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HULL SURVEYS OF CHEMICAL TANKERS

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



GDĄŃSK

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1 GENERAL

1.1 Application

1.1.1 The requirements of the present *Publication* apply to all self-propelled chemical tankers with integral cargo tanks, i.e. vessels with certificate of fitness for the carriage of dangerous chemicals in bulk.

If a chemical tanker is constructed with both integral and independent cargo tanks, these requirements are applicable only to that portion of the cargo length containing integral tanks.

Combined gas carrier/chemical tankers with independent cargo tanks within the hull, shall be surveyed as gas carriers.

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.

The requirements are additional to the classification requirements applicable to the remainder of the ship.

The requirements are not applicable to independent tanks on deck.

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 includes additional close-up survey when necessary.

1.2 Definitions

Chemical tanker – a ship constructed or adapted and used for the carriage in bulk of any liquid product listed in Chapter 17 of the *International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, IBC Code*.

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

Combined cargo/ballast tank – a tank which is used for the carriage of cargo or ballast water as routine part of the vessel's operation and will be treated as a ballast tank. Cargo tanks in which water ballast might be carried only in exceptional cases per MARPOL I/18.3 shall be considered as cargo tanks.

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

Close-up survey – a survey where the details of structural components are within the close visual inspection range of the Surveyor, i.e. normally within reach of hand.

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

Representative tanks – those tanks which are expected to reflect the condition of other tanks of similar type and service and with similar corrosion prevention systems.

When selecting representative tanks account shall be taken of the service and repair history on board and identifiable critical structural areas and/or suspect areas.

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

Critical structural area – locations which have been identified from calculations to require monitoring of 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.

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

Corrosion prevention system – is normally considered a full hard protective coating. Hard protective coating is usually to be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer’s specification.

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 light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition,

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

Reference is made to IACS Recommendation No.87 “Guidelines for Coating Maintenance & Repairs for Ballast Tanks and Combined Cargo/Ballast Tanks on Oil Tankers”.

Cargo area – the part of the ship which contains cargo tanks, slop tanks and cargo/ballast pump-rooms, cofferdams, ballast tanks and void spaces adjacent to cargo tanks and also deck areas throughout the entire length and breadth of the part of the ship over the above mentioned spaces.

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

Prompt and thorough repair – a permanent repair completed at the time of survey to the satisfaction of the Surveyor, therein removing the need for the imposition of any associated condition of classification, or recommendation.

Remote Inspection Techniques (RIT) – is a mean of survey that enables examination of any part of the structure without the need for direct physical access of the surveyor.

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 PRS Surveyor, will affect the ship’s structural, watertight or weathertight 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 (combined carriers).

For locations where adequate repair facilities are not available, consideration may be given upon Owner’s request, 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 PRS Surveyor, will impair the vessel’s fitness for continued service, remedial measures shall be implemented before the ship is readmitted to 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 weather tight integrity and impose a Recommendation with a specific time limit.

1.4 Thickness Measurements and Close-up Surveys

1.4.1 In any kind of survey, i.e. special, 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 carried out simultaneously with close-up surveys.

1.4.2 Consideration may be given by the attending Surveyor to allow use of Remote Inspection Techniques (RIT) as an alternative to close-up survey. Surveys conducted using a RIT are to be completed to the satisfaction of the attending Surveyor.

1.5 Remote Inspection Techniques (RIT)

1.5.1 The RIT is to provide the information normally obtained from a close-up survey. RIT surveys are to be carried out in accordance with the requirements given here-in and the requirements of IACS Recommendation 42 'Guidelines for Use of Remote Inspection Techniques for surveys'. These considerations are to be included in the proposals for use of a RIT which are to be submitted in advance of the survey so that satisfactory arrangements can be agreed with the PRS.

1.5.2 The equipment and procedure for observing and reporting the survey using a RIT are to be discussed and agreed with the parties involved prior to the RIT survey, and suitable time is to be allowed to set-up, calibrate and test all equipment beforehand.

1.5.3 When using a RIT as an alternative to close-up survey, if not carried out by the Society itself, it is to be conducted by a firm approved as by PRS and is to be witnessed by an attending PRS surveyor.

1.5.4 The structure to be examined using a RIT is to be sufficiently clean to permit meaningful examination. Visibility is to be sufficient to allow for a meaningful examination. The PRS is to be satisfied with the methods of orientation on the structure.

1.5.5 The Surveyor is to be satisfied with the method of data presentation including pictorial representation, and a good two-way communication between the Surveyor and RIT operator is to be provided.

1.5.6 If the RIT reveals damage or deterioration that requires attention, the Surveyor may require traditional survey to be undertaken without the use of a RIT.

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, as far as practicable, for the purpose of ensuring, 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, 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 chemical 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 (see 4.2.3) and Intermediate Survey (see 3.2.2.1 and 3.2.2.2) shall be performed.

When considered necessary by PRS Surveyor, or when extensive corrosion exists, thickness measurements shall be performed and if the results of these thickness measurements indicate that substantial corrosion is found, the extent of thickness measurements 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 Intermediate Survey shall be held at or between either 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, 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 Chemical Tankers between 5 and 10 Years of Age

The following applies:

3.2.2.1 For ballast tanks, an overall survey of representative tanks selected by PRS Surveyor shall be performed. If such inspections reveal no visible structural defects, the examination may be limited to a verification that the hard protective coating remains in GOOD condition.

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 founded 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 PRS Surveyor.

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

3.2.3 Chemical Tankers between 10 and 15 Years of Age

The following applies:

3.2.3.1 The requirements of Intermediate Survey shall be to the same extent as for the previous Class Renewal Survey as required in 4 and 5.1. However, pressure testing of cargo and ballast tanks is not required unless deemed necessary by PRS Surveyor.

3.2.3.2 In application of 3.2.3.1, 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.

3.2.3.3 In application of 3.2.3.1, an under water survey may be considered in lieu of the requirements of 4.2.2.

3.2.4 Chemical Tankers over 15 Years of Age

The following applies:

3.2.4.1 The requirements of Intermediate Survey shall be to the same extent as the previous Class Renewal Survey as required in 4 and 5.1. However, pressure testing of cargo and ballast tanks is not required unless deemed necessary by PRS Surveyor.

3.2.4.2 In application of 3.2.4.1, 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 a part of 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 Survey, 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-yearly intervals.

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 the extension was granted.

4.1.3 For surveys completed within 3 months before the 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 shall 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 are in a satisfactory condition and are fit for their 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 shall discover substantial corrosion, significant deformation, fractures, damages and other structural deterioration, that may be present.

4.2.1.3 Cargo piping on deck and cargo and ballast piping within the above tanks and spaces shall be examined and operationally tested to working pressure to the satisfaction of attending PRS 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 PRS Surveyor shall be advised of 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 Survey, 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 coating or corrosion protection system of cargo tanks shall be examined.

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

- 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 PRS Surveyor.

Thickness measurements shall be performed as considered necessary by PRS 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. The survey of stainless steel tanks may be performed as an overall survey supplemented by close-up survey as deemed necessary by PRS Surveyor.

4.3.3 The PRS 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:

- .1 in particular, for tanks having structural arrangements or details which have suffered defects in similar tanks or on similar ships according to available information.
- .2 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 a GOOD condition, the extent of close-up surveys according to Table I may be specially considered.

4.4 Extent of Thickness Measurement

4.4.1 The minimum requirements for thickness measurements at Class Renewal Survey are given in Table II. Thickness measurement of stainless steel hull structure and piping may be waived, except for clad steel plating.

4.4.2 Provisions for extended measurements for areas with substantial corrosion are given in Table IV, and may be additionally specified in the *Hull Survey Programme*, 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 PRS Surveyor may further extend the thickness measurements, as deemed necessary.

4.4.4 For areas in tanks where hard protective coatings are found to be in a 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.

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 are 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 PRS 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.

4.5.5 The testing of double bottom tanks and other spaces not designated for the carriage of liquid may be omitted, provided a satisfactory internal examination together with an examination of the tanktop is performed.

4.6 Chemical Tankers Over 10 Years of Age

4.6.1 The selected steel cargo pipes outside cargo tanks and ballast pipes passing through cargo tanks shall be:

- thickness measured at random or selected pipe lengths to be opened for internal inspection;
 - pressure tested to the maximum working pressure.
- Special attention shall be given to cargo/slop discharge piping through ballast tanks and void spaces.

5 PREPARATION 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,
- Intermediate Survey for chemical tanker over 10 years of age.

The *Hull Survey Programme* at Intermediate Survey may consist of the *Hull Survey Programme* at the previous Class Renewal Survey supplemented by the *Executive Hull Summary* of that Class Renewal Survey and later relevant survey reports.

The *Hull Survey Programme* shall be worked out taking into account any amendments to the survey requirements implemented after the last Class Renewal Survey performed.

The *Hull Survey Programme* shall be in a written format based on the information in Annex IIIA.

5.1.1.1 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 IIIB, and forwarded to PRS.

5.1.2 In developing the *Hull 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 (scantling drawings), including information regarding the use of high tensile steels (HTS), clad steel and stainless steel,
- .4** *Executive Hull Summary*,
- .5** relevant previous damage and repair history,
- .6** relevant previous survey and inspection reports from both PRS and the Owner,
- .7** information regarding the use of the ship's tanks, typical cargoes and other relevant data,
- .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 (previous class notation), 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 Annex IIIC;**
- .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), and
- .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 as well as paragraphs 4.5 and 4.6 for close-up survey, thickness measurement, tank testing and pipe testing, respectively, and shall include the relevant information including at least:

- .1 basic ship information and particulars,
- .2 main structural plans (scantling drawings), including information regarding use of high tensile steels (HTS), clad steel and stainless steel,
- .3 plan of tanks,
- .4 list of tanks with information on use, corrosion prevention and condition of coating,
- .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 nomination of tanks and areas for close-up survey (per 4.3),
- .9 nomination of sections for thickness measurement (per 4.4),
- .10 nomination of tanks for tank testing (per 4.5), and the pipes that shall undergo pipe testing as per 4.6,
- .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 the Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Chemical Tankers. Class Renewal Survey – Hull, 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 *Hull Survey Programme*.

5.2 Conditions for Survey

5.2.1 The Owner shall provide the necessary facilities for a safe execution of the survey:

- .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 surveyors 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. The requirements given in *Publication No. 47/P – Requirements for Safe Entry to Confined Spaces* shall 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 coatings have been applied, safe access shall be provided for PRS 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 PRS Surveyor to examine the hull 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 PRS 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 platforms,
- boats or rafts,
- portable ladders,
- other equivalent means.

5.3.3 For Surveys conducted by use of a remote inspection technique, one or more of the following means for access, acceptable to the Surveyor, is to be provided:

- Unmanned robot arm.
- Remote Operated Vehicles (ROV).
- Unmanned Aerial Vehicles / Drones.
- Other means acceptable to the PRS.

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 PRS Surveyor as required.

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

- radiographic,
- ultrasonic,
- magnetic particle,
- 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 during the survey (e.g. safety helmet, gloves, safety shoes, etc.).

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 PRS Surveyor is given the necessary assistance from the personnel on board.

Necessary precautions and procedures for performing 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 shall also 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 PRS Surveyor, who will take into account the safety arrangements provided, including weather forecasting and ship response under foreseeable sea conditions and provided the expected rise of water within the tank does not exceed 0.25 m.

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

- .1** only rough duty, inflatable rafts or boats, having satisfactory residual buoyancy and stability even if one chamber is ruptured, should be used;
- .2** the boat or raft should be tethered to the access ladder and an additional person should be stationed down the access ladder with a clear view of the boat or raft;
- .3** appropriate lifejackets should be available for all participants;
- .4** the surface of water in the tank should be calm (under all foreseeable conditions the expected rise of water within the tank should not exceed 0.25 m) and the water level stationary. On no account should the level of the water 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 cargo on the water is not acceptable;
- .6** at no time should the water level 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 should only 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 should be used should 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 m, rafts or boats alone may be allowed only:

- .1** when the coating of the under deck structure is in GOOD condition and there is no evidence of wastage; or
- .2** if a permanent means of access is provided in each bay to allow safety entry and exit. This means access directly from the deck via a vertical ladder and a small platform fitted approximately 2 m below the deck in each bay, or access to deck from a longitudinal permanent platform having ladders to deck in each end of the tank. The platform shall, for the full length of the tank, be arranged in level with, or above, the maximum water level needed for rafting of under deck structure. For this purpose, the ullage corresponding to the maximum water level shall be assumed not more than 3 m from the deck plate measured at the midspan of deck transverses and in the middle length of the tank (See Fig. 1).

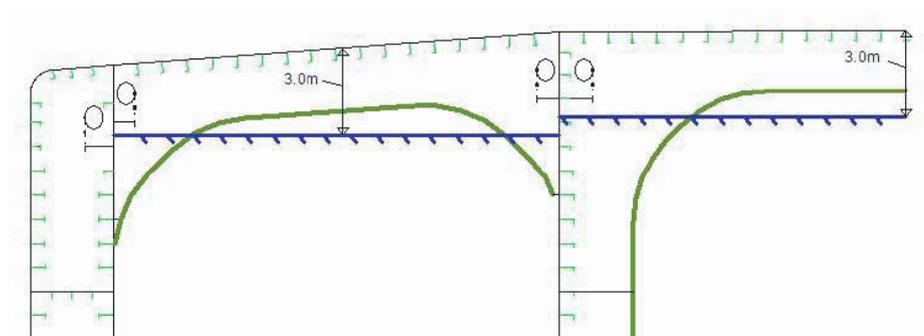


Fig. 1

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 Proper preparation and close co-operation between the attending PRS Surveyor(s) and the Owner's representatives onboard prior to and during the survey are an essential part in the safe and efficient conduct of the survey. During the survey on board safety meetings shall be held regularly.

5.7.2 Prior to the commencement of any part of the Class Renewal and Intermediate Survey a survey planning meeting shall be held between the attending PRS Surveyor(s), the Owner's Representative in attendance and the TM **firm** representative, where involved, and the master of the ship or an appropriately qualified representative appointed by the master or **firm** for the purpose of ascertaining that all the arrangements envisaged in the survey program 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/descaling, 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, and
- .9 communication between attending PRS 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 PRS 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 *Survey Report File* shall be a part of the documentation on board including:

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

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

6.3 Supporting Documents

6.3.1 The following additional documentation shall be available on board:

- *Hull Survey Programme* as required by 5.1 until such time as the Class Renewal Survey or Intermediate Survey, as applicable, has been completed,
- main structural plans of cargo and ballast 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,
- any other information that will help identify critical structural areas and/or suspect areas requiring inspection.

6.4 Review of Documentation on Board

Prior to survey, PRS 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, 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 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 the 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 Thickness measurement report shall be prepared and submitted to PRS.

The report shall give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report shall give the date when the measurements were performed, type of measurement equipment, names of measuring personnel and their qualifications and it has to be signed by the operator.

The thickness measurement report shall follow the principles as specified in the *Recommended Procedures for Thickness Measurements of Chemical Tankers* (see Annex II).

7.3.2 The PRS Surveyor is obliged to review the final thickness measurements 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.

8.2 Reporting

8.2.1 The principles for survey reporting are shown in Table VI.

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 PRS Surveyor(s), prior to continuing or completing the survey.

8.2.3 An *Executive Hull Summary* of the survey and results shall be issued to the Owner as shown in PRS FORM 328.1HS and placed on board the vessel for reference at future surveys.

The *Executive Hull Summary* shall be endorsed by PRS Head Office.

Table I.1
MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY
AT CLASS RENEWAL SURVEY OF SINGLE SKIN CHEMICAL TANKERS

Class Renewal Survey No. 1 Age ≤ 5	Class Renewal Survey No. 2 5 < Age ≤ 10	Class Renewal Survey No. 3 10 < Age ≤ 15	Class Renewal Survey No. 4 Age > 15
A ONE WEB FRAME RING – in a ballast wing tank	A ALL WEB FRAME RINGS – in a ballast wing tank or double bottom ballast tank (see Note 1)	A ALL WEB FRAME RINGS – in all ballast tanks	As Class Renewal Survey No. 3
B ONE DECK TRANSVERSE – in a cargo tank or on deck	B ONE DECK TRANSVERSE – in each remaining ballast tank or on deck B ONE DECK TRANSVERSE – in a cargo wing tank or on deck	A ALL WEB FRAME RINGS – in a cargo wing tank	Additional transverse areas as deemed necessary by PRS
D ONE TRANSVERSE BULKHEAD – lower part in a ballast tank	B ONE DECK TRANSVERSE – in two cargo centre tanks or on deck	A ONE WEB FRAME RING – in each remaining cargo tank	
D ONE TRANSVERSE BULKHEAD – lower part in a cargo wing tank	C BOTH TRANSVERSE BULKHEADS – in a ballast wing tank	C ALL TRANSVERSE BULKHEADS – in all cargo tanks	
D ONE TRANSVERSE BULKHEAD – lower part in a cargo centre tank (see Note 2)	D ONE TRANSVERSE BULKHEAD – in each remaining ballast tank D ONE TRANSVERSE BULKHEAD – lower part in two cargo centre tanks (see Note 2) D ONE TRANSVERSE BULKHEAD – lower part in a cargo wing tank	C ALL TRANSVERSE BULKHEADS – in all ballast tanks	

Note 1: Ballast double hull tank – means double bottom tank plus double side tank, as applicable, even if these tanks are separate.

Note 2: Where no centre cargo tanks are fitted (as in case of centre longitudinal bulkhead), transverse bulkheads in wing tanks shall be surveyed.

A – D: are areas to be subject to close-up surveys and thickness measurements (see Figs. 2.1 and 2.2).

- A) Complete transverse web frame ring, including adjacent structural members.
- B) Deck transverse, including adjacent deck structural members.
- C) Transverse bulkhead complete, including girder system and adjacent structural members.
- D) Transverse bulkhead lower part, including girder system and adjacent structural members.

Table I.2

**MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY
AT CLASS RENEWAL SURVEY OF DOUBLE SKIN CHEMICAL TANKERS**

Class Renewal Survey No. 1 Age ≤ 5	Class Renewal Survey No. 2 5 < Age ≤ 10	Class Renewal Survey No. 3 10 < Age ≤ 15	Class Renewal Survey No. 4 Age > 15
(1) ONE WEB FRAME RING – in a ballast double hull tank (see Note 1)	(1) ALL WEB FRAME RINGS – in a ballast wing tank or ballast double hull tank (see Note 1)	(1) ALL WEB FRAME RINGS – in all ballast tanks	As Class Renewal Survey No. 3
(2) ONE DECK TRANSVERSE – in a cargo tank or on deck	(6) THE KNUCKLE AREA AND THE UPPER PART – (3 meters approx.) of one web frame in each remaining ballast tank	(7) ALL WEB FRAME RINGS – in a cargo wing tank	Additional transverse areas as deemed necessary by PRS
(4) ONE TRANSVERSE BULKHEAD – in a ballast tank (see Note 1)		(7) ONE WEB FRAME RING – in each remaining cargo tank	
(5) ONE TRANSVERSE BULKHEAD – in a cargo wing tank	(2) ONE DECK TRANSVERSE – in two cargo tanks	(3) ALL TRANSVERSE BULKHEADS – in all cargo tanks	
(5) ONE TRANSVERSE BULKHEAD – in a cargo centre tank (see Note 2)	(4) ONE TRANSVERSE BULKHEAD – in each ballast tank (see Note 1)	(4) ALL TRANSVERSE BULKHEADS – in all ballast tanks	
	(5) ONE TRANSVERSE BULKHEAD – in two cargo centre tanks (see Note 2)		
	(5) ONE TRANSVERSE BULKHEAD – in a cargo wing tank		

Note 1: Ballast double hull tank: means double bottom tank plus double side tank plus double deck tank, as applicable, even if these tanks are separate.

Note 2: Where no centre cargo tanks are fitted (as in the case of centre longitudinal bulkhead), transverse bulkheads in wing tanks shall be surveyed.

(1) – (7) are areas to be subjected to close-up surveys and thickness measurements (see Figures 2.1 – 2.3).

- (1) Web frame in a ballast tank means vertical web in side tank, hopper web in hopper tank, floor in double bottom tank and deck transverse in double deck tank (where fitted), including adjacent structural members. In fore and aft peak tanks, web frame means a complete transverse web frame ring including adjacent structural members.
- (2) Deck transverse, including adjacent deck structural members (or external structure on deck in way of the tank, where applicable).
- (3) Transverse bulkhead complete in cargo tanks, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower and upper stools, where fitted.
- (4) Transverse bulkhead complete in ballast tanks, including girder system and adjacent structural members, such as longitudinal bulkheads, girders in double bottom tanks, inner bottom plating, hopper side, connecting brackets.
- (5) Transverse bulkhead lower part in cargo tank, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower stool, where fitted.
- (6) The *knuckle area* and the upper part (3 metres approximately), including adjacent structural members. *Knuckle area* is the area of the web frame around the connections of the slope hopper plating to the inner hull bulkhead and the inner bottom plating, up to 2 metres from the corners both on the bulkhead and the double bottom.
- (7) Web frame in a cargo tank means deck transverse, longitudinal bulkhead vertical girder and cross ties, where fitted, including adjacent structural members.

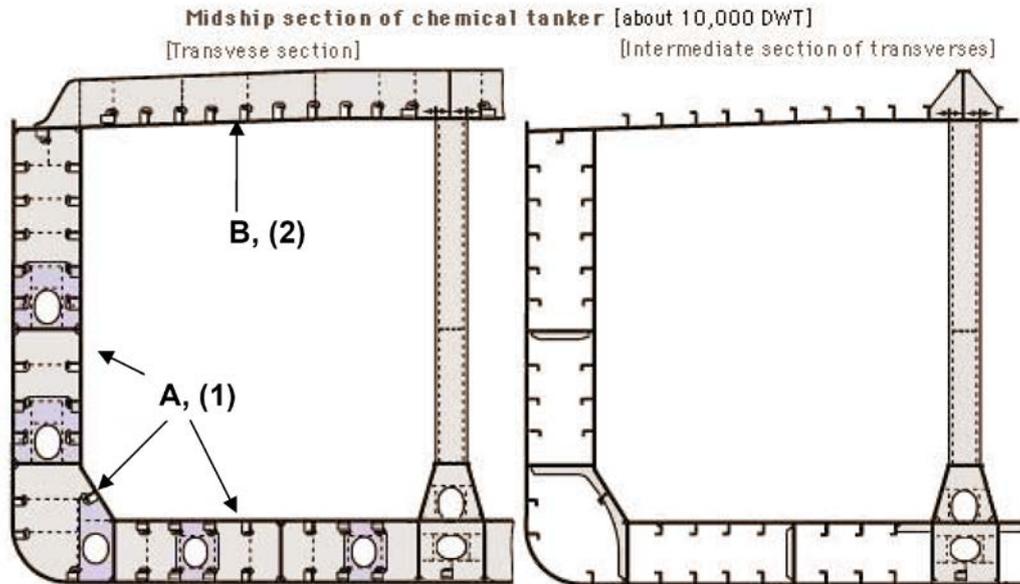


Fig. 2.1.
Representative transverse section of chemical tanker. Areas A & B and 1 & 2.

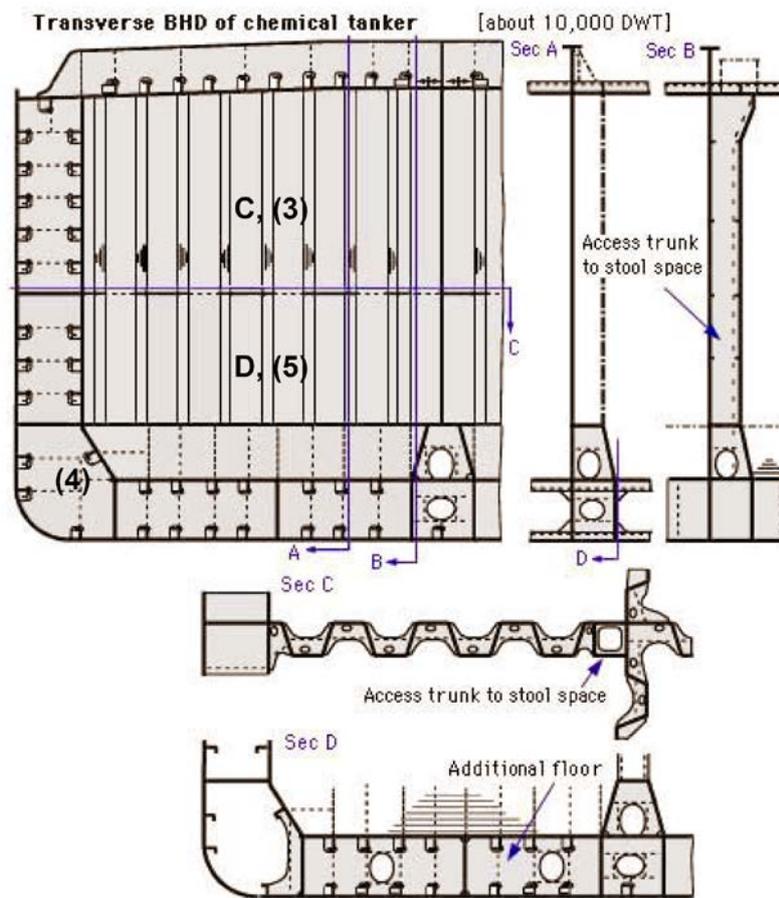


Fig. 2.2.
Representative transverse section of chemical tanker. Areas C & D and 3, 4 & 5.

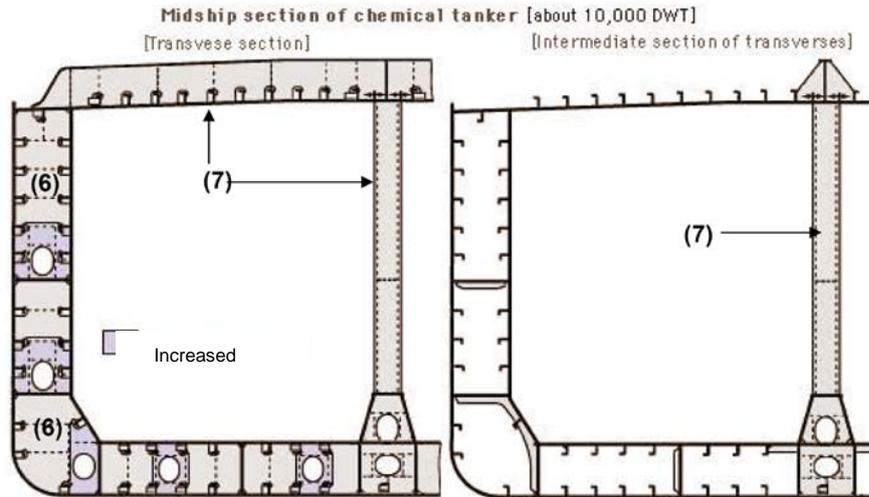


Fig. 2.3. Representative transverse section of chemical tankers. Areas 6 and 7.

Table II
MINIMUM REQUIREMENTS FOR THICKNESS MEASUREMENTS
AT CLASS RENEWAL SURVEY OF CHEMICAL TANKERS

Class Renewal Survey No. 1 Age ≤ 5	Class Renewal Survey No. 2 5 < Age ≤ 10	Class Renewal Survey No. 3 10 < Age ≤ 15	Class Renewal Survey No. 4 and subsequent Age > 15
1. Suspect areas	1. Suspect areas	1. Suspect areas	1. Suspect areas
2. One section of deck plating for the full beam of the ship within the cargo area (in way of a ballast tank, if any, or a cargo tank used primarily for water ballast)	2. Within the cargo area: .1 Each deck plate .2 One transverse section	2. Within the cargo area: .1 Each deck plate .2 Two transverse sections (at least one section shall include a ballast tank within 0.5L amidships) .3 All wind and water strakes	2. Within the cargo area: .1 Each deck plate .2 Three transverse sections (at least one section shall include a ballast tank within 0.5L amidships) .3 Each bottom plate
	3. Selected wind and water strakes outside the cargo area	3. Selected wind and water strakes outside the cargo area	3. All wind and water strakes, full length
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 CHEMICAL TANKERS

Class Renewal Survey No. 1 Age ≤ 5	Class Renewal Survey No. 2 and subsequent Age > 5
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 boundaries.

Table IV (sheet 1)

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

Class Renewal Survey of Chemical Tankers within the Cargo Area Length

BOTTOM AND HOPPER STRUCTURE		
STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
Bottom, inner bottom and hopper structure plating	Minimum of 3 bays across tank, including aft bay. Measurements around and under all suction bell mouths.	5 point pattern for each panel between longitudinals and floors
Bottom, inner bottom and hopper structure longitudinals	Minimum of three longitudinals in each bay where bottom plating measured	3 measurements in line across the flange and 3 measurements on vertical web
Bottom girders, including the watertight ones	At fore and aft watertight floors and in centre of tanks	Vertical line of single measurements on girder plating with one measurement between each panel stiffener, or a minimum of 3 measurements. 2 measurements across face flat where fitted
Bottom floors, including the watertight ones	3 floors in bays where bottom plating measured, with measurements at both ends and middle	5 point pattern over about 1 square metre
Hopper structure transverse watertight bulkhead or swash bulkhead	lower 1/3 of bulkhead	5 point pattern over 1 square metre of plating
	upper 2/3 of bulkhead	5 point pattern over 2 square metre of plating
	Stiffeners (minimum of 3)	For web, 5 point pattern over span (2 measurements across web at each end and 1 at centre of span). For flange, single measurement at each end and centre of span.
Panel stiffening	Where applicable	Single measurements

Table IV (sheet 2)

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

Class Renewal Survey of Chemical Tankers within the Cargo Area Length

DECK STRUCTURE		
STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1	2	3
Deck plating	Two transverse bands across tank	Minimum of 3 measurements per plate per band
Deck longitudinals	Every 3 rd longitudinal in each 2 bands with a minimum 1 longitudinal	3 measurements in line vertically on webs and 2 measurements on flange (if fitted)
Deck girders and brackets	At fore and aft transverse bulkhead, bracket toes and in centre of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of 3 measurements. Two measurements across flange. 5 point pattern on girder/bulkhead brackets

1	2	3
Deck transverse webs	Minimum of 2 webs with measurements at both ends and middle of span	5 point pattern over 1 square metre area. Single measurements on flange
Vertical web and transverse bulkhead in wing ballast tank for double hull design (2 meters from deck)	Minimum of 2 webs, and both transverse bulkheads	5 point pattern over 1 square metre area
Panel stiffening	Where applicable	Single measurements

Table IV (sheet 3)

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

Class Renewal Survey of Chemical Tankers within the Cargo Area Length

SIDE SHELL AND LONGITUDINAL BULKHEADS		
STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
Side shell and longitudinal bulkhead plating: – Deckhead and bottom strakes, and strakes in way of horizontal girders – All other strakes	– Plating between each pair of longitudinals in a minimum of 3 bays (along the tank) – Plating between every 3 rd pair of longitudinals in same 3 bays	Single measurement
Side shell and longitudinal bulkhead longitudinals on: – Deckhead and bottom strakes – All other strakes	– Each longitudinal in same 3 bays – Every third longitudinal in same 3 bays	3 measurements across web and 1 measurement on flange
Longitudinals – bracket	Minimum of 3 at top, middle and bottom of tank in same 3 bays	5 point pattern over area of bracket
Vertical web and transverse bulkheads of double side tanks (excluding deck area): – Strakes in way of horizontal girders – Other strakes	– Minimum of 2 webs and both transverse bulkheads – Minimum of 2 webs and both transverse bulkheads	– 5 point pattern over approx. 2 square meter area – 2 measurements between each pair of vertical stiffeners
Web frames and cross ties	3 webs with minimum of 3 locations on each web, including in way of cross tie connections and lower end brackets	5 point pattern over about 2 square metre area of webs, plus single measurements on flanges of web frame and cross tie
Horizontal girders	Plating on each girder in a minimum of 3 bays	2 measurements between each pair of longitudinal girder stiffeners
Panel stiffening	Where applicable	Single measurements

Table IV (sheet 4)

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

Class Renewal Survey of Chemical Tankers within the Cargo Length

TRANSVERSE WATERTIGHT AND SWASH BULKHEADS		
STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
Upper and lower stool, where fitted	<ul style="list-style-type: none"> – Transverse band within 25 mm of welded connection to inner bottom/ deck plating – Transverse band within 25 mm of welded connection to shelf plate 	5 points pattern between stiffeners over 1 meter length
Deckhead and bottom strakes, and strakes in way of horizontal stringers	Plating between pair of stiffeners at three locations – approx. 1/4, 1/2 and 3/4 width of tank	5 points pattern between stiffeners over 1 meter length
All other strakes	Plating between pair of stiffeners at middle location	Single measurement
Strakes in corrugated bulkheads	Plating for each change of scantling at centre of panel and at flange or fabricated connection	5 point pattern over about 1 square metre of plating
Stiffeners	Minimum of 3 typical stiffeners	For web, 5 point pattern over span between bracket connections (2 measurements across web at each bracket connection, and 1 at centre of span). For flange, single measurements at each bracket toe and at centre of span
Brackets	Minimum of 3 at top, middle and bottom of tank	5 point pattern over area of bracket
Horizontal stringers	All stringers with measurements at both ends and middle	5 point pattern over 1 square metre area, plus single measurements near bracket toes and on flanges
Deep webs and girders	Measurements at toe of bracket and at centre of span	For web, 5 point pattern over about 1 square metre. 3 measurements across face flat

Table V

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

1 Application

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

2 Procedures for Certification

2.1 Submission of Documents

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

- .1 Outline of firm, e.g. organization and management structure.
- .2 Experience of the firm on thickness measurement, inter alia, of hull structures of the vessels.
- .3 Technicians careers, i.e. experience of technicians as thickness measurement operators, technical knowledge of hull structure, etc. Operators shall be qualified according to a recognized industrial NDT Standard.
- .4 Equipment used for thickness measurement such as ultrasonic testing machines and its maintenance/calibration procedures.
- .5 A guide for thickness measurement operators.
- .6 Training programmes of technicians for thickness measurement.
- .7 Measurement record format in accordance with PRS *Recommended Procedures for Thickness Measurement of Chemical Tankers* (see Annex II).

2.2 Auditing of the Firm

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

2.3 Demonstration

Certification is conditional on an onboard demonstration at 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.

3.2 Renewal/endorsement of the *Certificate* shall be 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, PRS shall be immediately informed on such alteration. Re-audit is made, where deemed necessary by PRS.

5 Cancellation of Approval

Approval may be cancelled in the following cases:

- .1 Where the measurements were improperly performed or the results were improperly reported.
- .2 Where PRS Surveyor found any deficiencies in the approved thickness measurement operation systems of the firm.
- .3 Where the firm failed to inform PRS of any alteration in (4) above.

Table VI

REPORTING PRINCIPLES

As a principle, for chemical 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 recommendations have been imposed 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 recommendations imposed 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.

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, recommendation shall be imposed with a specific time limit for the repairs. In order to provide correct and proper information to the Surveyor attending for survey of the repairs, recommendation shall 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 Chemical Tankers, the following PRS Forms should be used:

- Form No. 328 C – Chemical Tanker Hull Survey Report (renewal),
- Form No. 328.1 C – Chemical Tanker Hull Survey Report (annual/intermediate),
- Form No. 328 HS – Executive Hull Summary,
- Form No. 328.1 HS – Preliminary Executive Hull Summary,
- Form No. 328 DP – Data on Hull Surveys,
- EWS/1 – IACS Early Warning Scheme (EWS),,
- Other related to survey reports (e.g. 305).

Table VII

EXECUTIVE HULL SUMMARY

PRS Forms No. 328.1 HS and 328 HS shall be used.

**GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION
WITH PLANNING FOR ENHANCED SURVEYS OF CHEMICAL TANKERS
CLASS RENEWAL SURVEY – HULL**

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References:

1. TSCF*, Guidance for the Inspection and Maintenance of Double Hull Tanker Structures, 1995.
2. TSCF*, Guidance Manual for Tanker Structures, 1997.

* Tanker Structure Co-operative Forum

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 chemical tankers.

As indicated in section 5.1.5 of PRS *Publication No. 46/P – Hull Surveys of Chemical Tankers* (Ref. 1), 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 *Hull Survey Programme*.

2 PURPOSE AND PRINCIPLES

2.1 Purpose

The purpose of the technical assessments described in these guidelines shall assist in identifying critical structural areas, nominating suspect areas and in focusing attention on structural elements or areas of structural elements which may be particularly susceptible to, or evidence a history of, wastage or damage. This information may be useful in nominating locations, areas and tanks for thickness measurement, close-up survey and tank testing.

Critical structural areas are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships (if available) to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

2.2 Minimum Requirements

However, these guidelines may not be used to reduce the requirements pertaining to thickness measurement, close-up survey and tank testing contained in Tables I, II and III, respectively, and in 4.5 of PRS *Publication No. 46/P* which are, in all cases, to be complied with as a minimum.

2.3 Timing

As with other aspects of survey planning, the technical assessments described in these guidelines should 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 assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of tanks and areas for survey:

- 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 assessments 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 Co-operative Forum (TSCF), (Refs. 1 and 2).

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

Technical assessments performed in conjunction with the survey planning process are, in principle, to be as shown in Figure 1. Figure 1 depicts, schematically, how technical assessments 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 made by the crew. The defects shall be analyzed, noted and marked on sketches.

In addition, general experience shall be utilized. For example, reference shall be made to the two TSCF's publications mentioned in Ref. 1 and 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 them with the actual structure and to search for similar details which may be susceptible to damage. An example is shown in Figure 2. In particular, Chapter 3 of Ref. 1 deals with various aspects specific to double hull tankers, such as stress concentration locations, misalignment during construction, corrosion trends, fatigue considerations and areas requiring special attention, which shall be considered in working out the survey planning.

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 *Hull 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. 2, Table 3.1),
- location of heated tanks.

Ref. 2 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. 2, together with the relevant information on the anticipated condition of the ship as derived from the information collected in order to prepare the *Hull Survey Programme* and the age of the ship.

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

Special attention shall be given to the areas where the double hull tanker is particularly exposed to corrosion. To this end, the specific aspects addressing corrosion in double hull tankers indicated in 3.4 (Corrosion trends) of Ref.1 shall be taken into account.

3.2.3 Locations for Close-up Survey and Thickness Measurement

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

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 highest corrosion risk and is always to include ballast tanks. The principle for the selection shall be that the extent is increased by age or where information is insufficient or unreliable.

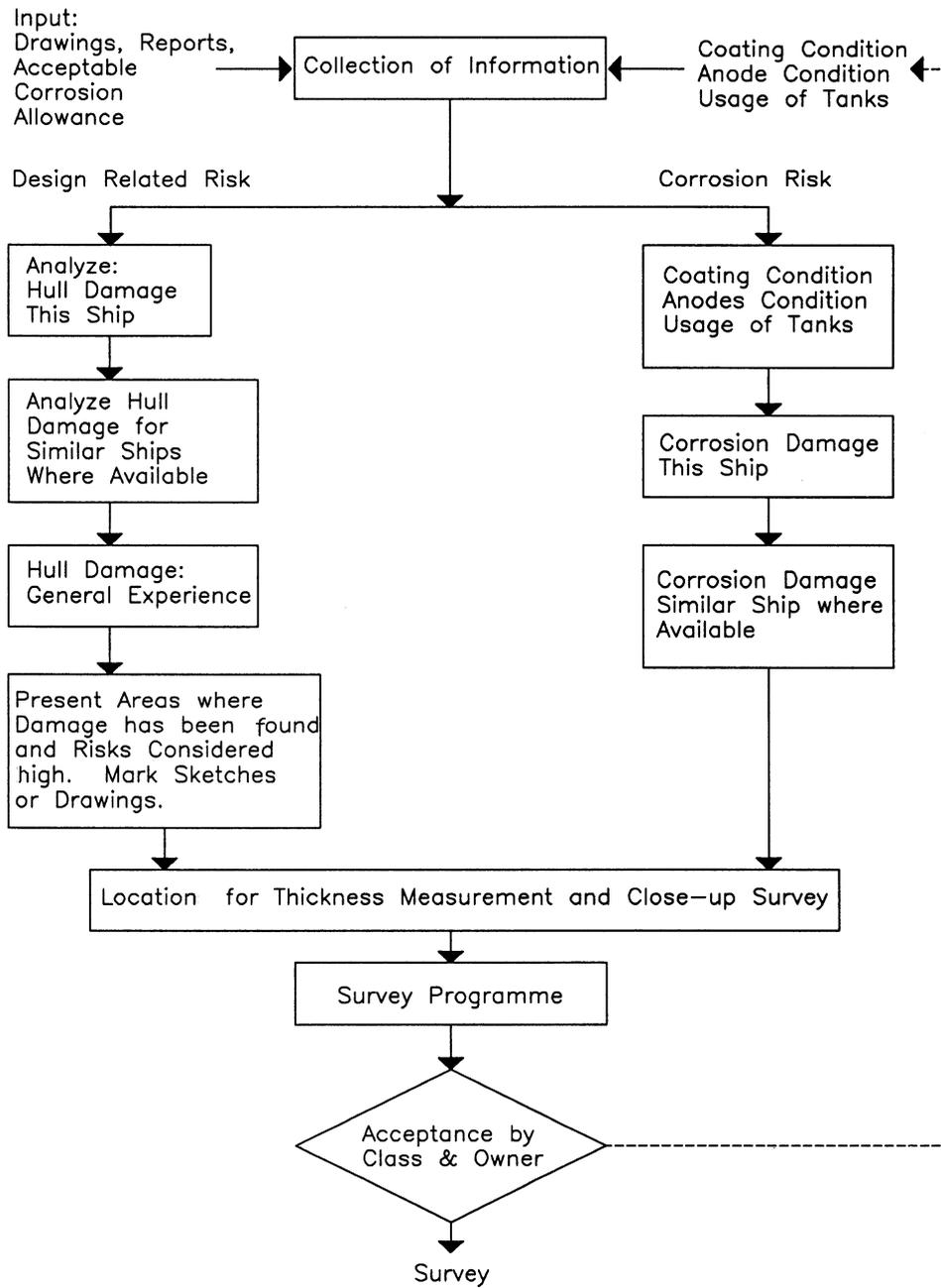


Figure 1.
Technical assessment and the survey planning process

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 style="text-align: center;">NOTE *ONE OR MORE FRACTURES MAY OCCUR</p>		<p style="text-align: center;">FULL COLLAR IF FRACTURES IN WEB PLATE ARE SMALL AND ARE REPAIRED BY WELDING</p> <p style="text-align: center;">WEB AND FLAT BAR CROPPED AND PART RENEWED OR ALTERNATIVELY WELDED</p>
<p style="text-align: center;">FACTORS CONTRIBUTING TO DAMAGE</p> <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	FIGURE 1
	SUBJECT: CATALOGUE OF STRUCTURAL DETAILS	

Figure 2.
Typical damage and repair example (reproduced from Ref. 1)

**RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS
OF CHEMICAL TANKERS**

1. This document is recommended to be used for recording thickness measurements as required by PRS *Publication No. 46/P*.
They are also recommended for recording thickness measurements during Owner's inspections (see Annex IIIC)
2. For Single Hull Chemical Tankers, please refer to Annex II of Publication No. 36/P – *Hull Surveys of Oil Tankers*.
3. For Double Hull Chemical Tankers, please refer to Annex II of Publication No. 58/P – *Hull Surveys of Double Hull Oil Tankers*.

HULL SURVEY PROGRAMME

1. *Hull Survey Programme* 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 this *Publication*.
2. *Hull Survey Programme*, PRS form No. 328PR shall be elaborated by the Owner with co-operation with PRS.

SURVEY PLANNING QUESTIONNAIRE

Survey Planning Questionnaire, PRS Form No. 628, is dedicated to complete necessary information that enables the Owner, with PRS cooperation, to develop *Hull Survey Programme* required by *Publication No. 46/P*. The Questionnaire, reflecting current information, should be completed by the Owner. Completed Questionnaire should be delivered to PRS.

OWNER'S INSPECTION REPORT

Ship Name:						
OWNER'S INSPECTION REPORT – Structural Condition						
For Tank No.:						
Grade of steel:		Deck: Bottom:		Side: Long. Bhd:		
Elements Other	Cracks	Buckles	Corrosion	Coating condition	Pitting	Mod./Rep.
Deck:						
Bottom:						
Side:						
Long. bulkheads:						
Transv. bulkheads:						
Repairs performed due to:						
Thickness measurements performed, dates:						
Results in general:						
Overdue surveys:						
Outstanding conditions of class:						
Comments:						
Date of inspection:						
Inspected by:						
Signature:						

List of amendments effective as of 1 January 2019

<i>Item</i>	<i>Title/Subject</i>	<i>Source</i>
1.2	Remote Inspection Technique definition added	IACS UR Z10.3 (Rev.18)
1.4.2	RIT alternative to close-up survey	
1.5	New point concerning RIT added	
5.1.2.11	Guidance for reporting	
5.3.3	Access to structures using RIT	
Table V	Transferred to Annex IIIC; following Tables renumbered	
Table VI	Superseded by Annex I	
Several items	Change the word “company” to “firm”	
