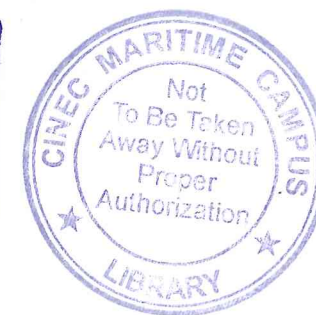


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GUIDELINES ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF BULK CARRIERS AND OIL TANKERS

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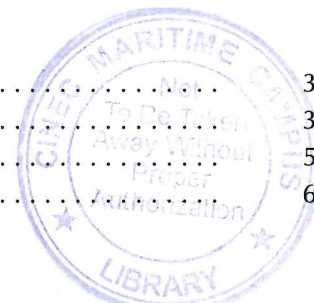
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Foreword

1 The Guidelines on the enhanced programme of inspections during surveys of bulk carriers and oil tankers (the Guidelines) were adopted on 4 November 1993 by Assembly resolution A.744(18) and subsequently made mandatory under SOLAS regulation XI-1/2, which entered into force on 1 January 1996. This regulation requires that bulk carriers and oil tankers as defined in SOLAS be subject to an enhanced programme of inspections in accordance with the Guidelines. The enhanced survey programme should be carried out during the surveys prescribed by regulation I/10 of the 1974 SOLAS Convention, as amended.

2 The Guidelines are divided into two annexes:

.1 Annex A (Guidelines on the enhanced programme of inspections during surveys of bulk carriers), including:

Part A – Guidelines on the enhanced programme of inspections during surveys of bulk carriers having single-side skin construction

Part B – Guidelines on the enhanced programme of inspections during surveys of bulk carriers having double-side skin construction

.2 Annex B (Guidelines on the enhanced programme of inspections during surveys of oil tankers), including:

Part A – Guidelines on the enhanced programme of inspections during surveys of double-hull oil tankers

Part B – Guidelines on the enhanced programme of inspections during surveys of oil tankers other than double-hull oil tankers

3 Since their adoption, the Guidelines have been frequently updated and brought in line with regulatory and technological developments as well as with current practice, in particular with the relevant IACS Unified Requirements.

4 The Guidelines have been amended in accordance with the provisions of article VIII of the SOLAS Convention, either by IMO's Maritime Safety Committee (MSC) or by a Conference of SOLAS Contracting Governments, as follows:

.1 by the June 1996 amendments, which were adopted by resolution MSC.49(66) and entered into force on 1 July 1998;

- .2 by the November 1997 amendments, which were adopted by resolution 2 of the Conference of Contracting Governments to SOLAS 1974 and entered into force on 1 July 1999;
- .3 by the December 2000 amendments, which were adopted by resolution MSC.105(73) and entered into force on 1 July 2002;
- .4 by the May 2002 amendments, which were adopted by resolution MSC.125(75) and entered into force on 1 January 2004;
- .5 by the June 2003 amendments, which were adopted by resolution MSC.144(77) and entered into force on 1 January 2005;
- .6 by the May 2005 amendments, which were adopted by resolution MSC.197(80) and entered into force on 1 January 2007; and
- .7 by the May 2008 amendments, which were adopted by resolution MSC.261(84) and are expected to enter into force on 1 January 2010.*

* In order for this publication to represent the complete consolidated current text of the Guidelines, these amendments have been included although they are technically not in force yet.

ANNEX A

Guidelines on the enhanced programme of inspections during surveys of bulk carriers



Part A

Guidelines on the enhanced programme of inspections during surveys of bulk carriers having single-side skin construction

1 General

1.1 Application*

1.1.1 The Guidelines should apply to all self-propelled bulk carriers of 500 gross tonnage and above having single-side skin construction. Where a bulk carrier has a combination of single- and double-side skin construction, the relevant requirements of parts A and B should apply to that construction, as applicable.

1.1.2 The Guidelines should apply to surveys of hull structure and piping systems in way of cargo holds, cofferdams, pipe tunnels, void spaces within the cargo length area and all ballast tanks. The surveys should be carried out during the surveys prescribed by regulation 1/10 of the 1974 SOLAS Convention, as amended.

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

1.2 Definitions

1.2.1 *Bulk carrier* is a ship which is constructed generally with single deck, topside tanks and hopper side tanks in cargo spaces, and is intended primarily to carry dry cargo in bulk and includes such types as ore carriers and combination carriers.[†]

1.2.2 *Ballast tank* is a tank which is used for water ballast and includes side ballast tanks, ballast double-bottom spaces, topside tanks, hopper side tanks and peak tanks.

* The intention of these Guidelines is to ensure that an appropriate level of review of plans and documents is conducted and consistency in application is attained. Such evaluation of survey reports, survey programmes, planning documents, etc., should be carried out at the managerial level of the Administration or organization recognized by the Administration.

[†] For combination carriers additional requirements are specified in the Guidelines on the enhanced programme of inspections during surveys for oil tankers set out in annex B.

1.2.3 Spaces are separate compartments including holds and tanks.

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

1.2.5 Close-up survey is a survey where the details of structural components are within the close visual inspection range of the surveyor, i.e., preferably within reach of hand.

1.2.6 Transverse section includes all longitudinal members such as plating, longitudinals and girders at the deck, side and bottom, inner bottom and hopper side plating, longitudinal bulkheads, and bottom plating in top wing tanks.

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

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

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

1.2.10 A corrosion prevention system is normally considered either:

- .1 a full hard coating; or
- .2 a full hard coating supplemented by anodes.

Protective coating should usually be epoxy coating or equivalent. Other coating systems may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specifications.

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

1.2.11 Coating condition is defined as follows:

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

1.2.12 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 to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

1.2.13 Cargo length area is that part of the ship which includes all cargo holds and adjacent areas including fuel tanks, cofferdams, ballast tanks and void spaces.

1.2.14 Intermediate survey is a survey carried out either at the second or third annual survey or between these surveys.

1.2.15 A prompt and thorough repair is a permanent repair completed at the time of survey to the satisfaction of the surveyor, therein removing the need for the imposition of any associated condition of classification or recommendation.

1.2.16 Convention means the International Convention for the Safety of Life at Sea, 1974, as amended.

1.2.17 Specially considered means sufficient close-up inspection and thickness measurements are taken to confirm the actual average condition of the structure under coating.

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 Administration, will affect the ship's structural, watertight or weathertight integrity, should be promptly and thoroughly repaired. Areas to be considered include:

- .1 side shell frames, their end attachments or adjacent shell plating;
- .2 deck structure and deck plating;

- .3 bottom structure and bottom plating;
- .4 watertight or oiltight bulkheads, and
- .5 hatch covers or hatch coamings.

Where adequate repair facilities are not available, the Administration may 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 corrosion or structural defects, either of which, in the opinion of the Administration, will impair the ship's fitness for continued service, remedial measures should be implemented before the ship continues in service.

1.4 Surveyors

For bulk carriers of 20,000 tons deadweight and above, two surveyors should jointly carry out the first scheduled renewal survey after the bulk carrier passes 10 years of age, and all subsequent renewal surveys and intermediate surveys. If the surveys are carried out by a recognized organization, the surveyors should be exclusively employed by such recognized organizations.

2 Renewal survey

2.1 General

2.1.1 The renewal survey may be commenced at the fourth annual survey and be progressed during the succeeding year with a view to completion by the fifth anniversary date.

2.1.2 As part of the preparation for the renewal survey, the survey programme should be dealt with in advance of the renewal survey. The thickness measurement should not be held before the fourth annual survey.

2.1.3 The survey should include, in addition to the requirements of the annual survey, examination, tests and checks of sufficient extent to ensure that the hull and related piping is in a satisfactory condition and is fit for its intended purpose for the new period of validity of the Cargo Ship Safety Construction Certificate, subject to proper maintenance and operation and to renewal surveys being carried out.

2.1.4 All cargo holds, ballast tanks, pipe tunnels, cofferdams and void spaces bounding cargo holds, decks and outer hull should be examined, and this examination should be supplemented by thickness measurement

and testing as deemed necessary to ensure that the structural integrity remains effective. The examination should be sufficient to discover substantial corrosion, significant deformation, fractures, damages or other structural deterioration.

2.1.5 All piping systems within the above spaces should be examined and operationally tested under working conditions to ensure that the condition remains satisfactory.

2.1.6 The survey extent of combined ballast/cargo holds should be evaluated based on the records of ballast history and extent of the corrosion prevention system provided.

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

2.2 Dry dock survey

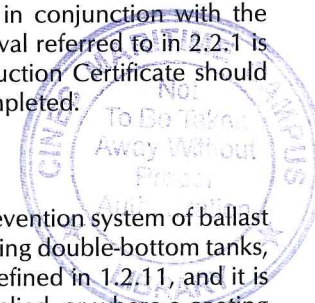
2.2.1 A survey in dry dock should be a part of the renewal survey. There should be a minimum of two inspections of the outside of the ship's bottom during the five-year period of the certificate. In all cases, the maximum interval between bottom inspections should not exceed 36 months.

2.2.2 For ships of 15 years of age and over, inspection of the outside of the ship's bottom should be carried out with the ship in dry dock. For ships of less than 15 years of age, alternate inspections of the ship's bottom not conducted in conjunction with the renewal survey may be carried out with the ship afloat. Inspection of the ship afloat should only be carried out when the conditions are satisfactory and the proper equipment and suitably qualified staff are available.

2.2.3 If a survey in dry dock is not completed in conjunction with the renewal survey or if the 36 month maximum interval referred to in 2.2.1 is not complied with, the Cargo Ship Safety Construction Certificate should cease to be valid until a survey in dry dock is completed.

2.3 Space protection

Where provided, the condition of the corrosion prevention system of ballast tanks should be examined. For ballast tanks, excluding double-bottom tanks, where a coating is found in POOR condition as defined in 1.2.11, and it is not renewed, or where a soft coating has been applied, or where a coating has not been applied, the tanks in question should be examined at annual intervals. When such breakdown of coating is found in ballast double-bottom tanks, or where a soft coating has been applied or where a coating



has not been applied, the tanks in question may be examined at annual intervals. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement should be carried out. Where a protective coating is provided in cargo holds and is found in good condition, the extent of close-up surveys and thickness measurements may be specially considered.

2.4 *Hatch covers and coamings*

2.4.1 A thorough inspection of the items listed in 3.3 should be carried out.

2.4.2 Checking of the satisfactory operation of all mechanically operated hatch covers should be made, including:

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

2.4.3 The effectiveness of sealing arrangements of all hatch covers by hose testing or equivalent should be checked.

2.4.4 Thickness measurement of the hatch cover and coaming plating and stiffeners should be carried out as given in annex 2.

2.5 *Extent of overall and close-up surveys*

2.5.1 An overall survey of all spaces excluding fuel oil tanks should be carried out at the renewal survey. Fuel oil tanks in way of cargo holds should be sufficiently examined to ensure that their condition is satisfactory.

2.5.2 Each renewal survey should include a close-up examination of sufficient extent to establish the condition of the shell frames and their end attachments in all cargo holds and ballast tanks as indicated in annex 1.

2.6 *Extent of thickness measurements*

2.6.1 The requirements for thickness measurements at the renewal survey are given in annex 2. Annex 11 provides additional thickness measurement guidelines applicable to the vertically corrugated transverse watertight bulkhead between cargo hold Nos.1 and 2 on ships subject to compliance with regulation XII/6.2 of the Convention.

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

2.6.3 The surveyor may extend the thickness measurements as deemed necessary. Provisions for extended measurements for areas with substantial corrosion as defined in 1.2.9 are given in annex 10.

2.6.4 For areas in spaces where coatings are found to be in GOOD condition as defined in 1.2.11, the extent of thickness measurements according to annex 2 may be specially considered by the Administration. Where a protective coating is provided in cargo holds and is found in good condition, the extent of close-up surveys and thickness measurements may be specially considered.

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

2.7 *Extent of tank pressure testing*

2.7.1 All boundaries of ballast tanks, deep tanks and cargo holds used for ballast within the cargo hold length should be pressure tested. Representative tanks for fresh water, fuel oil and lubrication oil should also be pressure tested.

2.7.2 Generally, the pressure should correspond to a water level to the top of hatches for ballast/cargo holds, or top of air pipes for ballast tanks or fuel tanks.

3 **Annual survey**

3.1 *General*

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

3.2 Examination of the hull

3.2.1 Examination of the hull plating and its closing appliances should be carried out as far as can be seen.

3.2.2 Examination of watertight penetrations should be carried out as far as practicable.

3.3 Examination of hatch covers and coamings

3.3.1 It should be confirmed that no unapproved changes have been made to the hatch covers, hatch coamings and their securing and sealing devices since the last survey.

3.3.2 A thorough survey of cargo hatch covers and coamings is only possible by examination in the open as well as closed positions and should include verification of proper opening and closing operation. As a result, at least the hatch covers sets within the forward 25% of the ship's length and at least one additional set, such that all the sets on the ship are assessed at least once in every five-year period, should be surveyed open, closed and in operation to the full extent in each direction at each annual survey, including:

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

The closing of the covers should include the fastening of all peripheral, and cross joint cleats or other securing devices. Particular attention should be paid to the condition of hatch covers in the forward 25% of the ship's length, where sea loads are normally greatest.

3.3.3 If there are indications of difficulty in operating and securing hatch covers, additional sets above those required by 3.3.2, at the discretion of the surveyor, should be tested in operation.

3.3.4 Where the cargo hatch securing system does not function properly, repairs should be carried out under the supervision of the Administration. Where hatch covers or coamings undergo substantial repairs, the strength of securing devices should be upgraded to comply with annex 13.

3.3.5 For each cargo hatch cover set, at each annual survey, the following items should be surveyed:

- .1 cover panels, including side plates, and stiffener attachments that may be accessible in the open position by close-up survey (for corrosion, cracks, deformation);

- .2 sealing arrangements of perimeter and cross joints (gaskets for condition and permanent deformation, flexible seals on combination carriers, gasket lips, compression bars, drainage channels and nonreturn valves);
- .3 clamping devices, retaining bars, cleating (for wastage, adjustment, and condition of rubber components);
- .4 closed cover locating devices (for distortion and attachment);
- .5 chain or rope pulleys;
- .6 guides;
- .7 guiderails and track wheels;
- .8 stoppers;
- .9 wires, chains, tensioners and gypsies;
- .10 hydraulic system, electrical safety devices and interlocks; and
- .11 end and interpanel hinges, pins and stools where fitted.

3.3.6 At each hatchway, at each annual survey, the coamings, with plating, stiffeners and brackets should be checked for corrosion, cracks and deformation, especially of the coaming tops.

3.3.7 Where considered necessary, the effectiveness of sealing arrangements may be proved by hose or chalk testing supplemented by dimensional measurements of seal compressing components.

3.3.8 Where portable covers, wooden or steel pontoons are fitted, the satisfactory condition of the following should be confirmed:

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

3.4 Examination of cargo holds

3.4.1 For bulk carriers over 10 years of age, the following should be carried out:

- .1 overall survey of all cargo holds. Where a protective coating is provided in cargo holds and is found in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered;
- .2 close-up examination of sufficient extent, minimum 25% of frames, to establish the condition of the lower region of the shell frames including approximately lower one-third length of the side frame at the side shell and side frame end attachment and the adjacent shell plating in the forward cargo hold. Where this level of survey reveals the need for remedial measures, the survey should be extended to include a close-up survey of all of the shell frames and adjacent shell plating of that cargo hold as well as a close-up survey of sufficient extent of all remaining cargo holds; and
- .3 when considered necessary by the surveyor, thickness measurement should be carried out. If the results of these thickness measurements indicate that substantial corrosion is found, the extent of thickness measurements should be increased in accordance with annex 10.

3.4.2 For bulk carriers over 15 years of age, the following should be carried out:

- .1 overall survey of all cargo holds. Where a protective coating is provided in cargo holds and is found in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered;
- .2 close-up examination of sufficient extent, minimum 25% of frames, to establish the condition of the lower region of the shell frames including approximately lower one-third length of the side frame at the side shell and side frame end attachment and the adjacent shell plating in the forward cargo hold and one other selected cargo hold. Where this level of survey reveals the need for remedial measures, the survey should be extended to include a close-up survey of all of the shell frames and adjacent shell plating of the cargo hold as well as a close-up survey of sufficient extent of all remaining cargo holds; and

- .3 when considered necessary by the surveyor, thickness measurement should be carried out. If the results of these thickness measurements indicate that substantial corrosion is found, the extent of thickness measurements should be increased in accordance with annex 10.

3.4.3 All piping and penetrations in cargo holds, including overboard piping, should be examined.

3.5 Examination of ballast tanks

Examination of ballast tanks should be carried out when required as a consequence of the results of the renewal survey and intermediate survey. When considered necessary by the surveyor, thickness measurement should be carried out. If the results of these thickness measurements indicate that substantial corrosion is found, the extent of thickness measurements should be increased in accordance with annex 10.

3.6 *Additional annual survey requirements for the foremost cargo hold of ships subject to SOLAS regulation XII/9.1 in accordance with the requirements of annex 12*

Ships subject to regulation XII/9.1 of the Convention are those meeting all of the following conditions:

- .1 bulk carriers of 150 m in length and upwards of single-side skin construction;
- .2 carrying solid bulk cargoes having a density of 1,780 kg/m³ and above;
- .3 constructed before 1 July 1999; and
- .4 constructed with an insufficient number of transverse watertight bulkheads to enable them to withstand flooding of the foremost cargo hold in all loading conditions and remain afloat in a satisfactory condition of equilibrium as specified in regulation XII/4.3 of the Convention.

4 Intermediate survey**4.1 General**

4.1.1 Items that are additional to the requirements of the annual survey may be surveyed either at the second or third annual survey or between these surveys.

4.1.2 The extent of survey is dependent upon the age of the ship as specified in 4.2, 4.3 and 4.4.

4.2 Bulk carriers 5 to 10 years of age

4.2.1 Ballast tanks

4.2.1.1 For spaces used for salt water ballast, an overall survey of representative spaces selected by the surveyor should be carried out. If such inspections reveal no visible structural defects, the examination may be limited to a verification that the protective coating remains efficient.

4.2.1.2 Where POOR coating condition, corrosion or other defects are found in salt water ballast spaces or where protective coating was not applied from the time of construction, the examination should be extended to other ballast spaces of the same type.

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

4.2.1.4 In addition to the requirements above, areas found to be suspect areas at the previous renewal survey should be overall and close-up surveyed.

4.2.2 Cargo holds

4.2.2.1 An overall survey of all cargo holds, including close-up survey of sufficient extent, minimum 25% of frames, should be carried out to establish the condition of:

- .1 shell frames including their upper and lower end attachments, adjacent shell plating, and transverse bulkheads in the forward cargo hold and one other selected cargo hold; and
- .2 areas found to be suspect areas at the previous renewal survey.

4.2.2.2 Where considered necessary by the surveyor as a result of the overall and close-up survey as described in 4.2.2.1, the survey should be extended to include a close-up survey of all of the shell frames and adjacent shell plating of that cargo hold as well as a close-up survey of sufficient extent of all remaining cargo holds.

4.2.3 Extent of thickness measurement

4.2.3.1 Thickness measurement should be carried out to an extent sufficient to determine both general and local corrosion levels at areas subject to close-up survey as described in 4.2.2.1. The minimum requirement for thickness measurements at the intermediate survey are areas found to be suspect areas at the previous renewal survey.

4.2.3.2 Where substantial corrosion is found, the extent of thickness measurements should be increased in accordance with the requirements of annex 10.

4.2.3.3 The thickness measurement may be dispensed with provided the surveyor is satisfied by the close-up survey, that there is no structural diminution and the protective coating, where applied, remains effective.

4.2.3.4 Where the protective coating in cargo holds, as referred to in the explanatory note below, is found to be in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered by the Administration.

Explanatory note:

At the time of new construction, all internal and external surfaces of hatch coamings and hatch covers, and all internal surfaces of the cargo holds, excluding the flat tank top areas and the hopper tanks sloping plating approximately 300 mm below the side shell frame and brackets, should have an efficient protective coating (epoxy coating or equivalent) applied in accordance with the manufacturer's recommendation. In the selection of coating, due consideration should be given by the owner to intended cargo conditions expected in service. For existing bulk carriers, where owners may elect to coat or recoat cargo holds as noted above, consideration may be given to the extent of the close-up and thickness measurement surveys. Prior to the coating of cargo holds of existing ships, scantlings should be ascertained in the presence of a surveyor.

4.3 Bulk carriers 10 to 15 years of age**4.3.1** Ballast tanks**4.3.1.1** For bulk carriers:

All salt water ballast tanks should be examined. If such inspections reveal no visible structural defects, the examination may be limited to a verification that the protective coating remains efficient.

4.3.1.2 For ore carriers:

- .1 all web frame rings - in one ballast wing tank;
- .2 one deck transverse - in each of the remaining ballast wing tanks;
- .3 both transverse bulkheads - in one ballast wing tank;
- .4 one transverse bulkhead - in each remaining ballast wing tank.

4.3.1.3 In addition, the requirements described in 4.2.1.2 to 4.2.1.4 apply.**4.3.2** Cargo holds

4.3.2.1 An overall survey of all cargo holds, including close-up survey of sufficient extent, minimum 25% of frames, should be carried out to establish the condition of:

- .1 shell frames including their upper and lower end attachments, adjacent shell plating, and transverse bulkheads of all cargo holds; and
- .2 areas found to be suspect areas at the previous renewal survey.

4.3.2.2 Where considered necessary by the surveyor as a result of the overall and close-up survey as described in 4.3.2.1, the survey should be extended to include a close-up survey of all of the shell frames and adjacent plating of all cargo holds.

4.3.3 Extent of thickness measurement

4.3.3.1 Thickness measurement should be carried out to an extent sufficient to determine both general and local corrosion levels at areas subject to close-up survey as described in 4.3.2.1. The minimum requirement for thickness measurements at the intermediate survey are areas found to be suspect areas at the previous renewal survey.

4.3.3.2 In addition, the requirements described in 4.2.3.2 to 4.2.3.4 apply.

4.4 Bulk carriers exceeding 15 years of age

4.4.1 The requirements of the intermediate survey should be to the same extent as the previous renewal survey required in 2 and 5.1. However, pressure testing of tanks and cargo holds used for ballast is not required unless deemed necessary by the attending surveyor.

4.4.2 In application of 4.4.1, 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 2.1.1.

5 Preparations for survey**5.1** Survey programme

5.1.1 A specific survey programme should be worked out in advance of the renewal survey by the owner in co-operation with the Administration. The survey programme should be in a written format based on the information in annex 4A. The survey should not commence until the survey programme has been agreed.

5.1.1.1 Prior to the development of the survey programme, the survey planning questionnaire should be completed by the owner based on the information set out in annex 4B, and forwarded to the Administration.

5.1.2 In developing the survey programme, the following documentation should be collected and consulted with a view to selecting tanks, holds, 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 (scantlings drawings), including information regarding use of high-tensile steels (HTS);
- .4 relevant previous survey and inspection reports from both the classification society and the owner;
- .5 information regarding the use of ship's holds and tanks, typical cargoes and other relevant data;
- .6 information regarding corrosion protection level on the new building; and
- .7 information regarding the relevant maintenance level during operation.

5.1.3 The submitted survey programme is to account for and comply, as a minimum, with the requirements of annexes 1 and 2 and paragraph 2.7 for close-up survey, thickness measurement and tank testing, respectively, and is to include 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);
- .3 plan of holds and tanks;
- .4 list of holds and tanks with information on use, protection 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 holds and tanks and areas for close-up survey (per annex 1);
- .9 nomination of sections for thickness measurement (per annex 2);
- .10 nomination of tanks for testing (per 2.7); and
- .11 damage experience related to ship in question.

5.1.4 The Administration will advise the owner of the maximum acceptable structural corrosion diminution levels applicable to the ship.

5.1.5 Use may also be made of the Guidelines for technical assessment in conjunction with the planning of enhanced surveys for bulk carriers contained in annex 9. These Guidelines are a recommended tool which may be invoked at the discretion of the Administration, 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 should provide the necessary facilities for a safe execution of the survey.

5.2.1.1 In order to enable the attending surveyors to carry out the survey, provisions for proper and safe access should be agreed between the owner and the Administration.

5.2.1.2 Details of the means of access should be provided in the survey planning questionnaire.

5.2.1.3 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 should not proceed.

5.2.2 Cargo holds, tanks and spaces should be safe for access. Cargo holds, tanks and spaces should be gas free and properly ventilated. Prior to entering a tank, void or enclosed space, it should be verified that the atmosphere in the tank is free from hazardous gas and contains sufficient oxygen.

5.2.3 Cargo holds, tanks and spaces should be sufficiently clean and free from water, scale, dirt, oil residues, sediments etc., to reveal corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating. In particular this applies to areas which are subject to thickness measurement.

5.2.4 Sufficient illumination should be provided to reveal corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating.

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

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

5.3 *Access to structures**

5.3.1 For overall survey, means should be provided to enable the surveyor to examine the 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, should be provided:

- .1 permanent staging and passages through structures;
- .2 temporary staging and passages through structures;
- .3 lifts and moveable platforms;

* Refer to MSC/Circ.686, Guidelines on the means of access to structures for inspection and maintenance of oil tankers and bulk carriers.

- .4 portable ladders;
- .5 other equivalent means.

5.4 *Equipment for survey*

5.4.1 Thickness measurements should normally be carried out by means of ultrasonic test equipment. The accuracy of the equipment should 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:

- .1 radiographic equipment;
- .2 ultrasonic equipment;
- .3 magnetic particle equipment;
- .4 dye penetrant;
- .5 other equivalent means.

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 should be made available during the survey. A safety checklist should be provided.

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

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

5.5 *Surveys at sea or at anchorage*

5.5.1 Surveys 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 should be in accordance with 5.1, 5.2, 5.3 and 5.4.

5.5.2 A communication system should be arranged between the survey party in the spaces and the responsible officer on deck.

5.5.3 When rafts or boats will be used for close-up survey the following conditions should 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 or hold 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 either stationary or falling. On no account should the level of the water be rising while the boat or raft is in use;
- .5 the tank, hold or space must contain clean ballast water only. Even a thin sheen of oil on the water is not acceptable; and
- .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.

5.5.4 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.

5.5.5 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 safe entry and exit. This means of access should be direct from the deck via a vertical ladder with a small platform fitted approximately 2 m below the deck. Other effective means of escape to the deck may be considered.

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

5.5.6 The use of rafts or boats alone in 5.5.4 and 5.5.5 does not preclude the use of boats or rafts to move about within a tank during a survey.

5.6 *Survey planning meeting*

5.6.1 The establishment of proper preparation and the close co-operation between the attending surveyor(s) and the owner's representatives on

board 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 should be held regularly.

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

5.6.3 The following is an indicative list of items that should 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 surveyor(s), the thickness measurement company operator(s) and owner representative(s) concerning findings.

6 Documentation on board

6.1 General

6.1.1 The owner should obtain, supply and maintain on board the ship documentation as specified in 6.2 and 6.3, which should be readily available for the surveyor. The condition evaluation report referred to in 6.2 should include a translation into English.

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

6.2 Survey report file

6.2.1 A survey report file should be a part of the documentation on board consisting of:

- .1 reports of structural surveys (annex 6);
- .2 condition evaluation report (annex 7); and
- .3 thickness measurement reports (annex 8).

6.2.2 The survey report file should be available also in the owner's and the Administration offices.

6.3 Supporting documents

The following additional documentation should be available on board:

- .1 main structural plans of holds and ballast tanks;
- .2 previous repair history;
- .3 cargo and ballast history;
- .4 inspections by ship's personnel with reference to:
 - .4.1 structural deterioration in general;
 - .4.2 leakages in bulkheads and piping;
 - .4.3 condition of coating or corrosion prevention system, if any. A guidance for reporting is shown in annex 3;
- .5 survey programme as required by 5.1 until such time as the renewal survey has been completed,

and any other information that would help to identify critical structural areas and/or suspect areas requiring inspection.

6.4 Review of documentation on board

Prior to survey, the surveyor should 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 carried out by the recognized organization acting on behalf of the Administration, should be witnessed by a surveyor of the recognized organization. The surveyor should be on board to the extent necessary to control the process.

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

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

7.2 Certification of thickness measurement company

The thickness measurements should be carried out by a qualified company certified by an organization recognized by the Administration according to principles stated in annex 5.

7.3 Reporting

7.3.1 A thickness measurement report should be prepared and submitted to the Administration. The report should give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report should give the date when the measurements were carried out, type of measuring equipment, names of personnel and their qualifications and be signed by the operator. The thickness measurement report should follow the principles as specified in the recommended procedures for thickness measurements set out in annex 8.

7.3.2 The surveyor should verify and countersign the thickness measurement reports.

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 ship collected during the survey should be evaluated for acceptability and continued structural integrity of the ship.

8.1.2 The analysis of data should be carried out and endorsed by the Administration and the conclusions of the analysis should form a part of the condition evaluation report.

8.2 Reporting

8.2.1 Principles for survey reporting are shown in annex 6.

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

8.2.3 A condition evaluation report of the survey and results should be issued to the owner as shown in annex 7 and placed on board the ship for reference at future surveys. The condition evaluation report should be endorsed by the Administration.



Annex 1 Requirements for close-up survey at renewal surveys

Age ≤ 5 years	5 < Age ≤ 10 years	10 < Age ≤ 15 years	Age > 15 years
1	2	3	4
<p>(A) 25% of shell frames in the forward cargo hold at representative positions. Selected frames in remaining cargo holds</p> <p>(B) One transverse web with associated plating and longitudinals in two representative water ballast tanks of each type (i.e., topside, hopper side or side tank)</p> <p>(C) Two selected cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted</p>	<p>(A) 25% of shell frames in all cargo holds including upper and lower end attachments and adjacent shell plating</p> <p>(B) One transverse web with associated plating and longitudinals in each water ballast tank (i.e., topside, hopper side or side tank)</p> <p>(B) Forward and aft transverse bulkhead in one side ballast tank, including stiffening system</p> <p>(C) One transverse bulkhead in each cargo hold, including internal structure of upper and lower stools, where fitted</p>	<p>(A) All shell frames in the forward cargo hold and 25% of frames in remaining cargo holds, including upper and lower end attachments and adjacent shell plating</p> <p>(B) All transverse bulkheads in ballast tanks, including stiffening system</p> <p>(B) All transverse webs with associated plating and longitudinals in each water ballast tank (i.e., topside, hopper side or side tank)</p> <p>(C) All cargo hold transverse bulkheads including internal structure of upper and lower stools, where fitted</p>	<p>(A) All shell frames in all cargo holds including upper and lower end attachments and adjacent shell plating.</p> <p>Areas (B)-(E) as for column 3</p>

Age ≤ 5 years	5 < Age ≤ 10 years	10 < Age ≤ 15 years	Age > 15 years
1	2	3	4
<p>(D) All cargo hold hatch covers and coamings</p>	<p>(D) All cargo hold hatch covers and coamings</p> <p>(E) Selected areas of deck plating inside line of hatch openings between cargo hold hatches</p>	<p>(D) All cargo hold hatch covers and coamings</p> <p>(E) All deck plating inside line of hatch openings between cargo hold hatches</p>	

(A) Cargo hold transverse frame

(B) Transverse web or watertight transverse bulkhead in water ballast tanks

(C) Cargo hold transverse bulkheads, platings, stiffeners and girders

(D) Cargo hold hatch covers and coamings

(E) Deck plating inside line of hatch openings between cargo hold hatches

Note: Close-up survey of transverse bulkheads to be carried out at four levels:

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

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

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

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

Annex 2
Requirements for thickness measurements at renewal surveys

Age ≤ 5 years	5 < Age ≤ 10 years	10 < Age ≤ 15 years	Age > 15 years
1	2	3	4
<p>1 Suspect areas</p>	<p>1 Suspect areas</p> <p>2 Within the cargo length area:</p> <p>.1 two transverse sections of deck plating outside line of cargo hatch openings</p> <p>3 Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to annex 1</p> <p>4 Selected cargo hold hatch covers and coamings (plating and stiffeners)</p> <p>5 Selected areas of deck plating inside line of openings between cargo hold hatches</p> <p>6 Wind and water strakes in way of transverse sections considered under point 2 above</p>	<p>1 Suspect areas</p> <p>2 Within the cargo length area:</p> <p>.1 each deck plate outside line of cargo hatch openings</p> <p>.2 two transverse sections, one of which should be in the amidship area, outside line of cargo hatch openings</p> <p>3 Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to annex 1</p> <p>4 All cargo hold hatch covers and coamings (plating and stiffeners)</p> <p>5 All deck plating inside line of openings between cargo hold hatches</p>	<p>1 Suspect areas</p> <p>2 Within the cargo length area:</p> <p>.1 each deck plate outside line of cargo hatch openings</p> <p>.2 three transverse sections, one of which should be in the amidship area, outside line of cargo hatch openings</p> <p>.3 each bottom plate</p> <p>3 Points 3 to 7 referred to in column 3</p>

Age ≤ 5 years	5 < Age ≤ 10 years	10 < Age ≤ 15 years	Age > 15 years
1	2	3	4
		<p>6 All wind and water strakes within the cargo length area</p> <p>7 Selected wind and water strakes outside the cargo length area</p> <p>8 As required by annex 12 for ships subject to compliance with regulation XII/6.2 of the Convention</p>	

Annex 3
Owner's inspection report
 Structural condition

Ship's name:							
Owners's inspection report – Structural condition							
For tank/hold no:							
Grade of steel: deck: side:							
bottom: longitudinal bulkhead:							
Elements	Cracks	Buckles	Corrosion	Coating condition	Pitting	Modification/ repair	Other
Deck:							
Bottom:							
Side:							
Side framing:							
Longitudinal bulkheads:							
Transverse bulkheads:							
Repairs carried out due to:							
Thickness measurements carried out (dates):							
Results in general:							
Overdue surveys:							
Outstanding conditions of class:							
Comments:							
Date of inspection:							
Inspected by:							
Signature:							

Annex 4A
Survey programme

Basic information and particulars

Name of ship:
IMO number:
Flag State:
Port of registry:
Gross tonnage:
Deadweight (metric tonnes):
Length between perpendiculars (m):
Shipbuilder:
Hull number:
Recognized Organization (RO):
RO ship identity:
Date of delivery of the ship:
Owner:
Thickness measurement company:

1 Preamble

1.1 Scope

1.1.1 The present 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 the Guidelines.

1.1.2 The arrangements and safety aspects of the survey should be acceptable to the attending surveyor(s).

1.2 Documentation

All documents used in the development of the survey programme should be available on board during the survey as required by section 6.

2 Arrangement of cargo holds, tanks and spaces

This section of the survey programme should provide information (either in the form of plans or text) on the arrangement of cargo holds, tanks and spaces that fall within the scope of the survey.

3 List of cargo holds, tanks and spaces with information on their use, extent of coatings and corrosion protection system

This section of the survey programme should indicate any changes relating to (and should update) the information on the use of the holds and tanks of the ship, the extent of coatings and the corrosion protective system provided in the survey planning questionnaire.

4 Conditions for survey

This section of the survey programme should provide information on the conditions for survey, e.g., information regarding cargo hold and tank cleaning, gas freeing, ventilation, lighting etc.

5 Provisions and method of access to structures

This section of the survey programme should indicate any changes relating to (and should update) the information on the provisions and methods of access to structures provided in the survey planning questionnaire.

6 List of equipment for survey

This section of the survey programme should identify and list the equipment that will be made available for carrying out the survey and the required thickness measurements.

7 Survey requirements

7.1 Overall survey

This section of the survey programme should identify and list the spaces that should undergo an overall survey for this ship in accordance with 2.4.1 and 2.5.1.

7.2 Close-up survey

This section of the survey programme should identify and list the hull structures that should undergo a close-up survey for this ship in accordance with 2.5.2.

8 Identification of tanks for tank testing

This section of the survey programme should identify and list the cargo holds and tanks that should undergo tank testing for this ship in accordance with 2.7.

9 Identification of areas and sections for thickness measurements

This section of the survey programme should identify and list the areas and sections where thickness measurements should be taken in accordance with 2.6.1.

10 Minimum thickness of hull structures

This section of the survey programme should specify the minimum thickness for hull structures of this ship that are subject to survey, according to (a) or (b):

- (a) Determined from the attached wastage allowance table and the original thickness to the hull structure plans of the ship;
- (b) Given in the following table(s):

Area or location	Original as-built thickness (mm)	Minimum thickness (mm)	Substantial corrosion thickness (mm)
Deck			
Plating			
Longitudinals			
Longitudinal girders			
Cross deck plating			
Cross deck stiffeners			
Bottom			
Plating			
Longitudinals			
Longitudinal girders			

Area or location	Original as-built thickness (mm)	Minimum thickness (mm)	Substantial corrosion thickness (mm)
Inner bottom			
Plating			
Longitudinals			
Longitudinal girders			
Floors			
Ship side in way of topside tanks			
Plating			
Longitudinals			
Ship side in way of hopper side tanks			
Plating			
Longitudinals			
Ship side in way of tanks (if applicable)			
Plating			
Longitudinals			
Longitudinal stringers			
Ship side in way of cargo holds			
Plating			
Side frames webs			
Side frames flanges			
Upper brackets webs			
Upper brackets flanges			
Lower brackets webs			
Lower brackets flanges			
Longitudinal bulkhead (if applicable)			
Plating			
Longitudinals (if applicable)			
Longitudinal girders (if applicable)			

Area or location	Original as-built thickness (mm)	Minimum thickness (mm)	Substantial corrosion thickness (mm)
Transverse bulkheads			
Plating			
Stiffeners (if applicable)			
Upper stool plating			
Upper stool stiffeners			
Lower stool plating			
Lower stool stiffeners			
Transverse web frames in topside tanks			
Plating			
Flanges			
Stiffeners			
Transverse web frames in hopper tanks			
Plating			
Flanges			
Stiffeners			
Hatch covers			
Plating			
Stiffeners			
Hatch coamings			
Plating			
Stiffeners			

Note: The wastage allowance tables should be attached to the survey programme.

11 Thickness measurement company

This section of the survey programme should identify changes, if any, relating to the information on the thickness measurement company provided in the survey planning questionnaire.

Annex 4B

Survey planning questionnaire

1 The following information will enable the owner in co-operation with the Administration to develop a survey plan complying with the requirements of the Guidelines. It is essential that the owner provides, when completing the present questionnaire, up-to-date information. The present questionnaire, when completed, shall provide all information and material required by the Guidelines.

Particulars

Ship's name:

IMO number:

Flag State:

Port of registry:

Owner:

Recognized Organization:

Gross tonnage:

Deadweight (metric tonnes):

Date of delivery:

Information on access provision for close-up surveys and thickness measurement

2 The owner should indicate, in the table below, the means of access to the structures subject to close-up survey and thickness measurement. A close-up survey is an examination where the details of structural components are within the close visual inspection range of the attending surveyor, i.e., preferably within reach of hand.

Hold/Tank No.	Structure	Temporary staging	Rafts	Ladders	Direct access	Other means (please specify)
F.P.	Fore peak					
A.P.	Aft peak					
Cargo holds	Hatch side coamings					
	Topside sloping plate					
	Upper stool plating					
	Cross deck					
	Side shell, frames & brackets					
	Transverse bulkhead					
	Hopper tank plating					
	Lower stool					
	Tank top					
	Under deck structure					
Topside tanks	Side shell & structure					
	Sloping plate & structure					
	Webs & bulkheads					

Hold/Tank No.	Structure	Temporary staging	Rafts	Ladders	Direct access	Other means (please specify)
Hopper tanks	Hopper sloping plate & structure					
	Side shell & structure					
	Bottom structure					
	Webs & bulkheads					
	Double bottom structure					
	Upper stool internal structure					
	Lower stool internal structure					
	Under deck & structure					
	Side shell & structure					
Wing tanks of double ore carriers	Side shell vertical web & structure					
	Longitudinal bulkhead & structure					
	Longitudinal bulkhead web & structure					
	Bottom plating & structure					
	Cross ties/stringers					

History of bulk cargoes of a corrosive nature (e.g., high sulphur content)

Owner's inspections

3 Using a format similar to that of the table below (which is given as an example), the owner should provide details of the results of their inspections, for the last 3 years – in accordance with the Guidelines – on all CARGO holds and BALLAST tanks and VOID spaces within the cargo area.

Tank/Hold No.	Corrosion protection (1)	Coating extent (2)	Coating condition (3)	Structural deterioration (4)	Hold and tank history (5)
Cargo holds					
Topside tanks					
Hopper tanks					
Double side skin tanks					
Double bottom tanks					
Upper stools					
Lower stools					
Wing tanks (ore tankers)					
Fore peak					
Aft peak					
Miscellaneous other spaces:					

Note: Indicate tanks which are used for oil/ballast.

- 1) HC = hard coating; SC = soft coating;
A = anodes; NP = no protection
- 2) U = upper part; M = middle part;
L = lower part; C = complete
- 3) G = good; F = fair; P = poor;
RC = recoated (during the last
three years)
- 4) N = no findings recorded; Y = findings
recorded, description of findings
should be attached to this questionnaire
- 5) DR = Damage & Repair; L = Leakages;
CV = Conversion (Description to be
attached to this questionnaire)

Name of owner's representative:
Signature:.....
Date:

Reports of port State control inspections

List the reports of port State control inspections containing hull structural related deficiencies and relevant information on rectification of the deficiencies:

Safety management system

List non-conformities related to hull maintenance including the associated corrective actions:

Name and address of the approved thickness measurement company:

Annex 5

Procedures for certification of a company engaged in thickness measurement of hull structures

1 Application

This guidance applies for certification of the company which intends to engage in the thickness measurement of hull structures of ships.

2 Procedures for certification

Submission of documents

2.1 The following documents should be submitted to an organization recognized by the Administration for approval:

- .1 outline of the company, e.g., organization and management structure;
- .2 experience of the company on thickness measurement of hull structures of ships;
- .3 technicians' careers, i.e., experience of technicians as thickness measurement operators, technical knowledge and experience of hull structure, etc. Operators should be qualified according to a recognized industrial NDT Standard;
- .4 equipment used for thickness measurement such as ultrasonic testing machines and their maintenance/calibration procedures;
- .5 a guide for thickness measurement operators;
- .6 training programmes for technicians for thickness measurement;
- .7 measurement record format in accordance with recommended procedures for thickness measurements (see annex 8).

Auditing of the company

2.2 Upon reviewing the documents submitted with satisfactory results, the company should be audited in order to ascertain that the company is duly organized and managed in accordance with the documents submitted, and eventually is capable of conducting thickness measurement of the hull structure of ships.

2.3 Certification is conditional upon an on board demonstration of thickness measurement as well as satisfactory reporting.

3 Certification

3.1 Upon satisfactory results of both the audit of the company referred to in 2.2 and the demonstration tests referred to in 2.3, the Administration or organization recognized by the Administration should issue a certificate of approval as well as a notice to the effect that the thickness measurement operation system of the company has been certified.

3.2 Renewal/endorsement of the certificate should be made at intervals not exceeding three years by verification that original conditions are maintained.

4 Report of any alteration to the certified thickness measurement operation system

In cases where any alteration to the certified thickness measurement operation system of the company is made, such an alteration should be immediately reported to the organization recognized by the Administration. Re-audit should be made where deemed necessary by the organization recognized by the Administration.

5 Withdrawal of the certification

The certification may be withdrawn in the following cases:

- .1 where the measurements were improperly carried out or the results were improperly reported;
- .2 where the surveyor found any deficiencies in the approved thickness measurement operation systems of the company; and
- .3 where the company failed to report any alteration referred to in 4 to the organization recognized by the Administration as required.

Annex 6

Survey reporting principles

As a principle, for bulk carriers subject to the Guidelines, the surveyor should include the following contents in his report for survey of hull structure and piping systems, as relevant for the survey.

1 General

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

- .1 in connection with commencement, continuation and/or completion of periodical hull surveys, i.e., annual, intermediate and renewal surveys, as relevant;
- .2 when structural damages/defects have been found;
- .3 when repairs, renewals or modifications have been carried out; and
- .4 when condition of class (recommendation) has been imposed or has been deleted.

1.2 The reporting should provide:

- .1 evidence that prescribed surveys have been carried out in accordance with applicable requirements;
- .2 documentation of surveys carried out with findings, repairs carried out and condition of class (recommendation) imposed or deleted;
- .3 survey records, including actions taken, which should form an auditable documentary trail. Survey reports should be kept in the survey report file required to be on board;
- .4 information for planning of future surveys; and
- .5 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 should 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, are to be made available to the next attending surveyor, prior to continuing or completing the survey. Thickness measurement and tank testing carried out is also to be listed for the next surveyor.

2 Extent of the survey

2.1 Identification of compartments where an overall survey has been carried out.

2.2 Identification of locations, in each ballast tank and cargo hold including hatch covers and coamings, where a close-up survey has been carried out, together with information on the means of access used.

2.3 Identification of locations, in each ballast tank and cargo hold including hatch covers and coamings, where thickness measurement has been carried out.

Note: As a minimum, the identification of location of close-up survey and thickness measurement should include a confirmation, with description of individual structural members, corresponding to the extent of requirements stipulated in annex A based on type of periodical survey and the ship's age.

Where only partial survey is required, i.e., 25% of shell frames, one transverse web, two selected cargo hold transverse bulkheads, the identification should include location within each ballast tank and cargo hold by reference to frame numbers.

2.4 For areas in ballast tanks and cargo holds where protective coating is found to be in good condition and the extent of close-up survey and/or thickness measurement has been specially considered, structures subject to special consideration should be identified.

2.5 Identification of tanks subject to tank testing.

2.6 Identification of piping systems on deck and within cargo holds, ballast tanks, pipe tunnels, cofferdams and void spaces where:

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

3 Result of the survey

3.1 Type, extent and condition of protective coating in each tank, as relevant (rated GOOD, FAIR or POOR) including identification of tanks fitted with anodes.

Contents of condition evaluation report

- Part 1 – General particulars: – See front page
- Part 2 – Report review: – Where and how survey was done
- Part 3 – Close-up survey: – Extent (which tanks/holds)
- Part 4 – Thickness measurements: – Reference to thickness measurement report
– Summary of where measured
– Separate form indicating the spaces with substantial corrosion, and corresponding:
– thickness diminution
– corrosion pattern
- Part 5 – Tank corrosion prevention system: – Separate form indicating:
– location of coating/anodes
– condition of coating (if applicable)
- Part 6 – Repairs: – Identification of spaces/areas
- Part 7 – Condition of class/flag State requirements:
- Part 8 – Memoranda: – Acceptable defects
– Any points of attention for future surveys, e.g., for suspect areas
– Extended annual/intermediate survey due to coating breakdown
- Part 9 – Conclusion: – Statement on evaluation/ verification of survey report

Extract of thickness measurements

Reference is made to the thickness measurement report:

Position of substantially corroded tanks/areas ¹ or areas with deep pitting ³	Thickness diminution [%]	Corrosion pattern ²	Remarks: (e.g., ref. attached sketches)

Notes:

- ¹ Substantial corrosion, i.e., 75%-100% of acceptable margins wasted.
- ² P = Pitting
C = Corrosion in general
- ³ Any bottom plating with a pitting intensity of 20% or more, with wastage in the substantial corrosion range or having an average depth of pitting of $\frac{1}{3}$ or more of actual plate thickness should be noted.

Tank/hold corrosion prevention system

Tank/hold nos. ¹	Tank/hold corrosion prevention system ²	Coating condition ³	Remarks

Notes:

- 1 All ballast tanks and cargo holds should be listed.
- 2 C = Coating A = Anodes NP = No protection
- 3 Coating condition according to the following standard:
 - GOOD condition with only minor spot rusting.
 - FAIR condition with local breakdown of coating at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition.
 - POOR condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

If coating condition POOR is given, extended annual surveys should be introduced. This should be noted in part 7 of the Contents of condition evaluation report.

Annex 8*Recommended procedures for thickness measurements***General**

- 1 These procedures should be used for recording thickness measurements as required by annex 2.
- 2 Reporting forms TM1-BC, TM2-BC, TM3-BC, TM4-BC, TM5-BC, TM6-BC and TM7-BC, set out in appendix 2 should be used for recording thickness measurements and the maximum allowance diminution should be stated.
- 3 Appendix 3 contains guidance diagrams and notes relating to the reporting forms and the requirements for thickness measurement.
- 4 The reporting forms should, where appropriate, be supplemented by data presented on structural sketches.

Appendix 1 General particulars

Appendix 2 Reports on thickness measurement

Appendix 3 Guidance on thickness measurement

Appendix 4 Ore carriers – Thickness measurement and typical transverse section indicating longitudinal and transverse members

Appendix 5 Ore carriers – Thickness measurements and close-up survey requirements

Appendix 1 GENERAL PARTICULARS

Ship's name:
 IMO number:
 Class/Administration identity number:
 Port of registry:
 Gross tonnage:
 Deadweight:
 Date of build:
 Classification society:

Name of company performing thickness measurement:

Thickness measurement company certified by:

Certificate number:

Certificate valid from: to

Place of measurement:

First date of measurement:

Last date of measurement:

Renewal survey/intermediate survey* due:

Details of measurement equipment:

Qualification of operator:

Report number: consisting of pages

Name of operator: Name of surveyor:

Signature of operator: Signature of surveyor:

Company official stamp: Administration:
 Official stamp

* Delete as appropriate.

Appendix 2 REPORTS ON THICKNESS MEASUREMENT

Report on thickness measurement of all deck plating, all bottom shell plating or side shell plating (TM1-BC)

Ship's name	IMO number	Class identity no.	Report no.	Forward reading		Aft reading		Diminution S		Mean diminution		Maximum allowable diminution (mm)
				Gauged	Diminution P	Diminution P	Diminution P	mm	%	P	S	
STRAKE POSITION	No. of or letter	Orig. thk. (mm)	Gauged	Diminution P	Diminution S	Gauged	Diminution P	Diminution S	mm	%	P	S
12th forward			P									
11th			P									
10th			P									
9th			P									
8th			P									
7th			P									
6th			P									
5th			P									
4th			P									
3rd			P									
2nd			P									
1st			P									
Amidships			P									
1st aft			P									
2nd			P									
3rd			P									
4th			P									
5th			P									
6th			P									
7th			P									
8th			P									
9th			P									
10th			P									
11th			P									
12th			P									

Operator's signature Surveyor's signature Notes - see following page

Notes:

- 1 This report should be used for recording the thickness measurement of:
 - .1 All strength deck plating within the cargo length area.
 - .2 Keel, bottom shell plating and bilge plating within the cargo length area.
 - .3 Side shell plating that is all wind and water strakes within the cargo length area.
 - .4 Side shell plating that is selected wind and water strakes outside the cargo length area.
- 2 The strake position should be clearly indicated as follows:
 - .1 For strength deck, indicate the number of the strake of plating inboard from the stringer plate.
 - .2 For bottom plating, indicate the number of the strake of plating outboard from the keel plate.
 - .3 For side shell plating, give number of the strake of plating below sheerstrake and letter as shown on shell expansion.
- 3 Only the deck plating strakes outside line of openings should be recorded.
- 4 Measurements should be taken at the forward and aft areas of all plates and the single measurements recorded should represent the average of multiple measurements.

Report on thickness measurement of shell and deck plating (one, two or three transverse sections) (TM2-BC(1))

Ship's name	IMO number	Class identity no.	Report no.	STRENGTH DECK AND SHEERSTRAKE PLATING												
				FIRST TRANSVERSE SECTION AT FRAME NUMBER				SECOND TRANSVERSE SECTION AT FRAME NUMBER				THIRD TRANSVERSE SECTION AT FRAME NUMBER				
				No. or letter	Orig. thk. (mm)	Diminution	Max. allow. dimin. (mm)	No. or letter	Orig. thk. (mm)	Diminution	Max. allow. dimin. (mm)	No. or letter	Orig. thk. (mm)	Diminution	Max. allow. dimin. (mm)	
		P	S	%	mm	%	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 strake																
sheerstrake																
TOPSIDE TOTAL																

Operator's signature Surveyor's signature Notes - see following page

Notes:

- 1 This report should be used for recording the thickness measurement of strength deck plating and sheerstrake plating transverse sections:

Two or three sections within the cargo length area, comprising structural items (1), (2) and (3) as shown on the diagram of typical transverse section indicating longitudinal and transverse members, in appendix 3.
- 2 Only the deck plating outside the line of openings should be recorded.
- 3 The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
- 4 The exact frame station of measurement should be stated.
- 5 The single measurements recorded should represent the average of multiple measurements.

Report on thickness measurement of shell and deck plating (one, two or three transverse sections) (TM2-BC(2))

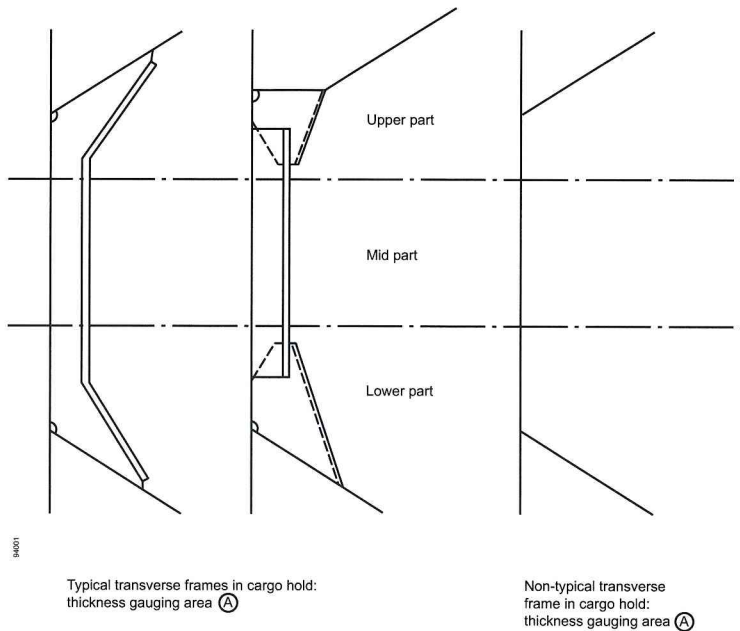
Ship's name IMO number Class identity no. Report no.

STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER. ...						SECOND TRANSVERSE SECTION AT FRAME NUMBER. ...						THIRD TRANSVERSE SECTION AT FRAME NUMBER. ...									
	No. or letter	Orig. thk (mm)	Gauged P	S	Diminution P	Diminution S	Max. allow. dimin. (mm)	No. or letter	Orig. thk (mm)	Gauged P	S	Diminution P	Diminution S	Max. allow. dimin. (mm)	No. or letter	Orig. thk (mm)	Gauged P	S	Diminution P	Diminution S	Max. allow. dimin. (mm)	
1st below sheerstrake																						
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 Surveyor's signature Notes - see following page

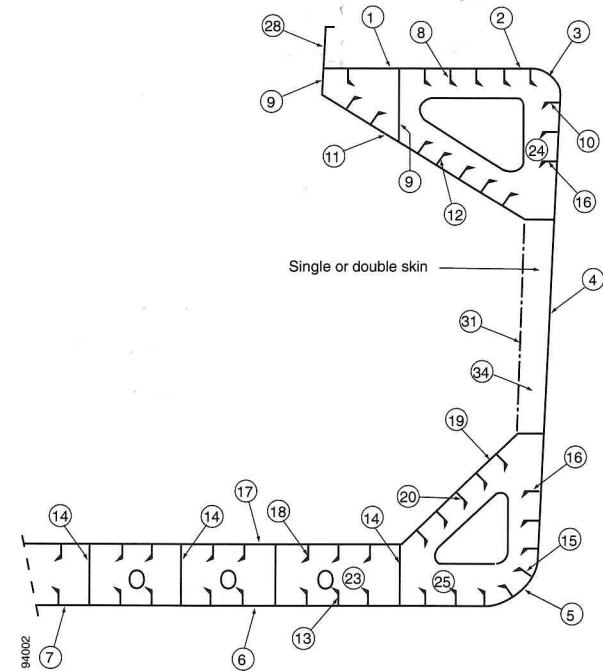
Notes:

- 1 This report should be used for recording the thickness measurement of:
 - cargo hold transverse frames; and
 - structural item number (34) as shown on the diagram of typical transverse section indicating longitudinal and transverse members in appendix 3.
- 2 Guidance for areas of measurement is indicated in appendix 3.
- 3 The single measurements recorded should represent the average of multiple measurements.



**Appendix 3
GUIDANCE ON THICKNESS MEASUREMENT**

Typical transverse section indicating longitudinal and transverse members



REPORT ON TM2-BC	
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 TM3-BC	
8	Deck longitudinals
9	Deck girders
10	Sheerstrake longitudinals
11	Topside tank sloping plating
12	Topside tank sloping plating longitudinals
13	Bottom longitudinals
14	Bottom girders
15	Bilge longitudinals
16	Side shell longitudinals
17	Inner bottom plating
18	Inner bottom longitudinals
19	Hopper side plating
20	Hopper side longitudinals
21	
22	

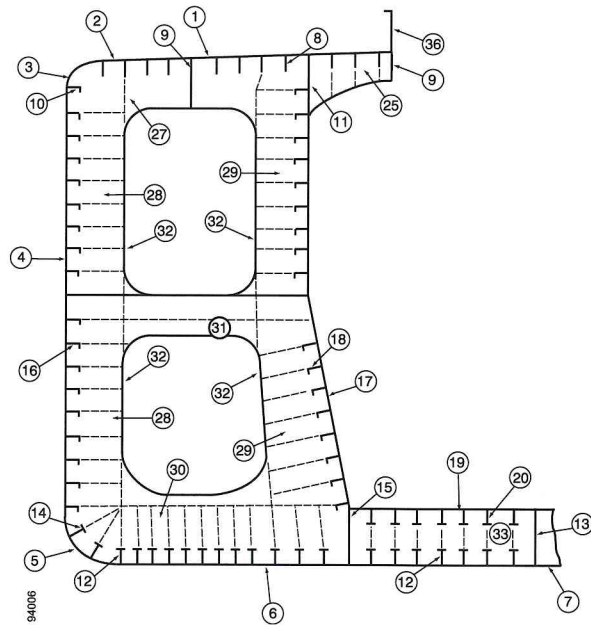
REPORT ON TM4-BC	
23	Double-bottom tank floors
24	Topside tank transverses
25	Hopper side tank transverses
26	
27	

REPORT ON TM6-BC	
28	Hatch coamings
29	Deck plating between hatches
30	Hatch covers
31	Inner bulkhead plating
32	
33	

REPORT ON TM7-BC	
34	Hold frames or diaphragms

Appendix 4 ORE CARRIERS

Thickness measurement and typical transverse section indicating longitudinal and transverse members



REPORT ON TM2-BC (1) and (2)	
1	Strength deck plating
2	Stringer plate
3	Sheerstake
4	Side shell plating
5	Bilge plating
6	Bottom shell plating
7	Keel plate

REPORT ON TM3-BC	
8	Deck longitudinals
9	Deck girders
10	Sheerstake 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	Longitudinal bulkhead plating (remainder)
18	Longitudinal bulkhead longitudinals
19	Inner bottom plating
20	Inner bottom longitudinals
21	
22	
23	
24	

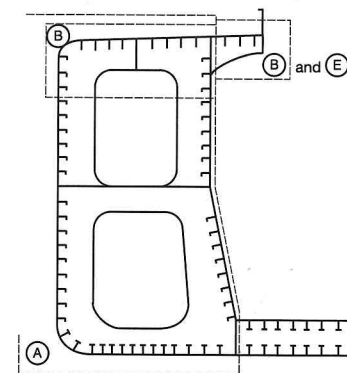
REPORT ON TM4-BC	
25	Deck transverse centre tank
26	Bottom transverse centre tank
27	Deck transverse wing tank
28	Side shell vertical web
29	Longitudinal bulkhead vertical web
30	Bottom transverse wing tank
31	Struts
32	Transverse web face plate
33	D.B. floors
34	
35	

REPORT ON TM6-BC	
36	Hatch coamings
37	Deck plating between hatches
38	Hatch covers
39	
40	

Appendix 5 ORE CARRIERS

Thickness measurement and close-up survey requirements

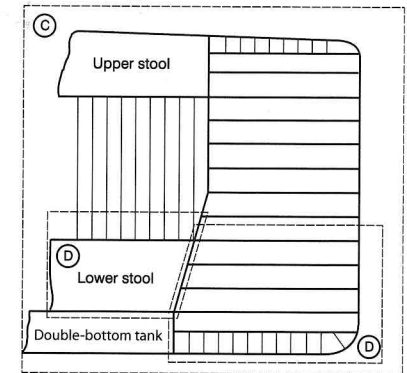
Typical transverse section close-up survey



Thickness to be reported on TM3-T of Annex B and TM4-T of Annex B as appropriate

Close-up survey area

Typical transverse bulkhead



Thickness to be reported on TM5-T of Annex B

Recommendations for the extent and pattern of gaugings are indicated in annex 10.

Annex 9

Guidelines for technical assessment in conjunction with the planning of enhanced surveys for bulk carriers

RENEWAL SURVEY

1 Introduction

These Guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of renewal surveys of bulk carriers. As indicated in 5.1.6, the Guidelines are a recommended tool which may be invoked at the discretion of an Administration, 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 assessments described in these Guidelines is to assist in identifying critical structural areas, nominating suspect areas and in focusing attention on structural elements or areas of structural elements which may be particularly susceptible to, or evidence a history of, wastage or damage. This information may be useful in nominating locations, areas, holds and tanks for thickness measurement, close-up survey and tank testing.

2.2 Minimum requirements

These Guidelines may not be used to reduce the requirements of annexes 1 and 2 and paragraph 2.7 of annex A for close-up survey, thickness measurement and tank testing, respectively, 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 completed by the owner or operator in co-operation with the Administration well in advance of the commencement of the renewal survey, i.e., prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

2.4 Aspects to be considered

2.4.1 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 holds, tanks and areas for survey:

- .1 design features such as stress levels on various structural elements, design details and extent of use of high-tensile steel;
- .2 former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available; and
- .3 information with respect to types of cargo carried, protection of tanks, and condition of coating, if any, of holds and tanks.

2.4.2 Technical assessments of the relative risks of susceptibility to damage or deterioration of various structural elements and areas should be judged and decided on the basis of recognized principles and practices, such as may be found in reference 3.

3 Technical assessment

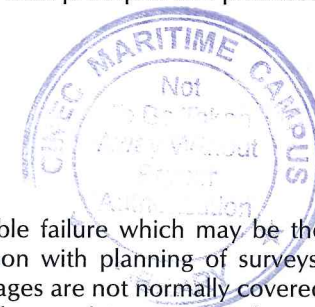
3.1 General

3.1.1 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.

3.1.2 Technical assessments performed in conjunction with the survey planning process should, in principle, be as shown schematically in figure 1 which depicts, schematically, how technical assessments can be carried out in conjunction with the survey planning process. The approach is based on an evaluation of experience and knowledge basically related to:

- .1 design; and
- .2 corrosion.

3.1.3 The design should 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.



3.1.4 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

3.2.1.1 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 should be included.

3.2.1.2 Typical damage experience to be considered will consist of:

- .1 number, extent, location and frequency of cracks; and
- .2 location of buckles.

3.2.1.3 This information may be found in the survey reports and/or the owner's files, including the results of the owner's own inspections. The defects should be analysed, noted and marked on sketches.

3.2.1.4 In addition, general experience should be utilized. For example, figure 2 shows typical locations in bulk carriers which experience has shown may be susceptible to structural damage. Also, reference should be made to reference 3 which contains a catalogue of typical damages and proposed repair methods for various bulk carrier structural details.

3.2.1.5 Such figures should 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 shown in figure 3.

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

3.2.1.7 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.

3.2.1.8 In this respect, stress calculations of typical and important components and details, in accordance with relevant methods, may prove useful and should be considered.

3.2.1.9 The selected areas of the structure identified during this process should be recorded and marked on the structural drawings to be included in the survey programme.

3.2.2 Corrosion

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

- .1 usage of tanks, holds and spaces;
- .2 condition of coatings;
- .3 condition of anodes;
- .4 cleaning procedures;
- .5 previous corrosion damage;
- .6 ballast use and time for cargo holds;
- .7 risk of corrosion in cargo holds and ballast tanks; and
- .8 location of ballast tanks adjacent to heated fuel oil tanks.

3.2.2.2 Reference 2 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

3.2.2.3 For bulk carriers, reference 3 should be used as the basis for the evaluation, together with the age of the ship and relevant information on the anticipated condition of the ship as derived from the information collected in order to prepare the survey programme.

3.2.2.4 The various tanks, holds and spaces should be listed with the corrosion risks nominated accordingly.

3.2.3 Locations for close-up survey and thickness measurement

3.2.3.1 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.

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

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

References

- 1 TSCF, *Guidance Manual for the Inspection and Condition Assessment of Tanker Structures*, 1986.
- 2 TSCF, *Condition Evaluation and Maintenance of Tanker Structures*, 1992.
- 3 IACS, *Bulk Carriers: Guidelines for Surveys, Assessment and Repair of Hull Structures*, 1994.

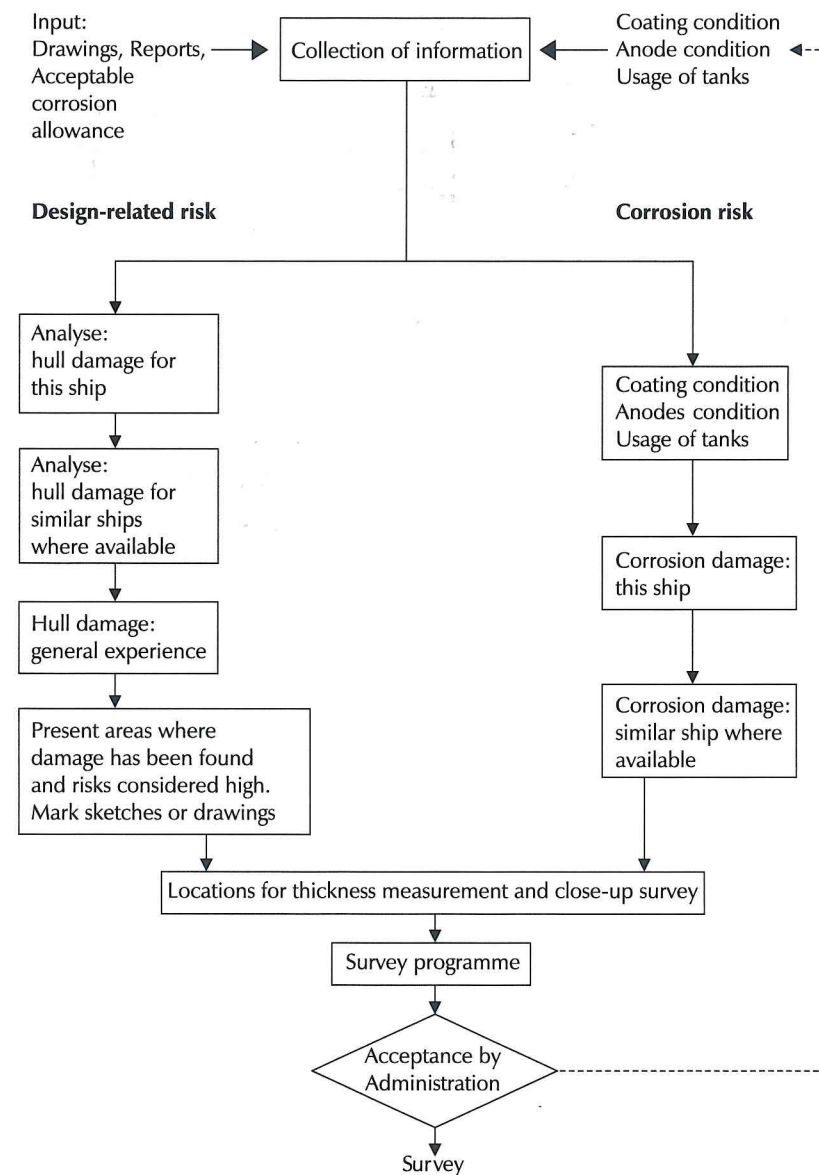


Figure 1 – Planning process: technical assessment and the survey

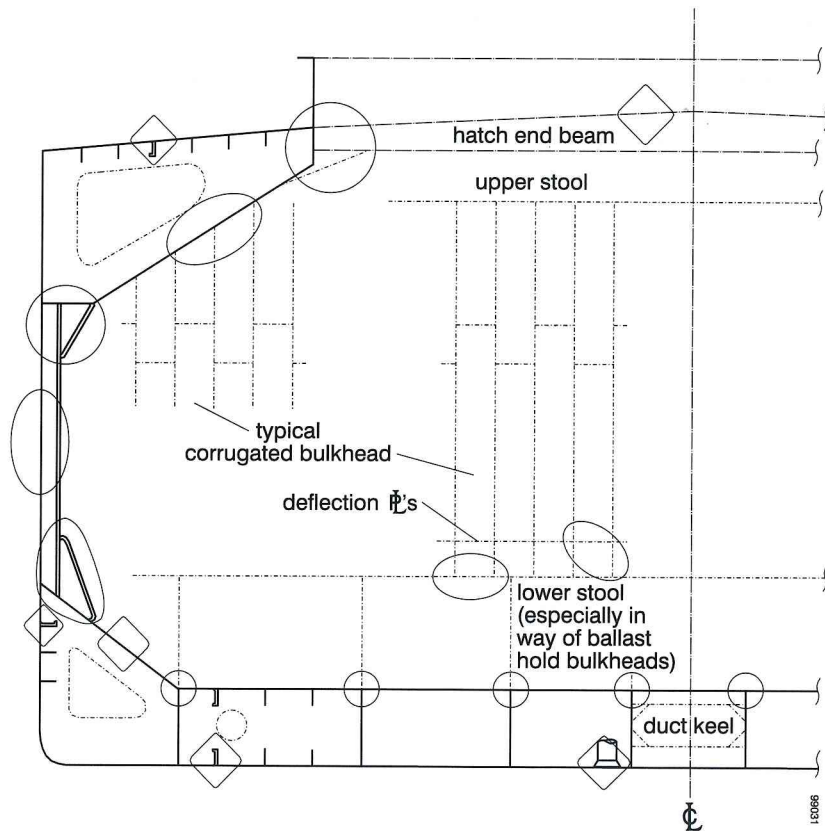


Figure 2 – Typical locations susceptible to structural damage or corrosion

AREA 1	Structural item	Side shell frames and end brackets (Separate bracket configuration)	EXAMPLE 1
Detail of damage		Fractures on brackets at termination of frame	
Sketch of damage		Sketch of repair	
<p>Separate bracket configuration</p>		<p>S = snaped end</p>	
Notes on possible cause of damage/repair			
<ol style="list-style-type: none"> 1 This type of damage is due to stress concentration. 2 For small fractures, e.g., hairline fractures, the fracture can be "veed" out, welded up, ground and examined by NDT for fractures. 3 For larger/significant fractures, consideration is to be given to cropping and partly renewing/renewing the frame brackets. If renewing the brackets, ends of frames can be snaped to soften them. 4 If felt prudent, soft toes are to be incorporated at the boundaries of the bracket to the wing tanks. 5 Attention to be given to the structure in wing tanks in way of the extended bracket arm, i.e., reinforcement provided in line with the bracket arm. 			

Figure 3 – Typical damage and repair example (reproduced from reference 3)

Annex 10

Requirements for extent of thickness measurement
at areas of substantial corrosion

RENEWAL SURVEY OF BULK CARRIERS WITHIN THE CARGO AREA**Shell plating**

Structural member	Extent of measurement	Pattern of measurement
1 Bottom and side shell plating	a Suspect plate, plus four adjacent plates	a Five-point pattern for each panel between longitudinals
	b See other tables for particulars on gauging in way of tanks and cargo holds	
2 Bottom/side shell longitudinals	Minimum of three longitudinals in way of suspect areas	Three measurements in line across web Three measurements on flange

Transverse bulkheads in cargo holds

Structural member	Extent of measurement	Pattern of measurement
1 Lower stool	a Transverse band within 25 mm of welded connection to inner bottom	a Five-point pattern between stiffeners over 1 m length
	b Transverse band within 25 mm of welded connection to shelf plate	b Ditto
2 Transverse bulkhead	a Transverse band at approximately mid-height	a Five-point pattern over 1 m ² of plating
	b Transverse band at part of bulkhead adjacent to upper deck or below upper stool shelf plate (for those ships fitted with upper stools)	b Five-point pattern over 1 m ² of plating

Deck structure including cross strips, main cargo hatchways, hatch covers, coamings and topside tanks

Structural member	Extent of measurement	Pattern of measurement
1 Cross-deck strip plating	Suspect cross-deck strip plating	Five-point pattern between under deck stiffeners over 1 m length
2 Under-deck stiffeners	a Transverse members	a Five-point pattern at each end and mid-span
	b Longitudinal member	b Five-point pattern on both web and flange
3 Hatch covers	a Side and end skirts, each three locations	a Five-point pattern at each location
	b Three longitudinal bands, outboard strakes (2) and centreline strake (1)	b Five-point measurement each band
4 Hatch coamings	Each side and end of coaming, one band lower third, one band upper two-thirds of coaming	Five-point measurement each band, i.e., end or side coaming
5 Topside water ballast tanks	a Watertight transverse bulkheads <ul style="list-style-type: none"> i lower third of bulkhead ii upper two-thirds of bulkhead iii stiffeners 	<ul style="list-style-type: none"> i five-point pattern over 1 m² of plating ii five-point pattern over 1 m² of plating iii five-point pattern over 1 m length
	b Two representative swash transverse bulkheads <ul style="list-style-type: none"> i lower third of bulkhead ii upper two-thirds of bulkhead iii stiffeners 	<ul style="list-style-type: none"> i five-point pattern over 1 m² of plating ii five-point pattern over 1 m² of plating iii five-point pattern over 1 m length