

BAHRIA CLASSIFICATION SOCIETY



BCS-R Z

Requirements Concerning Survey and Certification JULY 2022

These requirements are prepared by embedding related IACS Unified Requirements. In order to have consistency, the numbering of the requirements are kept as the same with related IACS Unified Requirements.

Unless otherwise specified, these Rules apply according to the implementation dates as defined in each requirement. See Rule Change Summary on BCS website for revision details.

This latest edition incorporates all rule changes.

"General Terms and Conditions" of the respective latest edition will be applicable (see Rules for Classification and Surveys).

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BCS-R Z3 Periodical Survey of the Outside of the Ship's Bottom and Related Items

Z3.1 General

Z3.1.1 The Owner is to notify the Classification Society whenever the outside of the ship's bottom and related items can be examined in drydock or on a slipway.

Z3.1.2 There is to be a minimum of two examinations of the outside of the ship's bottom and related items during each five-year special survey¹ period. One such examination is to be carried out in conjunction with the special survey. In all cases the interval between any two such examinations is not to exceed 36 months. An extension of examination of the ship's bottom of 3 months beyond the due date can be granted in exceptional circumstances².

Z3.1.3 Examinations of the outside of the ship's bottom and related items of ships is normally to be carried out with the ship in drydock. However, consideration may be given to alternate examination while the ship is afloat as an In-water Survey, subject to provisions of Z3.3. Special consideration is to be given to ships of 15 years or over before being permitted to have such examinations. For ESP ships of 15 years of age and over, such examinations are to be carried out with the ship in drydock.

Footnotes:

- 1) Some Member Societies use the term "Special Periodical Survey" others use the term "Class Renewal Survey" instead of the term "Special Survey".
- 2) 'Exceptional circumstances' means unavailability of dry-docking facilities; unavailability of repair facilities; unavailability of essential materials, equipment or spare parts; or delays incurred by action taken to avoid severe weather conditions.

Notes:

1. This requirement is implemented from 1 July 2020.

Z3.1.4 The interval between examinations of the outside of the ship's bottom and related items for ships operating in fresh water and for certain harbour or non-self-propelled craft may be greater than that given in Z3.1.2.

Z3.1.5 Compliance with BCS-R Z3 does not absolve the Owner from compliance with the requirements of SOLAS as amended, especially when shorter intervals between examination of the ship's bottom for certain types of ship are required.

Z3.1.6 For Oil Tankers, Combination Carriers, Bulk Carriers, Chemical Tankers, Double Hull Oil Tankers, Double Side Skin Bulk Carriers, General Dry Cargo Ships and Liquefied Gas Carriers, reference is also be made to BCS-R Z10.1, Z10.2, Z10.3, Z10.4, Z10.5, Z7.1 and Z7.2 as applicable.

Z3.2 Scope of the survey

Z3.2.1 When a ship is in drydock or on a slipway, it is to be placed on blocks of sufficient height and with the necessary staging to permit the examination of elements such as shell plating including bottom and bow plating, stern frame and rudder, sea chests and valves, propeller, etc.

Z3.2.2 The shell plating is to be examined for excessive corrosion, or deterioration due to chafing or contact with the ground and for any undue unfairness or buckling. Special attention is to be paid to the connection between the bilge strakes and the bilge keels. Important plate unfairness or other deterioration which do not necessitate immediate repairs are to be recorded.

Z3.2.3 Sea chests and their gratings, sea connections and overboard discharge valves and cocks and their fastenings to the hull or sea chests are to be examined. Valves and cocks need not be opened up more than once in a special survey period unless considered necessary by the Surveyor.

Z3.2.4 Visible parts of rudder, rudder pintles, rudder shafts and couplings and stern frame are to be examined. If considered necessary by the Surveyor, the rudder is to be lifted or the inspection plates removed for the examination of pintles. The clearance in the rudder bearings is to be ascertained and recorded. Where applicable, pressure test of the rudder may be required as deemed necessary by the surveyor.

Z3.2.5 Visible parts of propeller and stern bush, are to be examined. The clearance in the stern bush and the efficiency of the oil gland, if fitted, are to be ascertained and recorded. For controllable pitch propellers, the Surveyor is to be satisfied with the fastenings and tightness of hub and blade sealing. Dismantling need not to be carried out unless considered necessary by the Surveyor.

Z3.2.6 Visible parts of side thrusters are to be examined. Other propulsion systems which also have manoeuvring characteristics (such as directional propellers, vertical axis propellers, water jet units) are to be examined externally with focus on the condition of gear housing, propeller blades, bolt locking and other fastening arrangements. Sealing arrangement of propeller blades, propeller shaft and steering column shall be verified.

NOTE: For the survey of propeller shafts, refer to Requirement BCS-R Z21.

Z3.2.7 Special consideration may be given in application of relevant sections of this Requirement to commercial vessels owned or chartered by Governments, which are utilized in support of military operations or service.

Z3.3 In-Water Surveys

Z3.3.1 The In-water Survey is to provide the information normally obtained from a docking survey. Special consideration shall be given to ascertaining rudder bearing clearances and stern bush clearances of oil stern bearings based on a review of the operating history, on board testing and stern oil sample reports. These considerations are to be included in the proposals for in-water survey which are to be submitted in advance of the survey so that satisfactory arrangements can be agreed with the Classification Society.

Z3.3.2 The In-water Survey is to be carried out with the ship in sheltered water and preferably with weak tidal streams and currents. The in-water visibility and the cleanliness of the hull below the waterline is to be clear enough to permit a meaningful examination which allows the surveyor and the in-water survey firm to determine the condition of the plating, appendages and the welding. The Classification Society is to be satisfied with the methods of orientation of the divers or Remotely Operated Vehicle (ROV) on the plating, which should make use where necessary of permanent markings on the plating at selected points.

Z3.3.3 The equipment, procedure for observing and reporting the survey are to be discussed with the parties involved prior to the In-water Survey, and suitable time is to be allowed to permit the in-water survey firm to test all equipment beforehand.

Z3.3.4 The In-water Survey is to be carried out under the surveillance of a surveyor by an in-water survey firm approved as a service supplier according to BCS-R Z17.

Z3.3.5 The Surveyor is to be satisfied with the method of pictorial representation, and a good two-way communication between the Surveyor and divers is to be provided.

Z3.3.6 If the In-water Survey reveals damage or deterioration that requires early attention, the Surveyor may require that the ship be drydocked in order that a detailed survey can be undertaken and the necessary repairs carried out.

BCS-R Z7 Hull Classification Surveys

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RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS OF SHIPS BUILT ACCORDING TO THE NET SCANTLING APPROACH

Note:

1. This requirement is applied for surveys commenced on or after 1 July 2020.

1. General

1.1 Application

1.1.1 These requirements apply to all self-propelled vessels.

1.1.2 For additional items, refer to BCS-R Z1.

1.1.3 For additional requirements for hull structure, piping systems and ballast tanks applicable to tankers, bulk carriers, chemical tankers, double hulled tankers, double side skin bulk carriers, general dry cargo ships and liquefied gas carriers, refer to BCS-R Z10.1, Z10.2, Z10.3, Z10.4, Z10.5, Z7.1 and Z7.2 respectively.

1.1.4 For additional requirements applicable to cargo installations on ships carrying liquefied gases in bulk, refer to BCS-R Z16.

1.1.5 For additional requirements applicable to water level detectors fitted on single hold cargo ships, refer to BCS-R Z7.1.

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

1.2 Definitions

1.2.1 Ballast Tank

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

1.2.2 Spaces

Spaces are separate compartments including holds and tanks.

1.2.3 Close-Up Survey

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

1.2.4 Transverse Section

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

1.2.5 Representative Space

Representative Spaces are those which are expected to reflect the conditions of other spaces of similar type and service and with similar corrosion prevention systems. When selecting representative spaces, account is to be taken of the service and repair history on board and identifiable Critical Structural Areas and/or Suspect Areas.

1.2.6 Critical Structural Area

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

1.2.7 Suspect Area

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

1.2.8 Substantial Corrosion

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

1.2.9 Corrosion Prevention System

A Corrosion Prevention System is normally considered a full hard protective coating.

Hard Protective Coating is usually to be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specifications.

1.2.10 Coating Condition

Coating condition is defined as follows:

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

1.2.11 Prompt and Thorough Repair

A Prompt and Thorough Repair is a permanent repair completed at the time of survey to the satisfaction of the Surveyor, therein removing the need for the imposition of any associated condition of classification.

1.2.12 Special consideration

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

1.2.13 Air pipe head

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

1.2.14 Cargo Length Area

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

1.2.15 Remote Inspection Techniques(RIT)

Remote Inspection Technique is a means of survey that enables examination of any part of the structure without the need for direct physical access of the surveyor(refer to BCS-G 42).

1.3 Repairs

1.3.1 Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Surveyor, will affect the vessel's structural, watertight or weathertight integrity, is to be promptly and thoroughly (see 1.2.11) repaired. Areas to be considered include:

- side shell frames, their end attachments and adjacent shell plating;
- deck structure and deck plating;
- bottom structure and bottom plating;
- watertight or oiltight bulkheads;
- hatch covers and hatch coamings;
- items in 3.2.3.5, 3.2.3.6 and 3.2.3.8.

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

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

1.3.3 Where the damage found on structure mentioned in Para. 1.3.1 is isolated and of a localised nature which does not affect the ship's structural integrity, consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weather tight integrity and impose a condition of class in accordance with BCS-PR 35, with a specific time limit.

1.4 Thickness measurements and close-up surveys

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

1.4.2 Consideration may be given by the attending Surveyor to allow use of Remote Inspection Techniques (RIT) as an alternative to close-up survey. Surveys conducted using a RIT are to be completed to the satisfaction of the attending Surveyor. When RIT is used for a close-up survey, temporary means of access for the corresponding thickness measurements is to be provided unless such RIT is also able to carry out the required thickness measurements.

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

1.5 Thickness measurements Acceptance Criteria

The acceptance criteria for thickness measurements are according to the Rules of BCS and/or specific BCS-R's depending on ship's age and structural elements concerned, e.g BCS-R S18 for corrugated transverse bulkhead, BCS-R S21A for all cargo hatch covers and coamings on exposed decks.

1.6 Remote Inspection Techniques (RIT)

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

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

1.6.3 When using a RIT as an alternative to close-up survey, if not carried out by BCS itself, it is to be conducted by a firm approved as a service supplier according to BCS-R Z17 and is to be witnessed by an attending surveyor of BCS.

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

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

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

2. Special Survey

2.1 Schedule

2.1.1 Special Surveys are to be carried out at 5 years intervals to renew the Classification Certificate.

2.1.2 The first Special Survey is to be completed within 5 years from the date of the initial classification survey and thereafter 5 years from the credited date of the previous Special Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances.

In this case, the next period of class will start from the expiry date of the Special Survey before the extension was granted.

2.1.3 For surveys completed within 3 months before the expiry date of the Special Survey, the next period of class will start from the expiry date of the Special Survey. For surveys completed more than 3 months before the expiry date of the Special Survey, the period of class will start from the survey completion date. In cases where the vessel has been laid up or has been out of service for a considerable period because of a major repair or modification and the owner elects to only carry out the overdue surveys, the next period of class will start from the expiry date of the special survey. If the owner elects to carry out the next due special survey, the period of class will start from the survey completion date.

2.1.4 The Special Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5th anniversary date. When the Special Survey is

commenced prior to the 4th Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited to the Special Survey.

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

2.1.6 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

2.2 Scope

2.2.1 The Special Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to ensure that the hull, equipment and related piping, as required in 2.2.12, are in satisfactory condition and fit for the intended purpose for the new period of class of five years to be assigned, subject to proper maintenance and operation and the periodical surveys being carried out at the due dates.

2.2.2 The examinations of the hull are to be supplemented by testing and thickness measurements as required in 2.2.9 and 2.2.11, to ensure that the structural integrity remains effective. The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

2.2.3 The Special Survey is to include examination of underwater parts per Z3.

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

2.2.5 All spaces including holds and their 'tween decks where fitted; double bottom, deep, ballast, peak and cargo tanks; pumprooms, pipe tunnels, duct keels, machinery spaces, dry spaces, cofferdams and voids are to be internally examined including the plating and framing, bilges and drain wells, sounding, venting, pumping and drainage arrangements. Internal examination of fuel oil, lube oil and fresh water tanks is to be carried out in accordance with Table 3. At special survey No.3 and subsequent special surveys, structural downflooding ducts and structural ventilation ducts are to be internally examined.

2.2.6 Engine room structure is to be examined. Particular attention is to be given to tank tops, shell plating in way of tank tops, brackets connecting side shell frames and tank tops, and engine room bulkheads in way of tank top and bilge wells. Particular attention is to be given to the sea suction, sea water cooling pipes and overboard discharge valves and their connections to the shell plating. Where wastage is evident or suspect, thickness measurements are to be carried out, and renewals or repairs made when wastage exceeds allowable limits.

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

2.2.8 When such breakdown of hard protective coating is found in double bottom ballast tanks and it is not renewed, where a soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the tanks in question

may be examined at annual intervals. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.

2.2.9 Boundaries of double-bottom, deep, ballast, peak, and other tanks, including holds adapted for the carriage of salt water ballast, are to be tested with a head of liquid to the top of air pipes or to near the top of hatches for ballast/cargo holds. Boundaries of fuel oil, lube oil and fresh water tanks are to be tested with a head of liquid to the highest point that liquid will rise under service conditions. Tank testing of fuel oil, lube oil and fresh water tanks may be specially considered based on a satisfactory external examination of the tank boundaries, and a confirmation from the Master stating that the pressure testing has been carried out according to the requirements with satisfactory results. The Surveyor may extend the testing as deemed necessary.

2.2.10 Hatch Covers and Coamings

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

2.2.10.1 A thorough inspection of the items listed in 3.2.3, including close-up survey of hatch cover plating and hatch coaming plating, is to be carried out. Subject to cargo hold hatch covers of approved design which structurally have no access to the internals, close-up survey shall be done of accessible parts of hatch covers structures.

2.2.10.2 Checking of the satisfactory operation of all mechanically operated hatch covers is to be made, including:

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

2.2.10.3 Checking the effectiveness of sealing arrangements of all hatch covers by hose testing or equivalent is to be carried out.

2.2.11 Thickness measurements are to be carried out in accordance with Table 1. The Surveyor may extend the thickness measurements as deemed necessary. When thickness measurements indicate substantial corrosion, the extent of thickness measurements is to be increased to determine areas of substantial corrosion. Table 2 may be used as guidance for these additional thickness measurements. These extended thickness measurements are to be carried out before the survey is credited as completed.

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

2.2.13 For all ships except for passenger ships, automatic air pipe heads are to be completely examined (both externally and internally) as indicated in Table 4.

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

3. Annual Surveys

3.1 Schedule

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

3.2 Scope

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

3.2.2 For additional items refer to BCS-R Z1.

3.2.3 Examination of weather decks, ship side plating above water line, hatch covers and coamings.

3.2.3.1 Confirmation is to be obtained that no unapproved changes have been made to the hatch covers, hatch coamings and their securing and sealing devices since the last survey.

3.2.3.2 Where mechanically operated steel covers are fitted, checking the satisfactory conditions, as applicable, of:

- hatch covers;
- tightness devices of longitudinal, transverse and intermediate cross junctions (gaskets, gasket lips, compression bars, drainage channels);
- clamping devices, retaining bars, cleating;
- chain or rope pulleys;
- guides;
- guide rails and track wheels;
- stoppers, etc.;
- wires, chains, gypsies, tensioning devices;
- hydraulic system essential to closing and securing;
- safety locks and retaining devices.

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

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

3.2.3.3 Checking the satisfactory condition of hatch coaming plating and their stiffeners, where applicable.

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

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

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

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

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

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

3.2.4 Suspect Areas

Suspect Areas identified at previous surveys are to be examined. Thickness measurements are to be taken of the areas of substantial corrosion and the extent of thickness measurements is to be increased to determine areas of substantial corrosion. Table 2 may be used as guidance for these additional thickness measurements. These extended thickness measurements are to be carried out before the annual survey is credited as completed.

Note: these requirements are not applicable to cargo tanks of oil tankers, chemical tankers and double hull oil tankers, surveyed in accordance with BCS-Rs Z10.1, Z10.3 and Z10.4.

3.2.5 Examination of Ballast Tanks

3.2.5.1 Examination of ballast tanks when required as a consequence of the results of the Special Survey and Intermediate Survey is to be carried out. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, then the extent of thickness measurements is to be increased to determine areas of substantial corrosion. Table 2 may be used as guidance for these additional measurements. These extended thickness measurements are to be carried out before the annual survey is credited as completed.

4. Intermediate Survey

4.1 Schedule

4.1.1 The Intermediate Survey is to be carried out either at or between the second and third Annual Survey.

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

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

4.1.4 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

4.2 Scope

4.2.1 The scope of the second or third Annual Survey is to be extended to include the following:

4.2.1.1 For ships between 5 and 10 years of age, a general, internal examination of representative ballast tanks is to be carried out. If there is no hard protective coating, soft or semi-hard coating, or POOR coating condition, the examination is to be extended to other ballast tanks of the same type.

4.2.1.2 For ships over 10 years of age, a general, internal examination of all ballast tanks is to be carried out.

4.2.2 If such examinations reveal no visible structural defects, the examination may be limited to a verification that the corrosion prevention system remains effective.

4.2.3 For ballast tanks, excluding double bottom ballast tanks, if there is no hard protective coating, soft or semi-hard coating, or POOR coating condition and it is not renewed, the tanks in question are to be internally examined at annual intervals.

4.2.4 When such conditions are found in double bottom ballast tanks, the tanks in question may be internally examined at annual intervals.

4.2.5 In the case of dry cargo ships over 15 years old, other than bulk carriers subject to BCS- R Z10.2 or Z10.5 or general dry cargo ships subject to Z7.1, an internal examination of selected cargo holds is to be carried out.

4.2.6 In the case of ships over 10 years of age, other than ships engaged in the carriage of dry cargoes only or ships subject to BCS-R Z10.1, Z10.3, Z10.4 or Z7.2, an internal examination of selected cargo spaces is to be carried out.

5. Preparations for Survey

5.1 Conditions for survey

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

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

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

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

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

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

5.1.7 In refrigerated cargo spaces the condition of the coating behind the insulation is to be examined at representative locations. The examination may be limited to verification that the protective coating remains effective and that there are no visible structural defects. Where POOR coating condition is found, the examination is to be extended as deemed necessary by the Surveyor. The condition of the coating is to be reported. If indents, scratches, etc., are detected during surveys of shell plating from the outside, insulations in way are to be removed as required by the Surveyor, for further examination of the plating and adjacent frames.

5.2 Access to structures

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

5.2.2 For survey in cargo holds and ballast tanks, one or more of the following means for access, acceptable to the Surveyor, is to be provided:

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

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

- Unmanned robot arm
- Remotely Operated Vehicles (ROV)
- Unmanned Aerial Vehicles / Drones
- Other means acceptable to BCS.

5.3 Equipment for survey

5.3.1 Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required. Thickness measurements are to be carried out by a firm approved by BCS in accordance with BCS-R Z17, except that in respect of measurements of non-ESP ships less than 500 gross tonnage and all fishing vessels, the firm need not be so approved.

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

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

5.4 Survey at sea or at anchorage

5.4.1 Survey at sea or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel onboard. Necessary precautions and procedures for carrying out the survey are to be in accordance with 5.1, 5.2 and 5.3.

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

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

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

See footnote*

*Reference is made to BCS-G 39 - Guidelines for use of Boats or Rafts for Close-up surveys.

TABLE 1**MINIMUM REQUIREMENTS FOR THICKNESS MEASUREMENTS AT SPECIAL SURVEY**

Special Survey No.1 Age ≤ 5	Special Survey No.2 5 < Age ≤ 10	Special Survey No.3 10 < Age ≤ 15	Special Survey No.4 and Subsequent 15 < Age
1) Suspect areas throughout the vessel.	1) Suspect areas throughout the vessel.	1) Suspect areas throughout the vessel.	1) Suspect areas throughout the vessel.
	2) One transverse section of deck plating in way of a cargo space within the amidships 0.5L	2) Two transverse sections within the amidships 0.5L in way of two different cargo spaces.	2) A minimum of three transverse sections in way of cargo spaces within the amidships 0.5L.
		3) All cargo hold hatch covers and coamings (plating and stiffeners).	3) All cargo hold hatch covers and coamings (plating and stiffeners).
		4) Internals in forepeak and afterpeak ballast tanks.	4) Internals in forepeak and afterpeak ballast tanks.
			5) All exposed main deck plating full length.
			6) Representative exposed superstructure deck plating((poop, bridge, and forecastle deck).
			7) Lowest strake and strakes in way of 'tween decks of all transverse bulkheads in cargo spaces together with internals in way.
			8) All wind – and water strakes, port and starboard, full length.
			9) All keel plates full length. Also, additional bottom plates in way of cofferdams, machinery space, and aft end of tanks.

			10) Plating of seachests. Shell plating in way of overboard discharges as considered necessary by the attending surveyor
--	--	--	--

Notes:

For thickness measurements reporting, the forms included in Annex I or Annex II may be used, as appropriate. The annexed forms are a recommendation and are not a mandatory requirement under this BCS-R Z7.

1. Thickness measurement locations are to be selected to provide the best representative sampling of areas likely to be most exposed to corrosion, considering cargo and ballast history and arrangement and condition of protective coatings.
2. Thickness measurements of internals may be specially considered by the Surveyor if the hard protective coating is in GOOD condition.
3. For ships less than 100 meters in length, the number of transverse sections required at Special Survey No. 3 may be reduced to one (1), and the number of transverse sections required at Subsequent Special Surveys may be reduced to two (2).
4. For ships more than 100 meters in length, at Special Survey No. 3, thickness measurements of exposed deck plating within amidship 0.5 L may be required.
5. Subject to cargo hold hatch covers of approved design which structurally have no access to the internals, thickness measurement shall be done of accessible parts of hatch covers structures.

TABLE 2

**GUIDANCE FOR ADDITIONAL THICKNESS MEASUREMENTS IN
WAY OF SUBSTANTIAL CORROSION**

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

TABLE 3**MINIMUM REQUIREMENTS FOR INTERNAL EXAMINATION AT HULL
SPECIAL SURVEYS OF FUEL OIL, LUBE OIL AND FRESH WATER
TANKS**

Tank	Special Survey No. 1 Age ≤ 5	Special Survey No. 2 5 < Age ≤ 10	Special Survey No. 3 10 < Age ≤ 15	Special Survey No. 4 and Subsequent Age > 15
Fuel Oil Bunkertanks				
-Engine Room	None	None	One	One
-Cargo Length Area	None	One	Two	Half, minimum 2
-If no tanks in Cargo Length Area, additional fuel tank(s) outside of Engine Room (if fitted)	None	One	One	Two
Lube Oil	None	None	None	One
Fresh Water	None	One	All	All
Notes 1) These requirements apply to tanks of integral (structural) type. 2) If a selection of tanks is accepted to be examined, then different tanks are to be examined at each special survey, on a rotational basis. 3) Peak tanks (all uses) are subject to internal examination at each special survey. 4) At special surveys no 3 and subsequent surveys, one deep tank for fuel oil in the cargo length area is to be included, if fitted.				

TABLE 4**SURVEY REQUIREMENTS FOR AUTOMATIC PIPE HEADS AT SPECIAL SURVEYS**

Special Survey no.1 Age ≤ 5	Special Survey no.2 5 < age ≤ 10	Special Survey No.3 and subsequent Age > 10
<ul style="list-style-type: none">- Two air pipe heads, one port and one starboard, located on the exposed decks in the forward 0.25 L, preferably air pipes serving ballast tanks.- Two air pipe heads, one port and one starboard, on exposed decks, serving spaced aft of 0.25 L, preferably air pipes serving ballast tanks. <p>(1) (2)</p>	<ul style="list-style-type: none">- All air pipe heads located on the exposed decks in the forward 0.25L.- At least 20% of air pipe heads on the exposed decks serving spaces aft of 0.25 L, preferably air pipes serving ballast tanks <p>(1) (2)</p>	<ul style="list-style-type: none">- All air pipe heads located on the exposed decks <p>(3)</p>
<p>(1) The selection of air pipe heads to be examined is left to the attending Surveyor.</p> <p>(2) According to the results of this examination, the Surveyor may require the examination of other heads located on the exposed decks.</p> <p>(3) Exemption may be considered for air pipe heads where there is substantial evidence of replacement after the last special survey.</p>		

ANNEX I*

Sheet 1

RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS OF SHIPS*

*Note: Annex I is recommendatory.

-
1. This document may be used for recording thickness measurements as required by BCS -R Z7.
 2. Reporting forms TM1-G, TM2-G (i) and (ii), TM3-G, TM4-G, TM5-G (sheets 4-9) may be used for recording thickness measurements and the maximum allowable diminution is to be stated.
The maximum allowable diminution could be stated in an attached document.

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- Sheet 4 - Report TM1-G for recording the thickness measurement of all deck plating, all bottom shell plating and side shell plating.
- Sheet 5 - Report TM2-G (i) for recording the thickness measurement of shell and deck plating at transverse sections - strength deck and sheerstrake plating.
- Sheet 6 - Report TM2-G (ii) for recording the thickness measurement of shell and deck plating at transverse sections - shell plating.
- Sheet 7 - Report TM3-G for recording the thickness measurement of longitudinal members at transverse sections.
- Sheet 8 - Report TM4-G for recording the thickness measurement of transverse bulkheads.
- Sheet 9 - Report TM5-G for recording the thickness measurement of miscellaneous structural members.

GENERAL PARTICULARS**Sheet 3**

Ship's name:-

IMO number:-

Class identity number:-

Port of registry:-

Gross tons:-

Deadweight:-

Date of build:-

Classification Society:-

Name of Company performing thickness measurement:-

Thickness measurement company certified by:-

Certificate No:-

Certificate valid from.....to.....

Place of measurement:-

First date of measurement:-

Last date of measurement:-

Special survey/intermediate survey due:-*

Details of measurement equipment:-

Qualification of operators:-

Report Number:-	consisting of	Sheets
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Names of operator:-.....	Name of surveyor:-.....
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Signature of operator:-.....	Signature of surveyor:-.....
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Company official stamp:-	Classification Society Official Stamp:-
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* Delete as appropriate

TM1-G

**Report on THICKNESS MEASUREMENT of ALL DECK PLATING, ALL BOTTOM SHELL PLATING
or SIDE SHELL PLATING*** (* - delete as appropriate)

Sheet 4

Ship's name.....

Class Identity No.

Report No.

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

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM1-G

1. This report may be used for recording the thickness measurement of:-
 - A - All strength deck plating within cargo length area.
 - B - Keel, bottom shell plating and bilge plating within the cargo length area.
 - C - Side shell plating that is all wind and water strakes within the cargo length area.
 - D - Side shell plating that is selected wind and water strakes outside the cargo length area.
2. The strake position is to be cleared indicates as follows:-
 - 2.1 For strength deck indicate the number of the strake of plating inboard from the stringer plate.
 - 2.2 For bottom plating indicate the number of the strake of plating outboard from the keel plate.
 - 2.3 For side shell plating give number of the strake of plating sheerstrake and letter as shown on shell expansion.
3. Only the deck plating strakes outside line of openings are to be recorded.
4. Measurements are to be taken at the forward and aft areas of all plates and the single measurements recorded are to represent the average of multiple measurements.
5. The maximum allowable diminution could be stated in an attached document.

TM2-G (i) Report on THICKNESS MEASUREMENT OF SHELL AND DECK PLATING
(one, two or three transverse sections)

Sheet 5

Ship's name.....

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									
STRAKE POSITION	No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S	
		mm	mm	P	S	mm	%	mm	%		mm	mm	P	S	mm	%	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																											
sheer strake																											
TOPSIDE TOTAL																											

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM2-G (i)

1. This report may be used for recording the thickness measurement of:-
Strength deck plating and sheerstrake plating transverse sections:-
Two or three section within the cargo length area, comprising of the structural items.
2. Only the deck plating strakes outside the line of openings are to be recorded.
3. The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
4. The exact frame station of measurement is to be stated.
5. The single measurements recorded are to represent the average of multiple measurements.
6. The maximum allowable diminution could be stated in an attached document.

TM2-G (ii) Report on THICKNESS MEASUREMENT OF SHELL AND DECK PLATING
(one, two or three transverse sections)

Sheet 6

Ship's name.....

Class Identity No.

Report No.

SHELL PLATING

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

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM2-G (ii)

1. This report may be used for recording the thickness measurement of:-
Shell plating transverse sections:-

Two or three sections within the cargo length area, comprising of the structural items.
2. The bottom area comprises keel, bottom and bilge plating.
3. The exact frame station of measurement is to be stated.
4. The single measurements recorded are to represent the average of multiple measurements.
5. The maximum allowable diminution could be stated in an attached document.

TM3-G

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

Sheet 7

Ship's name.....

Class Identity No.

Report No.

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM3-G

1. This report may be used for recording the thickness measurement of:-

Longitudinal Members at transverse sections:-

Two, or three sections within the cargo length area, comprising of the appropriate structural items.

2. The exact frame station of measurement is to be stated.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

TM4-G

Report on THICKNESS OF TRANSVERSE BULKHEADS

Sheet 8

Ship's name.....

Class Identity No.

Report No.

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM4-G

1. This report form may be used for recording the thickness measurement of cargo hold transverse bulkheads.
2. The single measurements recorded are to represent the average of multiple measurements.
3. The maximum allowable diminution could be stated in an attached document.

TM5-G

Report on THICKNESS MEASUREMENT OF MISCELLANEOUS STRUCTURAL MEMBERS

Sheet 9

Ship's name.....

Class Identity No.

Report No.

STRUCTURAL MEMBER:							SKETCH			
LOCATION OF STRUCTURE:										
Description	Org. Thk. mm	Max. Alwb. Dim. mm	Gauged		Diminution P				Diminution S	
			P	S	mm	%			mm	%

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM5-G

1. This report may be used for recording the thickness measurement of miscellaneous structural members.
2. The single measurements recorded are to represent the average of multiple measurements.
3. The maximum allowable diminution could be stated in an attached document.

ANNEX II (Net Scantling Design)*

Sheet 1

RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS OF SHIPS BUILT ACCORDING TO THE NET SCANTLING APPROACH*

*Note: Annex II (NSD) is recommendatory.

-
1. This document may be used for recording thickness measurements of ships built according to the net scantling approach as required by BCS-R Z7.
 2. Reporting forms TM1-G(NSD), TM2-G(NSD) (i) and (ii), TM3-G(NSD), TM4-G(NSD), TM5-G(NSD) (sheets 4-9) may be used for recording thickness measurements. The as-built thickness and the voluntary thickness addition and renewal thickness (minimum allowable thickness) are to be stated in the said forms.

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- Sheet 5 - Report TM2-G(NSD) (i) for recording the thickness measurement of shell and deck plating at transverse sections - strength deck and sheerstrake plating.
- Sheet 6 - Report TM2-G(NSD) (ii) for recording the thickness measurement of shell plating at transverse sections.
- Sheet 7 - Report TM3-G(NSD) for recording the thickness measurement of longitudinal members at transverse sections.
- Sheet 8 - Report TM4-G(NSD) for recording the thickness measurement of transverse bulkheads.
- Sheet 9 - Report TM5-G(NSD) for recording the thickness measurement of miscellaneous structural members.

GENERAL PARTICULARS

Sheet 3

Ships name:-

IMO number:-

Class identity number:-

Port of registry:-

Gross tons:-

Deadweight:-

Date of build:-

Classification Society:-

Name of Company performing thickness measurement:-

Thickness measurement company certified by:-

Certificate No:-

Certificate valid from.....to.....

Place of measurement:-

First date of measurement:-

Last date of measurement:-

Special survey/intermediate survey due:-*

Details of measurement equipment:-

Qualification of operators:-

Report Number:-	consisting of	Sheets
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Names of operator:-.....	Name of surveyor:-.....
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Signature of operator:-.....	Signature of surveyor:-.....
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Company official stamp:-	Classification Society Official Stamp:-
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* Delete as appropriate

TM1-G(NSD) Report on THICKNESS MEASUREMENT of ALL DECK PLATING, ALL BOTTOM PLATING or SIDE SHELL PLATING* (* - delete as appropriate)

Sheet 4

Ship's name.....

Class Identity No.....

Report No.....

STRAKE POSITION														
PLATE POSITION	No. or Letter	As Built Thk. mm	Voluntary Thickness Addition mm	Renewal Thickness mm (a)	Forward Reading				Aft Reading				Mean Remaining Corr. Addition, mm [(c1)+(c2)]/2 P S	
					Gauged Thk. mm (b1)		Remaining Corr. Addition, mm (c1)=(b1)-(a)		Gauged Thk. mm (b2)		Remaining Corr. Addition, mm (c2)=(b2)-(a)			
					P	S	P	S	P	S	P	S		
12th forward														
11th														
10th														
9th														
8th														
7th														
6th														
5th														
4th														
3rd														
2nd														
1st														
Amidships														
1st aft														
2nd														
3rd														
4th														
5th														
6th														
7th														
8th														
9th														
10th														
11th														
12th														

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM1-G(NSD)

1. This report may be used for recording the thickness measurement of:-
 - A - All strength deck plating within cargo length area.
 - B - Keel, bottom shell plating and bilge plating within the cargo length area.
 - C - Side shell plating that is all wind and water strakes within the cargo length area.
 - D - Side shell plating that is selected wind and water strakes outside the cargo length area.
2. The strake position is to be clearly indicated as follows:-
 - 2.1 For strength deck indicate the number of the strake of plating inboard from the stringer plate.
 - 2.2 For bottom plating indicate the number of the strake of plating outboard from the keel plate.
 - 2.3 For side shell plating give number of the strake of plating sheerstrake and letter as shown on shell expansion.
3. Only the deck plating strakes outside line of openings are to be recorded.
4. Measurements are to be taken at the forward and aft areas of all plates and the single measurements recorded are to represent the average of multiple measurements.
5. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and substantial corrosion allowable limits (according to the individual classification Society's Rules) the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM2-G(NSD) (i) Report on THICKNESS MEASUREMENT OF SHELL AND DECK PLATING
(one, two or three transverse sections)

Sheet 5

Ship's name.....

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																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
STRAKE POSITION	No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)				No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)				No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM2-G(NSD) (i)

1. This report may be used for recording the thickness measurement of:-
Strength deck plating and sheerstrake plating transverse sections:-

One, two or three sections within the cargo length area, comprising of the structural items.
2. Only the deck plating strakes outside the line of openings are to be recorded.
3. The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
4. The exact frame station of measurement is to be stated.
5. The single measurements recorded are to represent the average of multiple measurements.
6. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and substantial corrosion allowable limits (according to the individual classification Society's Rules), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM2-G(NSD) (ii) Report on THICKNESS MEASUREMENT OF SHELL PLATING
(one, two or three transverse sections)

Sheet 6

Ship's name.....

Class Identity No.

Report No.

SHELL PLATING

SHELL PLATING																											
	FIRST TRANSVERSE SECTION AT FRAME NUMBER								SECOND TRANSVERSE SECTION AT FRAME NUMBER								THIRD TRANSVERSE SECTION AT FRAME NUMBER										
STRAKE POSITION	No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm	Gauged Thk. mm (b)		Remaining Corr. Addition, mm		No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm	Gauged Thk. mm (b)		Remaining Corr. Addition, mm		No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm	Gauged Thk. mm (b)		Remaining Corr. Addition, mm				
					(a)	P	S	P					S	(a)	P	S					P	S	(a)	P	S	P	S
1st below sheer strake																											
2nd																											
3rd																											
4th																											
5th																											
6th																											
7th																											
8th																											
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14th																											
15th																											
16th																											
17th																											
18th																											
19th																											
20th																											
Keel strake																											
BOTTOM TOTAL																											

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM2-G(NSD) (ii)

1. This report may be used for recording the thickness measurement of:-

Shell plating transverse sections:-

One, two or three sections within cargo length area comprising of the structural items.

2. The bottom area comprises keel, bottom and bilge plating.
3. The exact frame station of measurement is to be stated.
4. The single measurements recorded are to represent the average of multiple measurements.
5. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and substantial corrosion allowable limits (according to the individual classification Society's Rules), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

Sheet 7

Report No.

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM3-G(NSD)

1. This report may be used for recording the thickness measurement of:-

Longitudinal Members at transverse sections:-

One, two, or three sections within the cargo length area, comprising of the appropriate structural items.

2. The exact frame station of measurement is to be stated.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and substantial corrosion allowable limits (according to the individual classification Society's Rules), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM4-G(NSD) Report on THICKNESS MEASUREMENTS OF TRANSVERSE BULKHEADS

Sheet 8

Ship's name.....

Class Identity No.

Report No.

LOCATION OF STRUCTURE:				FRAME NO.:					
STRUCTURAL COMPONENT (PLATING/STIFFENER)									
STRUCTURAL COMPONENT (PLATING/STIFFENER)	As Built Thickness mm	Voluntary Thickness Addition mm	Renewal Thickness mm (a)	Gauged Thickness mm (b)		Remaining Corr. Addition mm (b)-(a)			
				P	S	P	S	P	S

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM4-G(NSD)

1. This report form may be used for recording the thickness measurement of cargo hold transverse bulkheads.
2. The single measurements recorded are to represent the average of multiple measurements.
3. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and substantial corrosion allowable limits (according to the individual classification Society's Rules), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

Sheet 9

Report No.

[illegible]

NOTES – See Reverse

NOTES TO REPORT TM5-G(NSD)

1. This report may be used for recording the thickness measurement of miscellaneous structural members.
2. The single measurements recorded are to represent the average of multiple measurements.
3. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and substantial corrosion allowable limits (according to the individual classification Society's Rules), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

BCS-R Z7.1 Hull Surveys for General Dry Cargo Ships

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- 1.2 Definitions
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- 6.3 Reporting

Note 1: This requirement is applied for surveys commenced on or after 1 July 2020.

ENCLOSURES:

Table I: Minimum requirements for Close-up Surveys at Hull Special Surveys of General Dry Cargo Ships.

Table II: Minimum requirements to Thickness Measurements at Hull Special Surveys of General Dry Cargo Ships.

Table III: Guidance for Additional Thickness Measurements in Way of Substantial Corrosion.

Table IV: Procedures for Certification of Firms Engaged in Thickness Measurement of Hull Structures.

Figure 1: Areas for Close-up Survey of General Dry Cargo Ships.

Figure 2: Areas for Close-up Survey of General Dry Cargo Ships.

1. GENERAL

1.1 Application

1.1.1 The requirements apply to all self-propelled General Dry Cargo Ships of 500gt and above carrying solid cargoes other than¹:

- ships subject to **BCS-R Z10.2 or BCS-R Z10.5**;
- dedicated container carriers;
- ro-ro cargo ships;
- refrigerated cargo ships;
- dedicated wood chip carriers;
- dedicated cement carriers;
- livestock carriers;
- deck cargo ships²;
- general dry cargo ships of double-side skin construction, with double-side skin extending for the length of the cargo area, and for the height of the cargo hold to the upper deck³.

1.1.2 For General Dry Cargo Ships with hybrid cargo hold arrangements, e.g. with some cargo holds of single-side skin and others of double-side skin, the requirements of BCS-R Z7.1 are to be applied only to structure in way of the single-side skin cargo hold region.

1.1.3 The requirements apply to surveys of hull structure and piping systems in way of cargo holds, cofferdams, pipe tunnels, void spaces and fuel oil tanks within the cargo area and all ballast tanks. The requirements are additional to the classification requirements applicable to the remainder of the ship. Refer to BCS-R Z7.

1.1.4 The requirements contain the minimum extent of examination, thickness measurements and tank testing. The survey is to be extended when Substantial Corrosion and/or structural defects are found and include additional Close-up Survey when necessary.

1.2 Definitions

1.2.1 Ballast Tank

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

1.2.2 Spaces

Spaces are separate compartments including holds and tanks.

1.2.3 Overall Survey

An 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 The requirements of paragraphs 2.6 and 3.3 also apply to those cargo ships, which, although belonging to the ship types listed in 1.1.1 that are excluded from the application of this UR, are fitted with a single cargo hold.

² A deck cargo ship is a ship that is designed to carry cargo exclusively above deck without any access for cargo below deck.

³ Special consideration may also be given to ships that are of double side-skin construction but with single skin in way of several frame spaces e.g. in way of a cargo hold entrance or in way of forebody hull form at the forward end of the foremost cargo hold.

1.2.4 Close Up Survey

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

1.2.5 Transverse Section

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

1.2.6 Representative Space

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 is to be taken of the service and repair history on board and identifiable Critical Structural Areas and/or Suspect Areas.

1.2.7 Critical Structural Area

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

1.2.8 Suspect Area

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

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 Corrosion Prevention System

A Corrosion Prevention System is normally considered a full hard protective coating.

Hard Protective Coating is usually to be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specifications.

1.2.11 Coating Condition

Coating Condition is defined as follows:

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

1.2.12 Cargo Length Area

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

1.2.13 Special Consideration

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

1.2.14 Prompt and Thorough Repair

A Prompt and Through 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.

1.2.15 Remote Inspection Techniques(RIT)

Remote Inspection Technique is a means of survey that enables examination of any part of the structure without the need for direct physical access of the surveyor(BCS-G 42).

1.3 Repairs

1.3.1 Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Surveyor, will affect the vessel's structural, watertight or weathertight integrity, is to be promptly and thoroughly (see 1.2.14) repaired. Areas to be considered include:

- side shell frames, their end attachments and adjacent shell plating;
- deck structure and deck plating;
- bottom structure and bottom plating;
- watertight bulkheads;
- hatch covers and hatch coamings.
- items in 3.2.3.5, 3.2.3.6 and 3.2.3.8 of BCS-R Z7.

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

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

1.3.3 Where the damage found on structure mentioned in Para. 1.3.1 is isolated and of a localised nature which does not affect the ship's structural integrity, consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weather tight integrity and impose a condition of class in accordance with BCS-PR 35, with a specific time limit.

1.4 Thickness measurements and close-up surveys

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

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

close -up survey , temporary means of access for the corresponding thickness measurements as specified in this UR is to be provided unless such RIT is also able to carry out the required thickness measurements.

1.5 Remote Inspection Techniques (RIT)

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

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

1.5.3 When using a RIT as an alternative to close-up survey, if not carried out by BCS itself, it is to be conducted by a firm approved as a service supplier according to BCS-R Z 17 and is to be witnessed by an attending surveyor of BCS.

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

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

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

1.6 Thickness measurements Acceptance Criteria

The acceptance criteria for thickness measurements are according to the Rules of BCS and/ or specific BCS-Rs depending on ship's age and structural elements concerned, e.g . BCS-R S18 for corrugated transverse bulkhead, BCS-R S21A for all cargo hatch covers and coamings on exposed decks

2. SPECIAL SURVEY *

2.1 Schedule

2.1.1 Special Surveys are to be carried out at 5 years intervals to renew the Classification Certificate.

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

2.1.3 For surveys completed within 3 months before the expiry date of the Special Survey, the next period of class will start from the expiry date of the Special Survey. For surveys completed more than 3 months before the expiry date of the Special Survey, the period of class will start from the survey completion date. In cases where the vessel has been laid up or has been out of service for a considerable period because of a major repair or modification and the owner elects to only carry out the overdue surveys, the next period of class will start from the expiry date of the special survey. If the owner elects to carry out the next due special survey, the period of class will start from the survey completion date.

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

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

2.1.6 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

2.2 Scope

2.2.1 General

2.2.1.1 The Special Survey is to include, in addition to the requirements of the Annual Surveys, examination, tests and checks of sufficient extent to ensure that the hull and related piping, as required in 2.2.1.3, are in a satisfactory condition and fit for the intended purpose for the new period of class of 5 years to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

2.2.1.2 All cargo holds, ballast tanks, including double bottom tanks, pipe tunnels, cofferdams and void spaces bounding cargo holds, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing as required in 2.4 and 2.5, to ensure that the structural integrity remains effective.

The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

* Some member Societies use the term "Special Periodical Survey" others use the term "Class Renewal Survey" instead of the term "Special Survey".

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

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

Note: For survey of automatic air pipes refer to 2.2.13 of BCS-R Z7.

2.2.2 Dry Dock Survey

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

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

2.2.3 Tank Protection

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

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

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

2.2.4 Hatch Covers and Coamings

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

2.2.4.1 A thorough inspection of the items listed in 3.2.3 is to be carried out.

2.2.4.2 Checking of the satisfactory operation of all mechanically operated hatch covers is to be made, including:

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

2.2.4.3 Checking the effectiveness of sealing arrangements of all hatch covers by hose testing or equivalent is to be carried out.

2.2.4.4 Close-up survey and thickness measurement¹ of the hatch cover and coaming plating and stiffeners is to be carried out as given in Table I and Table II.

2.3 Extent of Overall and Close-up Survey

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

Note: For fuel oil, lube oil and fresh water tanks, reference is to be made to UR Z7, Table 3.

2.3.2 The minimum requirements for close-up surveys at special survey are given in Table I.

2.3.3 The Surveyor may extend the close-up survey as deemed necessary taking into account the maintenance of the spaces under survey, the condition of the corrosion prevention system and where spaces have structural arrangements or details which have suffered defects in similar spaces or on similar ships according to available information.

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

Note: For examination of automatic air pipe heads, reference is to be made to BCS-R Z7, Table 4.

2.4 Extent of Thickness Measurement

2.4.1 The minimum requirements for thickness measurements at Special Survey are given in Table II.

2.4.2 The Surveyor may extend the thickness measurements as deemed necessary. When thickness measurements indicate substantial corrosion, the extent of thickness measurements is to be increased to determine the extent of areas of substantial corrosion. Table III may be used as guidance for these additional thickness measurements.

2.4.3 For areas in spaces where hard protective coatings are found to be in a GOOD condition, the extent of thickness measurement according to Table II may be specially considered.

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

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

2.5 Extent of Tank Testing

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

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

2.5.3 Tank testing of fuel oil tanks is to be carried out with a head of liquid to the highest point that liquid will rise under service conditions. Tank testing of fuel oil tanks may be specially considered based on a satisfactory external examination of the tank boundaries, and a confirmation from the Master stating that the pressure testing has been carried out according to the requirements with satisfactory results.

2.6 Additional requirements for single hold cargo ships (see Footnote 1 to 1.1.1) after determining compliance with SOLAS II-I/25

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

3. ANNUAL SURVEY

3.1 Schedule

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

3.2 Scope

3.2.1 General

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

3.2.2 Examination of the Hull

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

3.2.2.2 Examination of watertight penetrations as far as practicable.

3.2.3 Examination of weather decks, hatch covers and coamings

3.2.3.1 Confirmation is to be obtained that no unapproved changes have been made to the hatch covers, hatch coamings and their securing and sealing devices since the last survey.

3.2.3.2 Where mechanically operated steel covers are fitted, checking the satisfactory condition of:

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

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

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

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

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

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

Note: For survey of air pipes, flame screens on vents and ventilators refer to 3.2.3.5 to 3.2.3.8 of BCS-R Z7.

3.2.4 Suspect Areas

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

3.2.5 Examination of Cargo Holds

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

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

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

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

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

3.2.6 Examination of Ballast Tanks

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

3.3 Additional requirements for single hold cargo ships (see Footnote 1 to 1.1.1) after determining compliance with SOLAS II-I/25

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

4. INTERMEDIATE SURVEY

4.1 Schedule

4.1.1 The Intermediate Survey is to be held at or between either the 2nd or 3rd Annual Survey.

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

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

4.1.4 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

4.2 Scope

4.2.1 General

4.2.1.1 The survey extent is dependent on the age of the vessel as specified in 4.2.2 to 4.2.4.

4.2.2 Ships 5 - 10 Years of Age, the following is to apply :

4.2.2.1 Ballast tanks

- a) For ballast tanks, an Overall Survey of Representative Tanks selected by the Surveyor is to be carried out. If such overall survey reveals no visible structural defects, the examination may be limited to a verification that the corrosion prevention system remains efficient.
- b) Where POOR coating condition, soft or semi-hard coating, corrosion or other defects are found in ballast tanks or where a hard protective coating was not applied from the time of construction, the examination is to be extended to other ballast tanks of the same type.
- c) In ballast tanks other than double bottom tanks, where a hard protective coating is found in POOR condition, and it is not renewed, where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from time of construction, the tanks in question are to be examined and thickness measurements carried out as considered necessary at annual intervals. When such breakdown of hard protective coating is found in double bottom ballast tanks, where a soft or semi-hard coating has been applied, or where a hard protective coating has not been applied, the tanks in question may be examined at annual intervals. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.
- d) In addition to the requirements above, areas found suspect at previous surveys are to be surveyed in accordance with the provisions indicated in 3.2.4.

4.2.2.2 Cargo Holds

- a) An Overall Survey of one forward and one after cargo hold and their associated tween deck spaces.
- b) Areas found suspect at previous surveys are to be surveyed in accordance with the provisions indicated in 3.2.4.

4.2.3 Ships 10-15 Years of Age, the following is to apply:

4.2.3.1 Ballast Tanks

- a) For ballast tanks, an overall survey of all tanks is to be carried out. If such overall survey reveals no visible structural defects, the examination may be limited to a verification that the corrosion prevention system remains efficient.
- b) The requirements of 4.2.2.1 c) and d) also apply.

4.2.3.2 Cargo Holds

- a) An Overall Survey of all cargo holds and tween deck spaces.
- b) Areas found suspect at previous surveys are to be surveyed in accordance with the provisions indicated in 3.2.4.
- c) When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, then the extent of thickness measurements is to be increased to determine the extent of areas of substantial corrosion. Table III may be used as guidance for these additional measurements. These extended thickness measurements are to be carried out before the survey is credited as completed.

4.2.4 Ships over 15 Years of Age, the following is to apply :

4.2.4.1 The requirements of the Intermediate Survey are to be to the same extent as the previous Special Survey as required in 2, except for item 2c) in column 4 of Table II. However, tank testing specified in 2.5, survey of automatic air pipe heads (see Notes in 2.2.1.4 and 2.3.4) and internal examination of fuel oil, lube oil and fresh water tanks (see 2.3.1) are not required unless deemed necessary by the attending surveyor.

4.2.4.2 In application of 4.2.4.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.4.

4.2.4.3 In lieu of the requirements of 2.2.2, an in water survey, according to the provisions of item 3.1.3 of BCS-R Z3, may be considered as equivalent.

5 PREPARATION FOR SURVEY

5.1 Conditions of Survey

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

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

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

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

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

5.2 Access to Structures

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

5.2.2 For Close-up Surveys, one or more of the following means for access, acceptable to the Surveyor, is to be provided:

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

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

- Unmanned robot arm.
- Remotely Operated Vehicles (ROV).
- Unmanned Aerial Vehicles / Drones.
- Other means acceptable to BCS.

5.3 Equipment for Survey

5.3.1 Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required.

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

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

5.4 Survey at Sea or at Anchorage

5.4.1 Survey at sea or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel on board. Necessary precautions and procedures for carrying out the survey are to be in accordance with 5.1, 5.2, and 5.3.

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

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

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

See footnote*

* Reference is made to BCS-G 39 - Guidelines for use of Boats or Rafts for Close-up surveys.

6. PROCEDURES FOR THICKNESS MEASUREMENTS

6.1 General

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

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

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

6.2 Certification of Thickness Measurement Company

6.2.1 The thickness measurements are to be carried out by a company certified by BCS according to principles stated in Table IV.

6.3 Reporting

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

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

TABLE I

**TABLE OF THE MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT HULL
SPECIAL SURVEYS OF GENERAL DRY CARGO SHIPS**

Special Survey No.1 Age ≤ 5	Special Survey No.2 5 < Age ≤ 10	Special Survey No. 3 10 < Age ≤ 15	Special Survey No. 4 and Subsequent Age > 15
<p>(A) Selected shell frames in one forward and one aft cargo hold and associated tween deck spaces.</p> <p>(B) One selected cargo hold transverse bulkhead.</p> <p>(D) All cargo hold hatch covers and coamings (plating and stiffeners).</p>	<p>(A) Selected shell frames in all cargo holds and tween deck spaces.</p> <p>(B) One transverse bulkhead in each cargo hold.</p> <p>(B) Forward and aft transverse bulkhead in one side ballast tank, including stiffening system.</p> <p>(C) One transverse web with associated plating and framing in two representative ballast tanks of each type (i.e. topside, hopper side, side tank or double bottom tank).</p> <p>(D) All cargo hold hatch covers and coamings (plating and stiffeners).</p> <p>(E) Selected areas of all deck plating and underdeck structure inside line of hatch openings between cargo hold hatches.</p> <p>(F) Selected areas of inner bottom plating.</p>	<p>(A) All shell frames in the forward lower cargo hold and 25% frames in each of the remaining cargo holds and tween deck spaces including upper and lower end attachments and adjacent shell plating.</p> <p>(B) All cargo hold transverse bulkheads.</p> <p>(B) All transverse bulkheads in ballast tanks, including stiffening system.</p> <p>(C) All transverse webs with associated plating and framing in each ballast tanks.</p> <p>(D) All cargo hold hatch covers and coamings (plating and stiffeners).</p> <p>(E) All deck plating and underdeck structure inside line of hatch openings between cargo hold hatches.</p> <p>(F) All areas of inner bottom plating.</p>	<p>(A) All shell frames in all cargo holds and tween deck spaces including upper and lower end attachments and adjacent shell plating.</p> <p>Areas (B –F) as for Special Survey No. 3.</p>

- (A)** Cargo hold transverse frames.
- (B)** Cargo hold transverse bulkhead plating, stiffeners and girders.
- (C)** Transverse web frame or watertight transverse bulkhead in ballast tanks.
- (D)** Cargo hold hatch covers and coamings. Subject to cargo hold hatch covers of approved design which structurally have no access to the internals, close-up survey/thickness measurement shall be done of accessible parts of hatch covers structures.
- (E)** Deck plating and underdeck structure inside line of hatch openings between cargo hold hatches.
- (F)** Inner bottom plating.

See Figs 1 and 2 for the areas corresponding to (A), (B), (C), (D), (E) and (F).

- Note:** Close-up survey of cargo hold transverse bulkheads to be carried out at the following levels:
- Immediately above the inner bottom and immediately above the tween decks, as applicable.
 - Mid-height of the bulkheads for holds without tween decks.
 - Immediately below the main deck plating and tween deck plating.

TABLE II

**TABLE OF MINIMUM REQUIREMENTS FOR THE THICKNESS MEASUREMENT AT
HULL SPECIAL SURVEYS OF GENERAL DRY CARGO SHIPS**

Special Survey No. 1 Age ≤ 5	Special Survey No. 2 5 < Age ≤ 10	Special Survey No. 3 10 < Age ≤ 15	Special Survey No. 4 and Subsequent Age >15
1. Suspect areas.	1. Suspect areas. 2. One transverse section of deck plating in way of a cargo space within the amidships 0.5L. 3. Measurement for general assessment and recording of corrosion pattern of those structural members subject to close-up survey according to Table I.	1. Suspect areas. 2. Two transverse sections within the amidships 0.5L in way of two different cargo spaces. 3. Measurement for general assessment and recording of corrosion pattern of those structural members subject to close-up survey according to Table I. 4. Within the cargo length area, each deck plate outside line of cargo hatch openings. 5. All wind and water strakes within the cargo length area. 6. Selected wind and water strakes outside the cargo length area.	1. Suspect areas. 2. Within the cargo length area: a) A minimum of three transverse sections within the amidships 0.5L. b) each deck plate outside line of cargo hatch openings. c) Each bottom plate, including lower turn of bilge. d) Duct keel or pipe tunnel plating and internals. 3. Measurement for general assessment and recording of corrosion pattern of those structural members subject to close-up survey according to Table I. 4. All wind and water strakes full length

Notes:

1. Thickness measurement locations should be selected to provide the best representative sampling of areas likely to be most exposed to corrosion, considering cargo and ballast history and arrangement and condition of protective coatings.
2. For ships less than 100 metres in length, the number of transverse sections required at Special survey No. 3 may be reduced to one and the number of transverse sections at Special Survey No. 4 and subsequent surveys may be reduced to two.

TABLE III

**GUIDANCE FOR ADDITIONAL THICKNESS MEASUREMENTS IN WAY OF
SUBSTANTIAL CORROSION**

Structural Member	Extent of Measurement	Pattern of Measurement
Plating	Suspect area and adjacent plates.	5 point pattern over 1 square meter.
Stiffeners	Suspect area.	3 measurements each in line across web and flange.

TABLE IV

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

1. Application

This guidance applies for certification of the firms which intend to engage in the thickness measurement of hull structures of the vessels. UR Z17 also applies.

2. Procedures for Certification

(1) Submission of Documents:

Following documents are to be submitted to BCS for approval;

- a) Outline of firms, e.g. organization and management structure.
- b) Experiences of the firms on thickness measurement inter alia of hull structures of the vessels.
- c) Technicians careers, i.e. experiences of technicians as thickness measurement operators, technical knowledge of hull structure etc. Operators, are to be qualified according to a recognized industrial NDT Standard.
- d) Equipment used for thickness measurement such as ultra-sonic testing machines and its maintenance/calibration procedures.
- e) A guide for thickness measurement operators.
- f) Training programmes of technicians for thickness measurement.

(2) Auditing of the firms:

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

(3) Certification is conditional on an onboard demonstration at thickness measurements as well as satisfactory reporting.

3. Certification

(1) Upon satisfactory results of both the audit of the firm in 2(2) and the demonstration tests in 2(3) above, BCS will issue a Certificate of Approval as well as a notice to the effect that the thickness measurement operation system of the firm has been certified by BCS.

(2) Renewal/endorsement of the Certificate is to be made at intervals not exceeding 3 years by verification that original conditions are maintained.

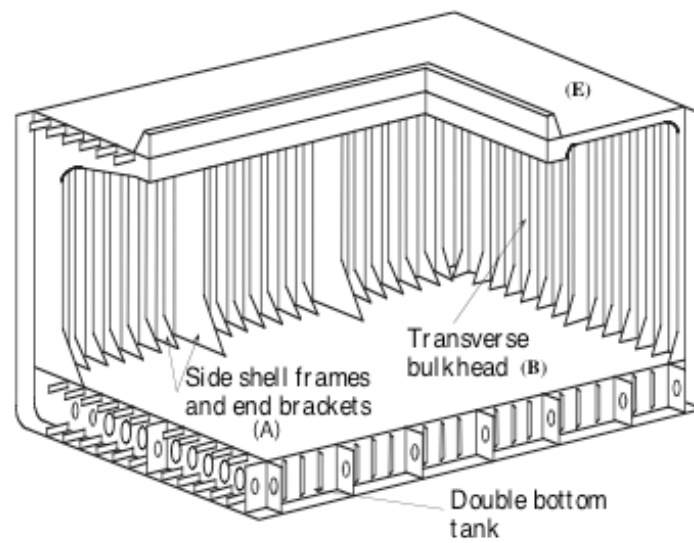
4. Information of any alteration to the Certified Thickness Measurement Operation System

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

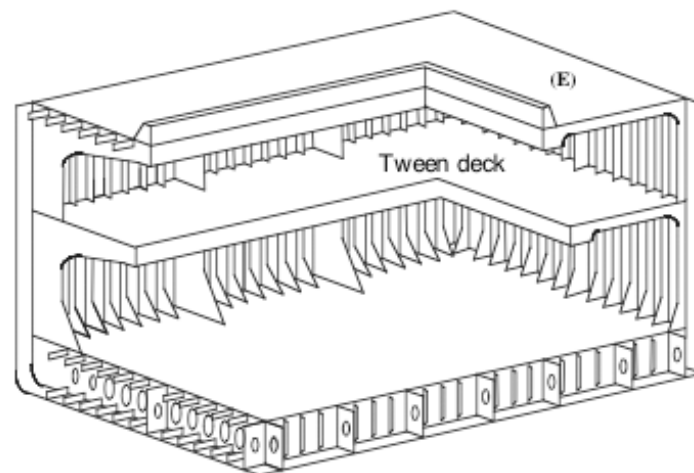
5. Cancellation of Approval

Approval may be cancelled in the following cases:

- (1) Where the measurements were improperly carried out or the results were improperly reported.
- (2) Where the Society's surveyor found any deficiencies in the approved thickness measurement operation systems of the firm.
- (3) Where the firm failed to inform of any alteration in 4 above to BCS.



(a) Single Deck Ship



(b) Tween Deck Ship

Figure 1 Areas for Close-Up Survey of General Dry Cargo Ships

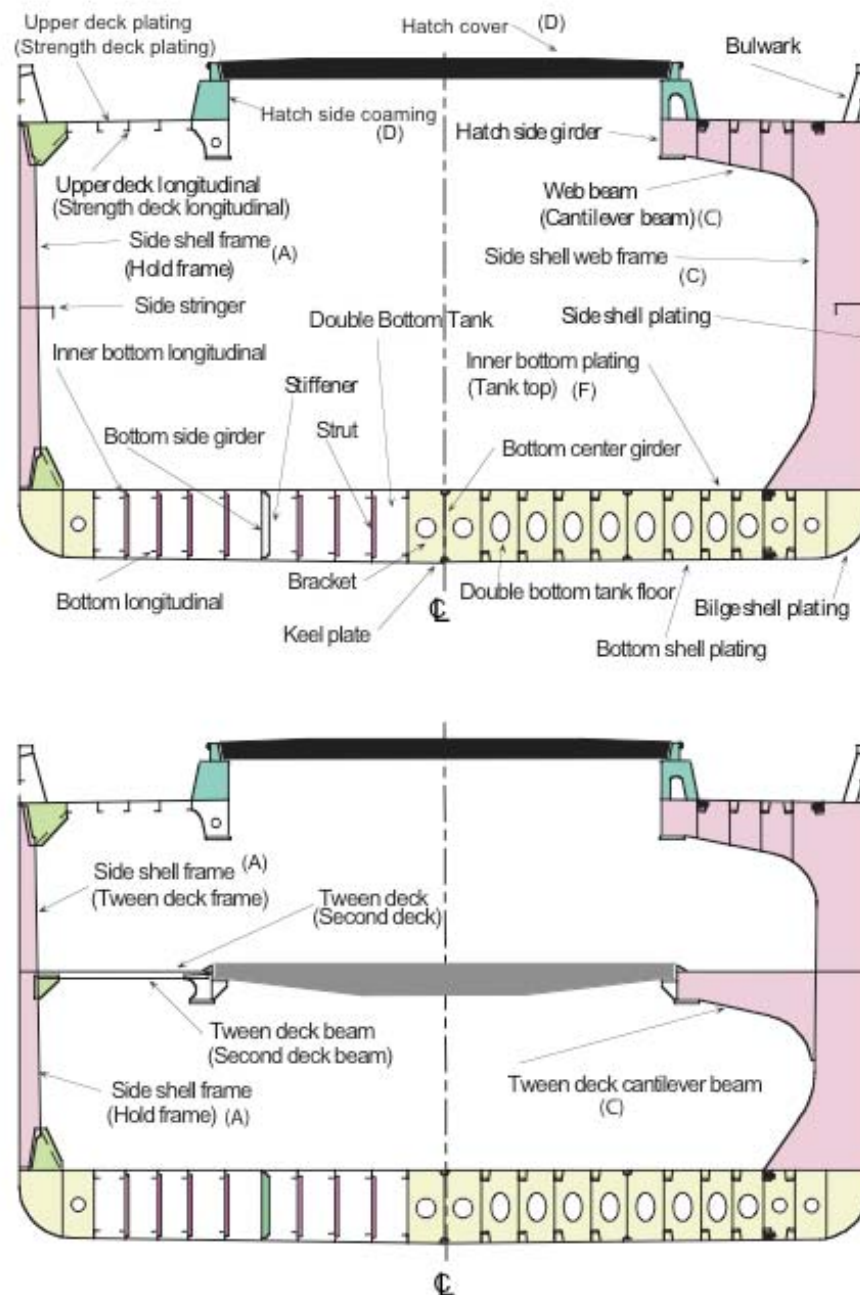


Figure 2 Areas for Close-Up Survey of General Dry Cargo Ships

BCS-R Z7.2 Hull Surveys for Liquefied Gas Carriers

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ENCLOSURES:

Table I:	Minimum requirements for Close-up Surveys at Hull Special Surveys of Liquefied Gas Carriers
Table II:	Minimum requirements for Thickness Measurements at Hull Special Surveys of Liquefied Gas Carriers
Table III:	Minimum requirements for Close-up Surveys at Hull Intermediate Surveys of Liquefied Gas Carriers
Table IV:	Procedures for Certification of Firms Engaged in Thickness Measurement of Hull Structure
Table V:	Guidance for Additional Thickness Measurements in Way of Substantial Corrosion
Figure 1:	Typical midship sections of Liquefied Gas Carriers.

Note:

1. This requirement is applied for surveys commenced on or after 1 July 2020.

1. GENERAL

1.1 Application

1.1.1 The requirements apply to all self-propelled ships carrying liquefied gases in bulk.

1.1.2 The requirements apply to surveys of hull structure and piping systems, except piping covered by BCS-R Z16, in way of pump rooms, compressor rooms, cofferdams, pipe tunnels, void spaces and fuel oil tanks within the cargo area and all ballast tanks.

The requirements are additional to the classification requirements applicable to the remainder of the ship. Refer to BCS-R Z7.

Refer to BCS-R Z16 for periodical surveys of cargo installations on ships carrying liquefied gases in bulk.

1.1.3 The requirements contain the minimum extent of examination, thickness measurements and tank testing. The survey is to be extended when Substantial Corrosion and/or structural defects are found and include additional Close-up Survey when necessary.

1.2 Definitions

1.2.1 Ballast Tank

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

1.2.2 Overall Survey

An 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.

1.2.3 Close-up Survey

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

1.2.4 Transverse Section

A Transverse Section includes all longitudinal members such as plating, longitudinals and girders at the deck, sides, bottom, inner bottom and longitudinal bulkheads.

1.2.5 Representative Tank

Representative Tanks are those which are expected to reflect the condition of other Tanks of similar type and service and with similar corrosion prevention systems. When selecting Representative Tanks account is to be taken of the service and repair history on board and identifiable Critical Structural Areas and/or Suspect Areas.

1.2.6 Critical Structural Areas

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

1.2.7 Suspect Areas

Suspect Areas are locations showing Substantial Corrosion and/or are considered by the surveyor to be prone to rapid wastage.

1.2.8 Substantial Corrosion

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

1.2.9 Corrosion Prevention System

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

1.2.10 Coating Condition

Coating Condition is defined as follows:

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

1.2.11 Cargo Area

Cargo Area is that part of the ship which contains cargo tanks, cargo/ballast pump rooms, compressor rooms, cofferdams, ballast tanks and void spaces adjacent to cargo tanks and also deck areas throughout the entire length and breadth of the part of the ship over the above mentioned spaces.

1.2.12 Special Consideration

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

1.2.13 Prompt and Thorough Repair

A Prompt and Through 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.

1.2.14 Remote Inspection Techniques(RIT)

Remote Inspection Technique is a means of survey that enables examination of any part of the structure without the need for direct physical access of the surveyor(refer to BCS-G 42).

1.3 Repairs

1.3.1 Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Surveyor, will affect the vessel's structural, watertight or weathertight integrity, is to be promptly and thoroughly (see 1.2.13) repaired. Areas to be considered include:

- side structure and side plating;
- deck structure and deck plating;
- bottom structure and bottom plating; watertight
- bulkheads;
- items in 3.2.3.5, 3.2.3.6 and 3.2.3.8 of BCS-R Z7.

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

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

1.3.3 Where the damage found on structure mentioned in Para. 1.3.1 is isolated and of a localised nature which does not affect the ship's structural integrity, consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weather tight integrity and impose a condition of class in accordance with BCS-PR 35, with a specific time limit.

1.4 Thickness measurements and close-up surveys

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

1.4.2 Consideration may be given by the attending Surveyor to allow use of Remote Inspection Techniques (RIT) as an alternative to close-up survey. Surveys conducted using a RIT are to be completed to the satisfaction of the attending Surveyor. When RIT is used for a close-up survey, temporary means of access for the corresponding thickness measurements as specified in this requirement is to be provided unless such RIT is also able to carry out the required thickness measurements.

1.5 Remote Inspection Techniques (RIT)

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

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

1.5.3 When using a RIT as an alternative to close-up survey, if not carried out by BCS itself, it is to be conducted by a firm approved as a service supplier according to BCS-R Z 17 and is to be witnessed by an attending surveyor of BCS.

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

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

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

2. SPECIAL SURVEY*

2.1 Schedule

2.1.1 Special Surveys are to be carried out at 5 years intervals to renew the Classification Certificate.

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

2.1.3 For surveys completed within 3 months before the expiry date of the Special Survey, the next period of class will start from the expiry date of the Special Survey. For surveys completed more than 3 months before the expiry date of the Special Survey, the period of class will start from the survey completion date. In cases where the vessel has been laid up or has been out of service for a considerable period because of a major repair or modification and the owner elects to only carry out the overdue surveys, the next period of class will start from the expiry date of the special survey. If the owner elects to carry out the next due special survey, the period of class will start from the survey completion date.

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

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

2.1.6 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

2.2 Scope

2.2.1 General

2.2.1.1 The Special Survey is to include, in addition to the requirements of the Annual Surveys, examination, tests and checks of sufficient extent to ensure that the hull and related piping, as required in 2.2.1.3, are in a satisfactory condition and fit for the intended purpose for the new period of class of 5 years to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

2.2.1.2 Ballast tanks, including double bottom tanks, pump rooms, compressor rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing as required in 2.4 and 2.5, to ensure that the structural integrity remains effective.

The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

* Some member Societies use the term "Special Periodical Survey" others use the term "Class Renewal Survey" instead of the term "Special Survey".

2.2.1.3 All piping systems within the above spaces, except those covered by BCS-R Z16, are to be examined and operationally tested to working pressure to attending Surveyor's satisfaction to ensure that tightness and condition remain satisfactory.

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

Note: For survey of automatic air pipes refer to 2.2.13 of BCS-R Z7.

2.2.2 Dry Dock Survey

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

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

2.2.3 Tank Protection

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

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

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

2.3 Extent of Overall and Close-up Survey

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

Note: For fuel oil, lube oil and fresh water tanks, reference is to be made to BCS-R Z7, Table 3.

2.3.2 The minimum requirements for close-up surveys at special survey are given in Table I.

2.3.3 The Surveyor may extend the close-up survey as deemed necessary taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and where tanks have structural arrangements or details which have suffered defects in similar spaces or on similar ships according to available information.

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

Note: For examination of automatic air pipe heads, reference is to be made to BCS-R 27, Table 4.

2.4 Extent of Thickness Measurement

2.4.1 The minimum requirements for thickness measurements at Special Survey are given in Table II.

2.4.2 The Surveyor may extend the thickness measurements as deemed necessary. When thickness measurements indicate substantial corrosion, the extent of thickness measurements is to be increased to determine the extent of areas of substantial corrosion. Table V may be used as guidance for these additional thickness measurements.

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

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

2.5 Extent of Tank Testing

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

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

2.5.3 Tank testing of fuel oil tanks is to be carried out with a head of liquid to the highest point that liquid will rise under service conditions. Tank testing of fuel oil tanks may be specially considered based on a satisfactory external examination of the tank boundaries, and a confirmation from the Master stating that the pressure testing has been carried out according to the requirements with satisfactory results.

3. ANNUAL SURVEY

3.1 Schedule

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

3.2 Scope

3.2.1 General

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

3.2.2 Examination of the hull

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

3.2.2.2 Examination of watertight penetrations as far as practicable.

3.2.3 Examination of weather decks.

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

3.2.3.2 Examination of bunker and vent piping systems.

3.2.4 Examination of cargo pump rooms and compressor rooms and, as far as practicable, pipe tunnels if fitted.

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

3.2.4.2 Examination of the condition of all piping systems, except those covered by BCS-R Z

16. Note: For survey of air pipes, flame screens on vents and ventilators refer to 3.2.3.5 to 3.2.3.8 of BCS-R Z7.

3.2.5 Suspect Areas

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

3.2.6 Examination of ballast tanks

3.2.6.1 Examination of ballast tanks when required as a consequence of the results of the Special Survey and Intermediate Survey is to be carried out. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, then the extent of thickness measurements are to be increased to determine the extent of

areas of substantial corrosion. Table V may be used as guidance for these additional measurements. These extended thickness measurements are to be carried out before the annual survey is credited as completed.

4. INTERMEDIATE SURVEY

4.1 Schedule

4.1.1 The Intermediate Survey is to be held at or between either the 2nd or 3rd Annual Survey.

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

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

4.1.4 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

4.2 Scope

4.2.1 The scope of the second or third annual survey is to be extended to include the following:

4.2.2 Ballast tanks

4.2.2.1 For ships between 5 and 10 years of age, an overall survey of representative ballast tanks is to be carried out. If there is no hard protective coating, soft or semi-hard coating or POOR coating condition, the examination is to be extended to other ballast tanks of the same type.

4.2.2.2 For ships over 10 years of age, an overall survey of all ballast tanks is to be carried out.

4.2.2.3 If such examinations reveal no visible structural defects, the examination may be limited to a verification that the corrosion prevention system remains efficient.

4.2.2.4 For ballast tanks, excluding double bottom tanks, if there is no hard protective coating, soft or semi-hard coating, or POOR coating condition and it is not renewed, the tanks in question are to be internally examined at annual intervals.

4.2.2.5 When such conditions are found in double bottom ballast tanks, the tanks in question may be internally examined at annual intervals.

4.2.2.6 The minimum requirements for close-up surveys at intermediate survey are given in Table III.

5. PREPARATION FOR SURVEY

5.1 Conditions of Survey

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

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

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

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

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

5.2 Access to Structures

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

5.2.2 For Close-up Surveys, one or more of the following means for access, acceptable to the Surveyor, is to be provided:

- permanent staging and passages through structures;
- temporary staging, e.g. ladders, and passages through structures;
- other equivalent means.

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

- Unmanned robot arm.
- Remotely Operated Vehicles (ROV).
- Unmanned Aerial Vehicles / Drones.
- Other means acceptable to BCS.

5.3 Equipment for Survey

5.3.1 Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required.

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

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

5.4 Survey at Sea or at Anchorage

5.4.1 Survey at sea or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel on board. Necessary precautions and procedures for carrying out the survey are to be in accordance with 5.1, 5.2, and 5.3.

5.4.2 A communication system is to be arranged between the survey party in the tank and the responsible officer on deck.

6. PROCEDURES FOR THICKNESS MEASUREMENTS

6.1 General

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

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

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

6.2 Certification of Thickness Measurement Company

6.2.1 The thickness measurements are to be carried out by a company certified by BCS according to principles stated in Table IV, except that in respect of measurements of ships less than 500 gross tonnage, the firm need not be so approved.

6.3 Reporting

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

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

TABLE I

**TABLE OF THE MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT HULL
SPECIAL SURVEYS OF LIQUEFIED GAS CARRIERS**

Special Survey No.1 (age ≤ 5)	Special Survey No.2 (5 < age ≤ 10)	Special Survey No.3 and subsequent (age > 10)
<p>One web frame in a representative ballast tank of the topside, hopper side and double hull side type (1)</p> <p>One transverse bulkhead in a ballast tank (3)</p>	<p>All web frames in a ballast tank, which is to be a double hull side tank or a topside tank. If such tanks are not fitted, another ballast tank is to be selected (1)</p> <p>One web frame in each remaining ballast tank (1)</p> <p>One transverse bulkhead in each ballast tank (2)</p>	<p>All web frames in all ballast tanks (1)</p> <p>All transverse bulkheads in all ballast tanks (2)</p>
<p>(1) Complete transverse web frame including adjacent structural members. (2) Transverse bulkhead complete, including girder system and adjacent members, and adjacent longitudinal bulkhead structure. (3) Transverse bulkhead lower part including girder system and adjacent structural members.</p> <p>Note 1: Ballast tanks include topside, double hull side, double bottom, hopper side, or any combined arrangement of the aforementioned, and peak tanks where fitted.</p> <p>Note 2: For areas in tanks where coatings are found to be in GOOD condition, as defined in 1.2.10, the extent of close-up surveys may be specially considered by BCS.</p> <p>Note 3: For ships having independent tanks of type C, with a midship section similar to that of a general cargo ship, the extent of close-up surveys may be specially considered by BCS.</p> <p>Note 4: The Surveyor may extend the close-up survey as deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:</p> <ul style="list-style-type: none"> - in particular, in tanks having structural arrangements or details which have suffered defects in similar tanks, or on similar ships according to available information; - in tanks having structures approved with reduced scantlings. 		

TABLE II

TABLE OF MINIMUM REQUIREMENTS FOR THE THICKNESS MEASUREMENT AT HULL SPECIAL SURVEY OF LIQUEFIED GAS CARRIERS

Special Survey No.1 age ≤ 5	Special Survey No.2 5 < age ≤ 10	Special Survey No.3 10 < age ≤ 15	Special Survey No.4 and subsequent age > 15
One section of deck plating for the full beam of the ship within 0.5 L amidships in way of a ballast tank, if any	Within the cargo area: - each deck plate - one transverse section within 0.5 L amidships in way of a ballast tank, if any	Within the cargo area: - each deck plate - two transverse sections (1) - all wind and water strakes	Within the cargo area: - each deck plate - three transverse sections (1) - each bottom plate - duct keel plating and internals
	Selected wind and water strakes outside the cargo area	Selected wind and water strakes outside the cargo area	All wind and water strakes, full length
Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey according to Table I	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey according to Table I	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey according to Table I	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey according to Table I
Suspect areas	Suspect areas	Suspect areas	Suspect areas
<p>(1) at least one section is to include a ballast tank within 0,5L amidships, if any</p> <p>Note 1: For ships having independent tanks of type C, with a midship section similar to that of a general cargo ship, the extent of thickness measurements may be increased to include the tank top plating at the discretion of the Surveyor.</p> <p>Note 2: For areas in spaces where coatings are found to be in GOOD condition, as defined in 1.2.10, the extent of thickness measurements may be specially considered by BCS.</p> <p>Note 3: The Surveyor may extend the thickness measurements as deemed necessary. Where substantial corrosion, as defined in 1.2.8, is found, the extent of thickness measurements is to be increased to the satisfaction of the Surveyor.</p>			

TABLE III

**TABLE OF THE MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT HULL
INTERMEDIATE SURVEYS OF LIQUEFIED GAS CARRIERS**

10 < age ≤ 15	age > 15
<p>Close-up survey of:</p> <ul style="list-style-type: none"> - all web frames and both transverse bulkheads in a representative ballast tank (1) and (2) - the upper part of one web frame in another representative ballast tank - one transverse bulkhead in another representative ballast tank (2) 	<p>Close-up survey of:</p> <ul style="list-style-type: none"> -all web frames and both transverse bulkheads in two representative ballast tanks (1) and (2)
<p>(1) Complete transverse web frame including adjacent structural members</p> <p>(2) Transverse bulkhead complete, including girder system and adjacent members, and adjacent longitudinal bulkhead structure</p> <p>Note 1: Ballast tanks include topside, double hull side, double bottom, hopper side, or any combined arrangement of the aforementioned, and peak tanks where fitted.</p> <p>Note 2: For areas in tanks where protective coating is found to be in GOOD condition, the extent of close-up survey may be specially considered by BCS.</p> <p>Note 3: For ships having independent tanks of type C, with a midship section similar to that of a general cargo ship, the extent of close-up surveys may be specially considered by BCS.</p> <p>Note 4: The extent of close-up surveys may be extended by the Surveyor as deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:</p> <ul style="list-style-type: none"> - in particular, in tanks having structural arrangements or details which have suffered defects in similar tanks, or on similar ships according to available information; - in tanks having structures approved with reduced scantlings. 	

TABLE IV

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

1. Application

This guidance applies for certification of the firms which intend to engage in the thickness measurement of hull structures of the vessels. BCS-R Z17 also applies

2. Procedures for Certification

- (1) Submission of Documents: Following documents are to be submitted to BCS for approval:

- a) Outline of firm, e.g. organization and management structure.
- b) Experience of the firm on thickness measurement inter alia of hull structures of the vessels.
- c) Technicians' careers, i.e. experience of technicians as thickness measurement operators, technical knowledge of hull structure, etc. Operators, are to be qualified according to a recognized industrial NDT Standard.
- d) Equipment used for thickness measurement such as ultra-sonic testing machines and its maintenance/calibration procedures.
- e) A guide for thickness measurement operators.
- f) Training programmes of technicians for thickness measurement.

- (2) Auditing of the firms:

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

- (3) Certification is conditional on an onboard demonstration at thickness measurements as well as satisfactory reporting.

3. Certification

- (1) Upon satisfactory results of both the audit of the firm in 2(2) and the demonstration tests in 2(3) above, BCS will issue a Certificate of Approval as well as a notice to the effect that the thickness measurement operation system of the firm has been certified by BCS.
- (2) Renewal/endorsement of the Certificate is to be made at intervals not exceeding 3 years by verification that original conditions are maintained.

4. Information of any alteration to the Certified Thickness Measurement Operation System

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

5. Cancellation of Approval

Approval may be cancelled in the following cases:

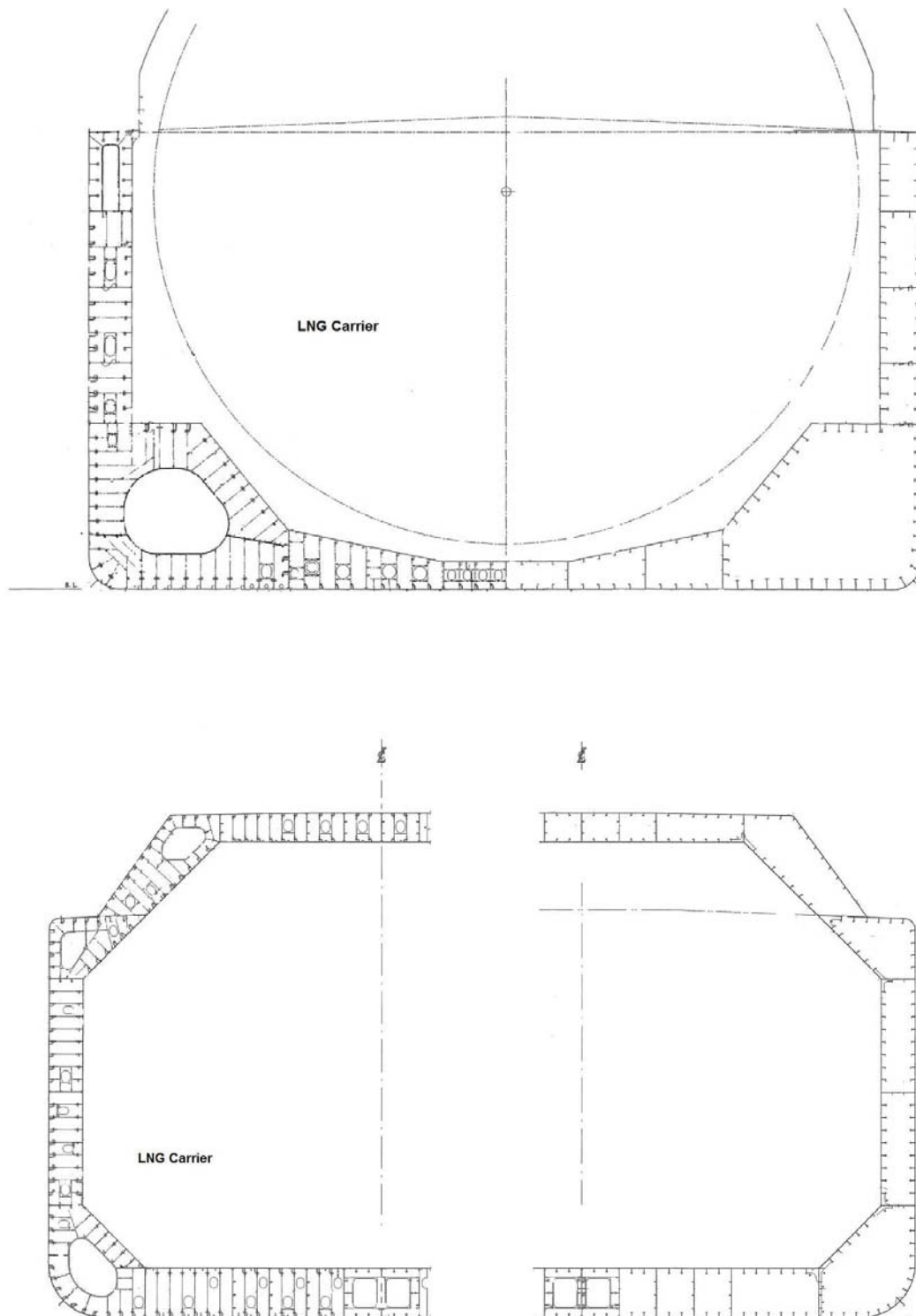
- (1) Where the measurements were improperly carried out or the results were improperly reported.
- (2) Where BCS's surveyor found any deficiencies in the approved thickness measurement operation system of the firm.
- (3) Where the firm failed to inform of any alteration in 4 above to BCS.

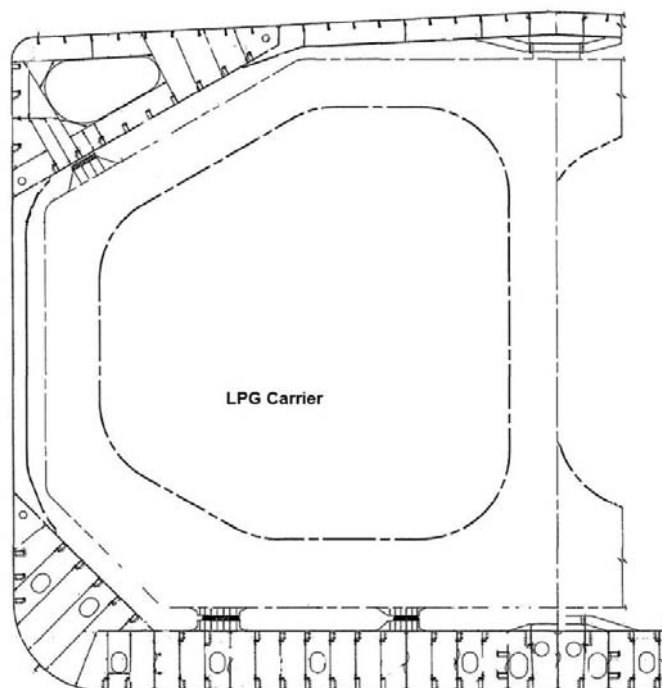
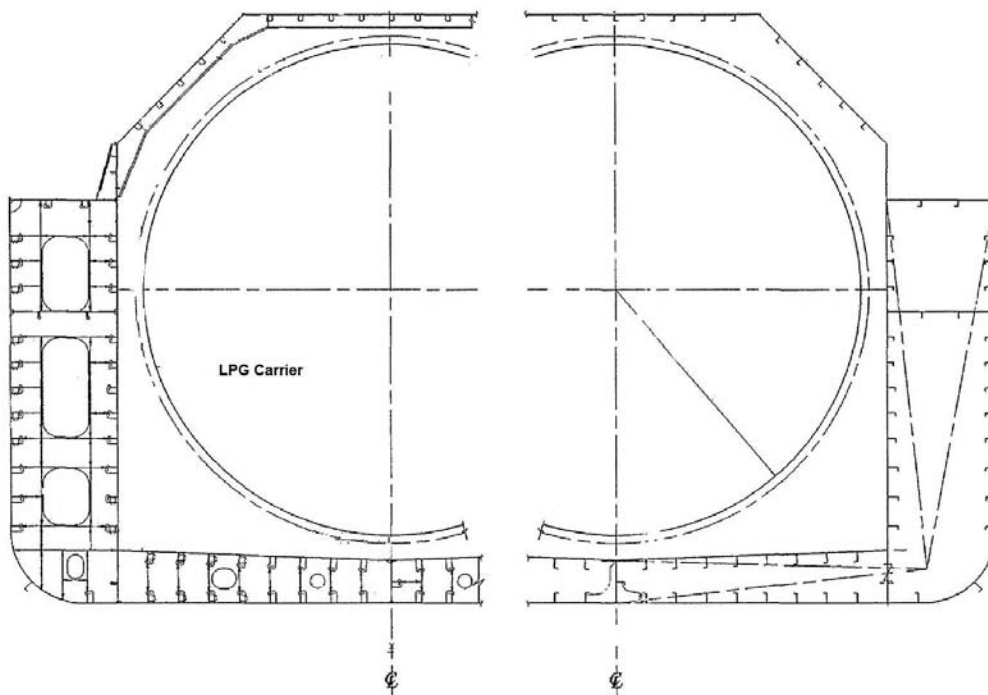
TABLE V

**GUIDANCE FOR ADDITIONAL THICKNESS MEASUREMENTS IN WAY OF
SUBSTANTIAL CORROSION**

Structural member	Extent of Measurement	Pattern of Measurement
Plating	Suspect area and adjacent plates	5 point pattern over 1 square metre
Stiffeners	Suspect area	3 measurements each in line across web and flange

FIGURE 1
TYPICAL MIDSHIP SECTIONS OF LIQUEFIED GAS CARRIERS





BCS-R Z8 Corrosion Protection Coating for Salt Water Ballast Spaces

At the time of new construction, all salt water ballast spaces having boundaries formed by the hull envelope shall have an efficient protective coating, epoxy or equivalent, applied in accordance with the manufacturer's recommendations.



BCS- R Z9 Corrosion Protection Coatings for Cargo Hold Spaces on Bulk Carriers

At the time of new construction, all internal and external surfaces of hatch coamings and hatch covers, and all internal surfaces of the cargo holds, excluding the flat tank top areas and the hopper tanks sloping plating approximately 300 mm below the side shell frame and brackets, are to have an efficient protective coating (epoxy coating or equivalent) applied in accordance with the manufacturer's recommendation. In the selection of coating due consideration is to be given by the owner to intended cargo conditions expected in service.

For existing bulk carriers, where Owners may elect to coat or recoat cargo holds as noted above, consideration may be given to the extent of the close-up and thickness measurement surveys. Prior to the coating of cargo holds of existing vessels, scantlings are to be ascertained in the presence of a Surveyor.

Note: This requirement is applied to new ships for which the request for class is received on or after 1 July 1998.

BCS- R Z10.1 Hull Surveys of Oil Tankers

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- Table I: Minimum requirements to Close-up Surveys at Special Survey of Oil Tankers, Ore/Oil Ships and etc.
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Annex I: Guidelines for Technical Assessment in conjunction with planning for Enhanced Surveys of Oil Tankers Special Survey - Hull

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Annex III: Criteria for Longitudinal Strength of Hull Girder for Oil Tankers

Appendix 1: Calculation criteria of section modulus of midship section of hull girder

Appendix II: Diminution limit of minimum longitudinal strength of ships in service

Appendix III: Sampling method of thickness measurements for longitudinal strength evaluation and repair methods

Annex IVA: Survey Programme

Appendix 1 List of Plans

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Notes:

1. This requirement is applied for surveys commenced on or after 1 July 2020.

1. GENERAL

1.1 Application

1.1.1 The requirements apply to all self-propelled Oil Tankers other than Double Hull Oil Tankers, as defined in 1.1.1 of BCS- R Z 10.4.

1.1.2 The requirements apply to surveys of hull structure and piping systems in way of cargo tanks, pump rooms, cofferdams, pipe tunnels, void spaces within the cargo area and all ballast tanks. The requirements are additional to the classification requirements applicable to the remainder of the ship. Refer to BCS- R Z7.

1.1.3 The requirements contain the minimum extent of examination, thickness measurements and tank testing. The survey is to be extended when Substantial Corrosion and/or structural defects are found and include additional Close-up Survey when necessary.

1.2 Definitions

1.2.1 **Oil Tanker:** An Oil Tanker is a ship which is constructed primarily to carry oil in bulk and includes ship types such as combination carriers (Ore/Oil ships etc.).

1.2.2 **Ballast Tank:** A Ballast Tank is a tank which is used solely for the carriage of salt water ballast.

1.2.2 bis **A Combined Cargo/Ballast Tank** is a tank which is used for the carriage of cargo or ballast water as a routine part of the vessel's operation and will be treated as a Ballast Tank. Cargo tanks in which water ballast might be carried only in exceptional cases per MARPOL I/18(3) are to be treated as cargo tanks.

1.2.3 **Overall Survey:** An 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.

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

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

1.2.6 **Representative Tank:** Representative Tanks are those which are expected to reflect the condition of other tanks of similar type and service and with similar corrosion prevention systems. When selecting Representative Tanks account is to be taken of the service and repair history onboard and identifiable Critical Structural Areas and/or Suspect Areas.

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

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

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

1.2.10 Corrosion Prevention System: A Corrosion Prevention System is normally considered a full hard protective coating.

Hard Protective Coating is usually to be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specifications.

1.2.11 Coating Condition: Coating condition is defined as follows:

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

Reference is made to BCS- G 87 "Guidelines for Coating Maintenance & Repairs for Ballast Tanks and Combined Cargo / Ballast Tanks on Oil Tankers".

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

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

1.2.14 Prompt and Thorough Repair: A Prompt and Thorough Repair is a permanent repair completed at the time of survey to the satisfaction of the Surveyor, therein removing the need for the imposition of any associated condition of classification.

1.3 Repairs

1.3.1 Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Surveyor, **will** affect the vessel's structural, watertight or weathertight integrity, is to be **promptly and thoroughly** (see 1.2.14) repaired. Areas to be considered include:

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

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

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

1.3.3 Where the damage found on structure mentioned in Para. 1.3.1 is isolated and of a localised nature which does not affect the ship's structural integrity, consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weather tight integrity and impose a condition of class in accordance with BCS- PR 35, with a specific time limit.

1.4 Thickness measurements and close-up surveys

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

2. SPECIAL SURVEY¹

2.1 Schedule

2.1.1 Special Surveys are to be carried out at 5 years intervals to renew the Classification Certificate.

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

2.1.3 For surveys completed within 3 months before the expiry date of the Special Survey, the next period of class will start from the expiry date of the Special Survey. For surveys completed more than 3 months before the expiry date of the Special Survey, the period of class will start from the survey completion date. In cases where the vessel has been laid up or has been out of service for a considerable period because of a major repair or modification and the owner elects to only carry out the overdue surveys, the next period of class will start from the expiry date of the special survey. If the owner elects to carry out the next due special survey, the period of class will start from the survey completion date.

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

2.1.5 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

2.2 Scope

2.2.1 General

2.2.1.1 The Special Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to ensure that the hull and related piping, as required in 2.2.1.3, is in a satisfactory condition and is fit for its intended purpose for the new period of class of 5 years to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

2.2.1.2 All cargo tanks, Ballast Tanks, including double bottom tanks, pumprooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing required in 2.4 and 2.5, to ensure that the structural integrity remains effective. The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

¹ Some Societies use the term "Special Periodical Survey" others use the term "Class Renewal Survey" instead of the term "Special Survey".

2.2.1.3 Cargo piping on deck, including Crude Oil Washing (COW) piping, Cargo and Ballast piping within the above tanks and spaces are to be examined and operationally tested to working pressure to attending Surveyor's satisfaction to ensure that tightness and condition remain satisfactory. Special attention is to be given to any ballast piping in cargo tanks and cargo piping in ballast tanks and void spaces, and Surveyors are to be advised on all occasions when this piping, including valves and fittings are open during repair periods and can be examined internally.

2.2.2 Dry Dock Survey

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

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

2.2.3 Tank Protection

2.2.3.1 Where provided, the condition of the corrosion prevention system of cargo tanks is to be examined.

A Ballast Tank is to be examined at subsequent annual intervals where:

- a. a **hard** protective coating has not been applied from the time of construction, or
- b. a soft or semi-hard coating has been applied, or
- c. substantial corrosion is found within the tank, or
- d. the **hard** protective coating is found to be in less than GOOD condition and the **hard** protective coating is not repaired to the satisfaction of the Surveyor.

Thickness measurements are to be carried out as deemed necessary by the surveyor.

2.3 Extent of Overall and Close-up Survey

2.3.1 An Overall Survey of all tanks and spaces is to be carried out at each Special Survey.

2.3.2 The minimum requirements for Close-up Surveys at Special Survey are given in Table I.

2.3.3 The Surveyor may extend the Close-up Survey as deemed necessary taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:

- a) In particular, tanks having structural arrangements or details which have suffered defects in similar tanks or on similar ships according to available information.
- b) In tanks which have structures approved with reduced scantlings due to an approved corrosion control system.

2.3.4 For areas in tanks where hard protective coatings are found to be in a GOOD condition as defined in 1.2.11, the extent of Close-up Surveys according to Table I may be specially considered.

2.4 Extent of Thickness Measurement

2.4.1 The minimum requirements for thickness measurements at Special Survey are given in Table II.

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

2.4.3 The Surveyor may further extend the thickness measurements as deemed necessary.

2.4.4 For areas in tanks where hard protective coating are found to be in a GOOD condition as defined in 1.2.11, the extent of thickness measurements according to Table II may be specially considered.

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

2.4.6 In cases where two or three sections are to be measured, at least one is to include a Ballast Tank within 0.5L amidships.

In case of oil tankers of 130m in length and upwards (as defined in the International Convention on Load Lines in force) and more than 10 years of age, for the evaluation of the ship's longitudinal strength as required in 8.1.1.1, the sampling method of thickness measurements is given in Annex III Appendix 3.

2.5 Extent of Tank Testing

2.5.1 The minimum requirements for ballast tank testing at Special Survey are given in 2.5.3 and Table III.

The minimum requirements for cargo tank testing at Special Survey are given in 2.5.4 and Table III.

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

- a) a tank testing procedure, specifying fill heights, tanks being filled and bulkheads being tested, has been submitted by the owner and reviewed by BCS prior to the testing being carried out;
- b) there is no record of leakage, distortion or substantial corrosion that would affect the structural integrity of the tank;
- c) the tank testing has been satisfactorily carried out within special survey window not more than 3 months prior to the date of the survey on which the overall or close up survey is completed;

-
- d) the satisfactory results of the testing is recorded in the vessel's logbook;
 - e) the internal and external condition of the tanks and associated structure are found satisfactory by the surveyor at the time of the overall and close up survey.

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

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

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

3. ANNUAL SURVEY

3.1 Schedule

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

3.2 Scope

3.2.1 General

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

3.2.2 Examination of the Hull

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

3.2.2.2 Examination of watertight penetrations as far as practicable.

3.2.3 Examination of weather decks

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

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

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

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

3.2.4 Examination of Cargo pump rooms and pipe tunnels if fitted.

3.2.4.1 Examination of all pumproom bulkheads for signs of oil leakage or fractures and, in particular, the sealing arrangements of all penetrations of pumproom bulkheads.

3.2.4.2 Examination of the condition of all piping systems.

3.2.5 Examination of Ballast Tanks

3.2.5.1 Examination of Ballast Tanks where required as a consequence of the results of the Special Survey (see 2.2.3) and Intermediate Survey (see 4.2.2.1 and 4.2.2.2) is to be carried out. When considered necessary by the surveyor, or when extensive corrosion exists, thickness measurements are to be carried out and if the results of these thickness measurements indicate that Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with Table IV. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

4. INTERMEDIATE SURVEY

4.1 Schedule

4.1.1 The Intermediate Survey is to be held at or between either the 2nd or 3rd Annual Survey.

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

4.1.3 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

4.2 Scope

4.2.1 General

4.2.1.1 The survey extent is dependent on the age of the vessel as specified in 4.2.2 to 4.2.4.

4.2.1.2 For weather decks, an examination as far as applicable of cargo, crude oil washing, bunker, ballast, steam and vent piping systems as well as vent masts and headers is to be carried out. If upon examination there is any doubt as to the condition of the piping, the piping may be required to be pressure tested, thickness measured or both.

4.2.2 Oil Tankers 5 – 10 Years of Age, the following is to apply:

4.2.2.1 All Ballast Tanks are to be examined. When considered necessary by the surveyor, thickness measurement and testing are to be carried out to ensure that the structural integrity remains effective.

4.2.2.2 A Ballast Tank is to be examined at subsequent annual intervals where:

- a. a **hard** protective coating has not been applied from the time of construction, or
- b. a soft or semi-hard coating has been applied, or
- c. substantial corrosion is found within the tank, or
- d. the **hard** protective coating is found to be in less than GOOD condition and the **hard** protective coating is not repaired to the satisfaction of the Surveyor.

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

4.2.3 Oil Tankers 10 - 15 years of Age, the following is to apply:

4.2.3.1 The requirements of the Intermediate Survey are to be to the same extent as the previous Special Survey as required in 2 and 5.1. However, pressure testing of cargo and ballast tanks **and the requirements for longitudinal strength evaluation of Hull Girder as required in 8.1.1.1** are not required unless deemed necessary by the attending Surveyor.

4.2.3.2 In application of 4.2.3.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.4.

4.2.3.3 In application of 4.2.3.1, an under water survey may be considered in lieu of the requirements of 2.2.2.

4.2.4 Oil Tankers over 15 years of Age, the following is to apply:

4.2.4.1 The requirements of the Intermediate Survey are to be to the same extent as the previous Special Survey as required in 2 and 5.1. However, pressure testing of cargo and ballast tanks **and the requirements for longitudinal strength evaluation of Hull Girder as required in 8.1.1.1** are not required unless deemed necessary by the attending Surveyor.

4.2.4.2 In application of 4.2.4.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.4.

4.2.4.3 In application of 4.2.4.1, a survey in dry dock is to be part of the intermediate survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo tanks and water ballast tanks are to be carried out in accordance with the applicable requirements for intermediate surveys, if not already performed.

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

5. PREPARATIONS FOR SURVEY

5.1 Survey Programme

5.1.1 The Owner in co-operation with BCS is to work out a specific Survey Programme prior to the commencement of any part of:

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

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

5.1.1.1 Prior to the development of the survey programme, the survey planning questionnaire is to be completed by the owner based on the information set out in Annex IVB, and forwarded to BCS.

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

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

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

-
- .13 any other information that will help identify suspect areas and critical structural areas

5.1.3 The submitted survey programme is to account for and comply, as a minimum, with the requirements of Tables I, II and III 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 of cargo and ballast tanks (scantling drawings), including information regarding use of high tensile steels (HTS);
- .3 arrangement of tanks;
- .4 list of tanks with information on their use, extent of coatings and corrosion protection systems;
- .5 conditions for survey (e.g., information regarding tank cleaning, gas freeing, ventilation, lighting, etc.);
- .6 provisions and methods for access to structures;
- .7 equipment for surveys;
- .8 identification of tanks and areas for close-up survey (see 2.3);
- .9 identification of areas and sections for thickness measurement (see 2.4);
- .10 identification of tanks for tank testing (see 2.5);
- .11 identification of the thickness measurement firm;
- .12 damage experience related to the ship in question; and
- .13 critical structural areas and suspect areas, where relevant.

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

5.1.5 Use may also be made of the Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Oil Tankers Special Survey - Hull, contained in Annex I. These guidelines are a recommended tool which may be invoked at the discretion of BCS, 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 is to 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 are to be agreed between the owner and BCS and are to be in accordance with BCS- PR 37.

5.2.1.2 Details of the means of access are to 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 is not to proceed.

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

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

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

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

5.3 Access to Structures

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

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

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

5.4 Equipment for Survey

5.4.1 Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required.

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

- radiographic equipment

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

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

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

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

5.5 Rescue and emergency response equipment

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

5.6 Survey at Sea or at Anchorage

5.6.1 Survey at sea or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel onboard. Necessary precautions and procedures for carrying out the survey are to be in accordance with 5.1, 5.2, 5.3 and 5.4.

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

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

5.6.4 When rafts or boats will be used for close-up survey the following conditions are to be observed:

- .1 only rough duty, inflatable rafts or boats, having satisfactory residual buoyancy and stability even if one chamber is ruptured, are to be used;
- .2 the boat or raft is to be tethered to the access ladder and an additional person is to be stationed down the access ladder with a clear view of the boat or raft;
- .3 appropriate lifejackets are to be available for all participants;
- .4 the surface of water in the tank is to be calm (under all foreseeable conditions the expected rise of water within the tank is to not exceed 0.25 m) and the water level stationary. On no account is the level of the water to be rising while the boat or raft is in use;
- .5 the tank or space must contain clean ballast water only. Even a thin sheen of oil on the water is not acceptable;

- .6 at no time is the water level to be allowed to be within 1 m of the deepest under deck web face flat so that the survey team is not isolated from a direct escape route to the tank hatch. Filling to levels above the deck transverses is only to be contemplated if a deck access manhole is fitted and open in the bay being examined, so that an escape route for the survey party is available at all times. Other effective means of escape to the deck may be considered;
- .7 if the tanks (or spaces) are connected by a common venting system, or Inert Gas system, the tank in which the boat or raft is to be used is to be isolated to prevent a transfer of gas from other tanks (or spaces).

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

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

- .1 when the coating of the under deck structure is in GOOD condition and there is no evidence of wastage; or
- .2 if a permanent means of access is provided in each bay to allow safe entry and exit.

This means:

- i. access direct from the deck via a vertical ladder and a small platform fitted approximately 2 m below the deck in each bay; or
- ii. access to deck from a longitudinal permanent platform having ladders to deck in each end of the tank. The platform shall, for the full length of the tank, be arranged in level with, or above, the maximum water level needed for rafting of under deck structure. For this purpose, the ullage corresponding to the maximum water level is to be assumed not more than 3m from the deck plate measured at the midspan of deck transverses and in the middle length of the tank (See Figure 1).

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

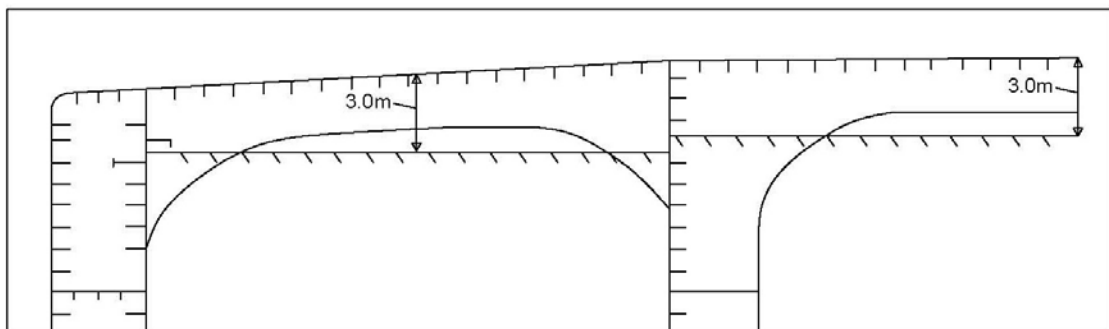


Figure 1 Maximum water level in a tank

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

Reference is made to BCS- G 39 - Guidelines for the use of Boats or Rafts for Close- up surveys.

5.7 Survey Planning Meeting

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

5.7.2 Prior to commencement of any part of the renewal and intermediate survey, a survey planning meeting is to be held between the attending surveyor(s), the owner's representative in attendance, the thickness measurement firm 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. See also 7.1.2.

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

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

6. DOCUMENTATION ON BOARD

6.1 General

6.1.1 The owner is to obtain, supply and maintain on board documentation as specified in 6.2 and 6.3, which is to be readily available for the Surveyor.

6.1.2 The documentation is to be kept on board for the life time of the ship.

6.2 Survey Report File

6.2.1 A Survey Report File is to be a part of the documentation on board consisting of

- Reports of structural surveys
- Executive Hull Summary
- Thickness measurement reports

6.2.2 The Survey Report File is to be available also in the Owner's and BCS's management offices.

6.3 Supporting Documents

6.3.1 The following additional documentation is to be available onboard:

- Survey Programme as required by 5.1 until such time as the Special Survey or Intermediate Survey, as applicable, has been completed.
- Main structural plans of cargo and ballast tanks
- Previous repair history
- Cargo and ballast history
- Extent of use of inert gas plant and tank cleaning procedures
- Inspections by ship's personnel with reference to
 - structural deterioration in general
 - leakages in bulkheads and piping
 - condition of corrosion prevention system, if any
- A guidance for reporting is shown in Table V.
- Any other information that will help identify Critical Structural Areas and/or Suspect Areas requiring inspection.

6.4 Review of Documentation On Board

6.4.1 Prior to survey, the Surveyor is to examine the completeness of the documentation onboard, 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 BCS itself, are to be witnessed by a Surveyor of BCS. The Surveyor is to be on board to the extent necessary to control the process.

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

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

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

7.2 Certification of Thickness Measurement Firm

7.2.1 The thickness measurements are to be carried out by a qualified firm certified by BCS according to principles stated in Table VII.

7.3 Reporting

7.3.1 A thickness measurement report is to be prepared. The report is to give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report is to give the date when the measurements were carried out, type of measurement equipment, names of personnel and their qualifications and has to be signed by the operator. The thickness measurement report is to follow the principles as specified in the Recommended Procedures for Thickness Measurements for Oil Tankers, Ore/Oil Ships and etc., contained in Annex II.

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

8. REPORTING AND EVALUATION OF SURVEY

8.1 Evaluation of Survey Report

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

8.1.1.1 In case of oil tankers of 130 m in length and upwards (as defined in the International Convention on Load Lines in force), the ship's longitudinal strength is to be evaluated by using the thickness of structural members measured, renewed and reinforced, as appropriate, during the **special survey** carried out after the ship reached 10 years of age in accordance with the criteria for longitudinal strength of the ship's hull girder for oil tankers specified in **Annex III**.

8.1.1.2 The final result of evaluation of the ship's longitudinal strength required in 8.1.1.1, after renewal or reinforcement work of structural members, if carried out as a result of initial evaluation, is to be reported as a part of the **Executive Hull Summary**.

8.2 Reporting

8.2.1 Principles for survey reporting are shown in Table VIII.

8.2.2 When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items examined and / or tested (pressure testing, thickness measurements etc.) and an indication of whether the item has been credited, are to be made available to the next attending Surveyor(s), prior to continuing or completing the survey.

8.2.3 An Executive Hull Summary of the survey and results is to be issued to the Owner as shown in Table IX and placed on board the vessel for reference at future surveys. The Executive Hull Summary is to be endorsed by BCS's head office or regional managerial office.

TABLE I

**Table of Minimum Requirements to Close-up Surveys
at Special Survey of Oil Tankers, Ore/Oil Ships and etc.**

Special Survey No.1 age ≤ 5	Special Survey No.2 5 < age ≤ 10	Special Survey No.3 10 < age ≤ 15	Special Survey No.4 and Subsequent age > 15
A) ONE WEB FRAME RING - in a ballast wing tank, if any, or a cargo wing tank used primarily for water ballast	A) ALL WEB FRAME RINGS - in a ballast wing tank, if any, or a cargo wing tank, used primarily for water ballast	A) ALL WEB FRAME RINGS - in all ballast tanks	As special survey No.3
B) ONE DECK TRANSVERSE - in a cargo oil tank	B) ONE DECK TRANSVERSE - in each of the remaining ballast tanks, if any	A) ALL WEB FRAME RINGS - in a cargo wing tank	Additional transverses included as deemed necessary by BCS
D) ONE TRANSVERSE BULKHEAD - in a ballast tank	B) ONE DECK TRANSVERSE - in a cargo wing tank	A) A minimum of 30% of all web frame rings in each remaining cargo wing tank (see Note 1)	
D) ONE TRANSVERSE BULKHEAD - in a cargo oil wing tank	B) ONE DECK TRANSVERSE - in two cargo centre tanks	C) ALL TRANSVERSE BULKHEADS - in all cargo and ballast tanks	
D) ONE TRANSVERSE BULKHEAD - in a cargo oil centre tank	C) BOTH TRANSVERSE BULKHEADS - in a wing ballast tank, if any, or a cargo wing tank used primarily for water ballast	E) A minimum of 30% of deck and bottom transverses including adjacent structural members in each cargo centre tank	
	D) ONE TRANSVERSE BULKHEAD - in each remaining ballast tank	F) As considered necessary by the surveyor	
	D) ONE TRANSVERSE BULKHEAD - in a cargo oil wing tank		
	D) ONE TRANSVERSE BULKHEAD - in two cargo centre tanks		

- A) Complete transverse web frame ring including adjacent structural members
- B) Deck transverse including adjacent deck structural members
- C) Transverse bulkhead complete – including girder system and adjacent structural members
- D) Transverse bulkhead lower part – including girder system and adjacent structural members
- E) Deck and bottom transverse including adjacent structural members
- F) Additional complete transverse web frame ring

See sketches in Sheet 15.

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

TABLE II

**Minimum Requirements to Thickness Measurements at Special Survey
of Oil Tankers, Ore/Oil Ships and etc.**

Special Survey No.1 age ≤ 5	Special Survey No.2 5 < age ≤ 10	Special Survey No.3 10 < age ≤ 15	Special Survey No.4 and Subsequent age > 15
1. Suspect areas	1. Suspect areas	1. Suspect areas	1. Suspect areas
2. One section of deck plating for the full beam of the ship within the cargo area (in way of a ballast tank, if any, or a cargo tank used primarily for water ballast)	2. Within the cargo area: .1 Each deck plate .2 One transverse section	2. Within the cargo area: .1 Each deck plate .2 Two transverse sections ⁽¹⁾ .3 All wind and water strakes	2. Within the cargo area: .1 Each deck plate .2 Three transverse sections ⁽¹⁾ .3 Each bottom plate
	3. Selected wind and water strakes outside the cargo area	3. Selected wind and water strakes outside the cargo area	3. All wind and water strakes, full length
4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I.	4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I.	4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I.	4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I.
(1): at least one section is to include a ballast tank within 0.5L amidships.			

TABLE III

**Minimum Requirements to Tank Testing at Special Survey
of Oil Tankers, Ore/Oil Ships and etc.**

Special Survey No.1 age ≤ 5	Special Survey No.2 and Subsequent age > 5
All ballast tank boundaries	All ballast tank boundaries
Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, pump-rooms or cofferdams	All cargo tank bulkheads

TABLE IV / Sheet 1

**Requirements for extent of thickness measurement at those areas
of substantial corrosion.**

**Special Survey of Oil Tankers, Ore/Oil Ships and etc.
within the cargo tank length.**

BOTTOM STRUCTURE

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1. Bottom plating	Minimum of 3 bays across tank aft bay Measurements around and under all bell mouths	5 point pattern for each panel between longitudinals and webs
2. Bottom Longitudinals	Minimum of 3 longitudinals in each bay where bottom plating measured	3 measurements in line across flange and 3 measurements on vertically web
3. Bottom girders and brackets	At fore and aft transverse bulkhead bracket toes and in centre of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across face flat. 5 point pattern on girder/bhd brackets.
4. Bottom transverse webs	3 webs in bays where bottom plating measured, with measurements at both ends and middle	5 point pattern over 2 square metre area. Single measurements on face flat.
5. Panel stiffening	Where provided	Single measurements

TABLE IV / Sheet 2

**Requirements for extent of thickness measurement at those areas
of substantial corrosion.**

**Special Survey of Oil Tankers, Ore/Oil Ships and etc.
within the cargo tank length.**

DECK STRUCTURE

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1. Deck plating	Two bands across tank	Minimum of three measurements per plate per band
2. Deck Longitudinals	Minimum of 3 longitudinals in each of two bays	3 measurements in line vertically on webs, and 2 measurements on flange (if fitted)
3. Deck girders and brackets	At fore and aft transverse bulkhead, bracket toes and in centre of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across face flat. 5 point pattern on girder/bhd brackets.
4. Deck transverse webs	Minimum of two webs with measurements at middle and both ends of span	5 point pattern over about 2 square metre areas. Single measurements on face flat.
5. Panel stiffening	Where provided	Single measurements

TABLE IV / Sheet 3

**Requirements for extent of thickness measurement at those areas
of substantial corrosion.**

**Special Survey of Oil Tankers, Ore/Oil Ships etc.
within the cargo tank length.**

SIDE SHELL AND LONGITUDINAL BULKHEADS

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

TABLE IV / Sheet 4

**Requirements for extent of thickness measurement at those areas
of substantial corrosion.**

**Special Survey of Oil Tankers, Ore/Oil Ships and etc.
within the cargo tank length.**

TRANSVERSE BULKHEADS AND SWASH BULKHEADS

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1. Deckhead and bottom strakes, and strakes in way of stringer platforms	Plating between pair of stiffeners at three locations - approx. 1/4, 1/2 and 3/4 width of tank	5 points pattern between stiffeners over 1 metre length
2. All other strakes	Plating between pair of stiffeners at middle location	Single measurement
3. Strakes in corrugated bulkheads	Plating for each change of scantling at centre of panel and at flange or fabricated connection	5 point pattern over about 1 square metre of plating
4. Stiffeners	Minimum of three typical stiffeners	For web, 5 point pattern over span between bracket connections (2 measurements across web at each bracket connection, and one at centre of span). For flange, single measurements at each bracket toe and at centre of span
5. Brackets	Minimum of three at top, middle and bottom of tank	5 point pattern over areas of bracket
6. Deep webs and girders	Measurements at toe of bracket and at centre of span	For web, 5 point pattern over about 1 square metre. 3 measurements across face flat.
7. Stringer platforms	All stringers with measurements at both ends and middle	5 point pattern over 1 square metre of area plus single measurements near bracket toes and on face flats

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TABLE VI

Note: Table VI is superseded by Annex I: Guidelines for Technical Assessment in conjunction with planning for Enhanced Surveys of Oil Tankers Special Survey - Hull.

TABLE VII

PROCEDURES FOR THE CERTIFICATION OF FIRMS ENGAGED IN THICKNESS MEASUREMENT OF HULL STRUCTURE

1. Application

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

2. Procedures for Certification

(1) Submission of Documents:

Following documents are to be submitted to BCS for approval:

- a) Outline of firms, e.g. organization and management structure.
- b) Experience of the firms on thickness measurement inter alia of hull structures of the vessels.
- c) Technicians' careers, i.e. experience of technicians as thickness measurement operators, technical knowledge of hull structure etc. Operators, are to be qualified according to a recognized industrial NDT Standard.
- d) Equipment used for thickness measurement such as ultra-sonic testing machines and its maintenance/calibration procedures.
- e) A guide for thickness measurement operators.
- f) Training programmes of technicians for thickness measurement.
- g) Measurement record format in accordance with the Recommended Procedures for Thickness Measurements of Oil Tankers, Ore/Oil Ships and etc., contained in Annex II.

(2) Auditing of the firms:

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

(3) Certification is conditional on an onboard demonstration at thickness measurements as well as satisfactory reporting.

3. Certification

(1) Upon satisfactory results of both the audit of the firm in 2(2) and the demonstration tests in 2(3) above, BCS will issue a Certificate of Approval as well as a notice to the effect that the thickness measurement operation system of the firm has been certified by BCS.

(2) Renewal/endorsement of the Certificate is to be made at intervals not exceeding 3 years by verification that original conditions are maintained.

4. Information of any alteration to the Certified Thickness Measurement Operation System

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

5. Cancellation of Approval

Approval may be cancelled in the following cases:

- (1) Where the measurements were improperly carried out or the results were improperly reported.
- (2) Where the BCS's surveyor found any deficiencies in the approved thickness measurement operation systems of the firm.
- (3) Where the firm failed to inform of any alteration in 4 above to BCS.

TABLE VIII

SURVEY REPORTING PRINCIPLES

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

1. General

1.1 A survey report is to be generated in the following cases:

- In connection with commencement, continuation and / or completion of periodical hull surveys, i.e. annual, intermediate and special surveys, as relevant
- When structural damages / defects have been found
- When repairs, renewals or modifications have been carried out
- When condition of class has been imposed or deleted

1.2 The purpose of reporting is to provide:

- Evidence that prescribed surveys have been carried out in accordance with applicable classification rules
- Documentation of surveys carried out with findings, repairs carried out and condition of class imposed or deleted
- Survey records, including actions taken, which shall form an auditable documentary trail. Survey reports are to be kept in the survey report file required to be on board
- Information for planning of future surveys
- Information which may be used as input for maintenance of classification rules and instructions

1.3 When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items surveyed, relevant findings and an indication of whether the item has been credited, is to be made available to the next attending surveyor, prior to continuing or completing the survey. Thickness measurement and tank testing carried out is also to be listed for the next surveyor.

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 tank, where a close-up survey has been carried out, together with information of the means of access used.

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

Note: As a minimum, the identification of location of close-up survey and thickness measurement is to include a confirmation with description of individual structural members corresponding to the extent of requirements stipulated in Z10.1 based on type of periodical survey and the ship's age.

Where only partial survey is required, i.e. one web frame ring / one deck transverse, the identification is to include location within each tank by reference to frame numbers.

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

2.5 Identification of tanks subject to tank testing.

2.6 Identification of cargo piping on deck, including crude oil washing (COW) piping, and cargo and ballast piping within cargo and ballast tanks, pump rooms, pipe tunnels and void spaces, where:

- Examination including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been carried out
- 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).

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

- Identification of findings, such as:
 - Corrosion with description of location, type and extent
 - Areas with substantial corrosion
 - Cracks / fractures with description of location and extent
 - Buckling with description of location and extent
 - Indents with description of location and extent
- Identification of compartments where no structural damages / defects are found

The report may be supplemented by sketches / photos.

3.3 Thickness measurement report is to be verified and signed by the surveyor controlling the measurements on board.

3.4 Evaluation result of longitudinal strength of the hull girder of oil tankers of 130 m in length and upwards and over 10 years of age. The following data is to be included, as relevant:

- Measured and as-built transverse sectional areas of deck and bottom flanges
- Diminution of transverse sectional areas of deck and bottom flanges
- Details of renewals or reinforcements carried out, as relevant (as per 4.2)

4. Actions taken with respect to findings

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

4.2 Repairs carried out are to be reported with identification of:

- Compartment
- Structural member
- Repair method (i.e. renewal or modification) including:
 - Steel grades and scantlings (if different from the original)
 - Sketches/photos, as appropriate

-
- Repair extent
 - NDT / Tests

4.3 For repairs not completed at the time of survey, condition of class is to be imposed with a specific time limit for the repairs. In order to provide correct and proper information to the surveyor attending for survey of the repairs, condition of class is to be sufficiently detailed with identification of each item to be repaired. For identification of extensive repairs, reference may be given to the survey report.

TABLE IX (i)

**IACS UNIFIED REQUIREMENTS FOR ENHANCED SURVEYS
EXECUTIVE HULL SUMMARY**

Issued upon Completion of Special Survey

GENERAL PARTICULARS

SHIP'S NAME:

CLASS IDENTIFY NUMBER:

IMO IDENTIFY NUMBER:

PORT OF REGISTRY:

NATIONAL FLAG:

DEADWEIGHT (M. TONNES):

GROSS TONNAGE:

NATIONAL:

ITC (69):

DATE OF BUILD:

CLASSIFICATION NOTATION:

DATE OF MAJOR CONVERSION:

TYPE OF CONVERSION:

-
- a) The survey reports and documents listed below have been reviewed by the undersigned and found to be satisfactory
- b) A summary of the survey is attached herewith on sheet 2
- c) The hull special survey has been completed in accordance with the Regulations on [date]

Executive Summary Report completed by:	Name Signature	Title
OFFICE	DATE	
Executive Summary Report verified by:	Name Signature	Title
OFFICE	DATE	

Attached reports and documents:

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)

TABLE IX (ii)

EXECUTIVE HULL SUMMARY

- | | | | |
|----|---|---------------------------|--|
| A) | General Particulars: | - | Ref. Table IX (i) |
| B) | Report Review: | - | Where and how survey was done |
| C) | Close-up Survey: | - | Extent (Which tanks) |
| D) | Cargo & Ballast Piping System: | - | Examined |
| | | - | Operationally tested |
| E) | Thickness measurements: | - | Reference to Thickness Measurement report |
| | | - | Summary of where measured |
| | | - | Separate form indicating the tanks/areas with Substantial Corrosion, and corresponding |
| | | | * Thickness diminution |
| | | | * Corrosion pattern |
| F) | Tank Protection: | Separate form indicating: | |
| | | - | Location of coating |
| | | - | Condition of coating (if applicable) |
| G) | Repairs: | - | Identification of tanks/areas |
| H) | Condition of Class/Recommendations: | | |
| I) | Memoranda: | - | Acceptable defects |
| | | - | Any points of attention for future surveys, e.g. for Suspect Areas |
| | | - | Extended Annual/Intermediate survey due to coating breakdown |
| J) | Evaluation results of the ship's longitudinal strength (for oil tankers of 130 m in length and upwards and of over 10 years of age) | | |
| K) | Conclusion: | - | Statement on evaluation/verification of survey report |

TABLE IX (iii)

EXTRACT OF THICKNESS MEASUREMENTS

Reference is made to the thickness measurements report:

1) Positions of substantially corroded Tanks/Areas or Areas with deep pitting	Thickness diminution [%]	2) Corrosion pattern	Remarks: e.g. Ref. attached sketches

Remarks

- 1) Substantial corrosion, i.e. 75 – 100% of acceptable margins wasted
- 2) P = Pitting
C = Corrosion in General
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 1/3 or more of actual plate thickness is to be noted.

TABLE IX (iv)
TANK PROTECTION

1) Tank Nos.	2) Tank protection	3) Coating condition	Remarks

Remarks:

1) All segregated ballast tanks and combined cargo/ballast tanks to be listed.

2) C = Coating NP = No Protection

3) Coating condition according to the following standard

GOOD condition with only minor spot rusting.

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

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

If coating condition **less than "GOOD"** is given, extended annual surveys are to be introduced. This is to be noted in part I) of the Executive Hull Summary.

TABLE IX (v)

**Evaluation result of longitudinal strength of the hull girder of oil tankers of
130 m in length and upwards and of over 10 years of age
(Of sections 1, 2 and 3 below, only one applicable section is to be completed)**

1 This section applies to ships regardless of the date of construction: Transverse sectional areas of deck flange (deck plating and deck longitudinals) and bottom flange (bottom shell plating and bottom longitudinals) of the ship's hull girder have been calculated by using the thickness measured, renewed or reinforced, as appropriate, during the **special survey** most recently conducted after the ship reached 10 years of age, and found that the diminution of the transverse sectional area does not exceed 10% of the as-built area, as shown in the following table:

Table 1		Transverse sectional area of hull girder flange		
		Measured	As-built	Diminution
Transverse Section 1	Deck flange	cm ²	cm ²	cm ² (%)
	Bottom flange	cm ²	cm ²	cm ² (%)
Transverse Section 2	Deck flange	cm ²	cm ²	cm ² (%)
	Bottom flange	cm ²	cm ²	cm ² (%)
Transverse Section 3	Deck flange	cm ²	cm ²	cm ² (%)
	Bottom flange	cm ²	cm ²	cm ² (%)

2 This section applies to ships constructed on or after 1 July 2002: Section moduli of transverse section of the ship's hull girder have been calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the **special survey** most recently conducted after the ship reached 10 years of age in accordance with the provisions of paragraph 2.2.1.1 of Annex III, and are found to be within their diminution limits determined by BCS*, as shown in the following table:

Table 2		Transverse section modulus of hull girder		
		Z _{act} (cm ³) *1	Z _{req} (cm ³) *2	Remarks
Transverse Section 1	Upper deck			
	Bottom			
Transverse Section 2	Upper deck			
	Bottom			
Transverse Section 3	Upper deck			
	Bottom			

* The actual transverse section modulus of the hull girder of oil tankers calculated under paragraph 2.2.1.1 of Annex III to BCS- R Z10.1 is not to be less than 90% of the required section modulus for new buildings specified in BCS- R S7* or S11, whichever is the greater.

* C = 1.0 c_n is to be used for the purpose of this calculation.

Notes

- *1 Z_{act} means the actual section moduli of the transverse section of the ship's hull girder calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the **special survey**, in accordance with the provisions of paragraph 2.2.1.1 of Annex III.
- *2 Z_{req} means diminution limit of the longitudinal bending strength of ships, as calculated in accordance with the provisions of paragraph 2.2.1.1 of Annex III.

The calculation sheets for Z_{act} are to be attached to this report.

3 This section applies to ships constructed before 1 July 2002: Section moduli of transverse section of the ship's hull girder have been calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the **special survey** most recently conducted after the ship reached 10 years of age in accordance with the provisions of paragraph 2.2.1.2 of Annex III, and found to meet the criteria required by BCS and that Z_{act} is not less than Z_{mc} (defined in *2 below) as specified in appendix 2 to Annex III, as shown in the following table:

Describe the criteria for acceptance of the minimum section moduli of the ship's hull girder for ships in service required by BCS.

Table 3		Transverse section modulus of hull girder		
		$Z_{act} (cm^3)$ *1	$Z_{mc} (cm^3)$ *2	Remarks
Transverse Section 1	Upper deck			
	Bottom			
Transverse Section 2	Upper deck			
	Bottom			
Transverse Section 3	Upper deck			
	Bottom			

Notes:

- *1 As defined in note *1 of Table 2.
- *2 Z_{mc} means the diminution limit of minimum section modulus calculated in accordance with provisions of paragraph 2.2.1.2 of Annex III.

ANNEX I

GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH PLANNING FOR ENHANCED SURVEYS OF OIL TANKERS SPECIAL SURVEY - HULL

Contents:

1. INTRODUCTION
2. PURPOSE AND PRINCIPLES
 - 2.1 Purpose
 - 2.2 Minimum Requirements
 - 2.3 Timing
 - 2.4 Aspects to be Considered
3. TECHNICAL ASSESSMENT
 - 3.1 General
 - 3.2 Methods
 - 3.2.1 Design Details
 - 3.2.2 Corrosion
 - 3.2.3 Locations for Close-up Survey and Thickness Measurement

REFERENCES

1. BCS- R Z10.1, "Hull Surveys of Oil Tankers."
2. TSCF, "Guidance Manual for the Inspection and Condition Assessment of Tanker Structures, 1986."
3. TSCF, "Condition Evaluation and Maintenance of Tanker Structures, 1992."

1. INTRODUCTION

These guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of enhanced special surveys of oil tankers. As indicated in section 5.1.5 of BCS- R Z10.1, "Hull Surveys of Oil Tankers," (Ref. 1), the guidelines are a recommended tool which may be invoked at the discretion of BCS, 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 and tanks for thickness measurement, close-up survey and tank testing.

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

2.2 Minimum Requirements

However, these guidelines may not be used to reduce the requirements pertaining to thickness measurement, close-up survey and tank testing contained in Tables I, II and III, respectively, of BCS- R Z10.1; 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 are to be worked out by the Owner or operator in cooperation with BCS well in advance of the commencement of the Special Survey, i.e., prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

2.4 Aspects to be Considered

Technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of tanks and areas for survey:

- * Design features such as stress levels on various structural elements, design details and extent of use of high tensile steel.
- * Former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available.
- * Information with respect to types of cargo carried, use of different tanks for cargo/ballast, protection of tanks and condition of coating, if any.

Technical assessments of the relative risks of susceptibility to damage or deterioration of various structural elements and areas are to be judged and decided on the basis of recognised principles and practices, such as may be found in publications of the Tanker Structure Cooperative Forum (TSCF), (Refs. 2 and 3).

3. TECHNICAL ASSESSMENT

3.1 General

There are three basic types of possible failure which may be the subject of technical assessment in connection with planning of surveys; corrosion, cracks and buckling. Contact damages are not normally covered by the survey plan since indents are usually noted in memoranda and assumed to be dealt with as a normal routine by Surveyors.

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

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

The design is to be considered with respect to structural details which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue.

Corrosion is related to the ageing process, and is closely connected with the quality of corrosion protection at newbuilding, and subsequent maintenance during the service life. Corrosion may also lead to cracking and/or buckling.

3.2 Methods

3.2.1 Design Details

Damage experience related to the ship in question and similar ships, where available, is the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings is to be included.

Typical damage experience to be considered will consist of:

- Number, extent, location and frequency of cracks;
- Location of buckles.

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

In addition, general experience is to be utilized. For example, reference should be made to TSCF's "Guidance Manual for the Inspection and Condition Assessment of Tanker Structures," (Ref. 2), which contains a catalogue of typical damages and proposed repair methods for various tanker structural details.

Such figures are to be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage. An example is shown in Figure 2.

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

The use of high tensile steel (HTS) is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favourable, e.g. side structures.

In this respect, stress calculations of typical and important components and details, in accordance with the latest Rules or other relevant methods, may prove useful and are to be considered.

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

3.2.2 Corrosion

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

- Usage of Tanks and Spaces
- Condition of Coatings
- Cleaning Procedures
- Previous Corrosion Damage
- Ballast use and time for Cargo Tanks
- Corrosion Risk Scheme (See Ref. 3, Table 3.1)
- Location of Heated Tanks

Ref. 3 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

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

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

3.2.3 Locations for Close-up Survey and Thickness Measurement

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

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

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

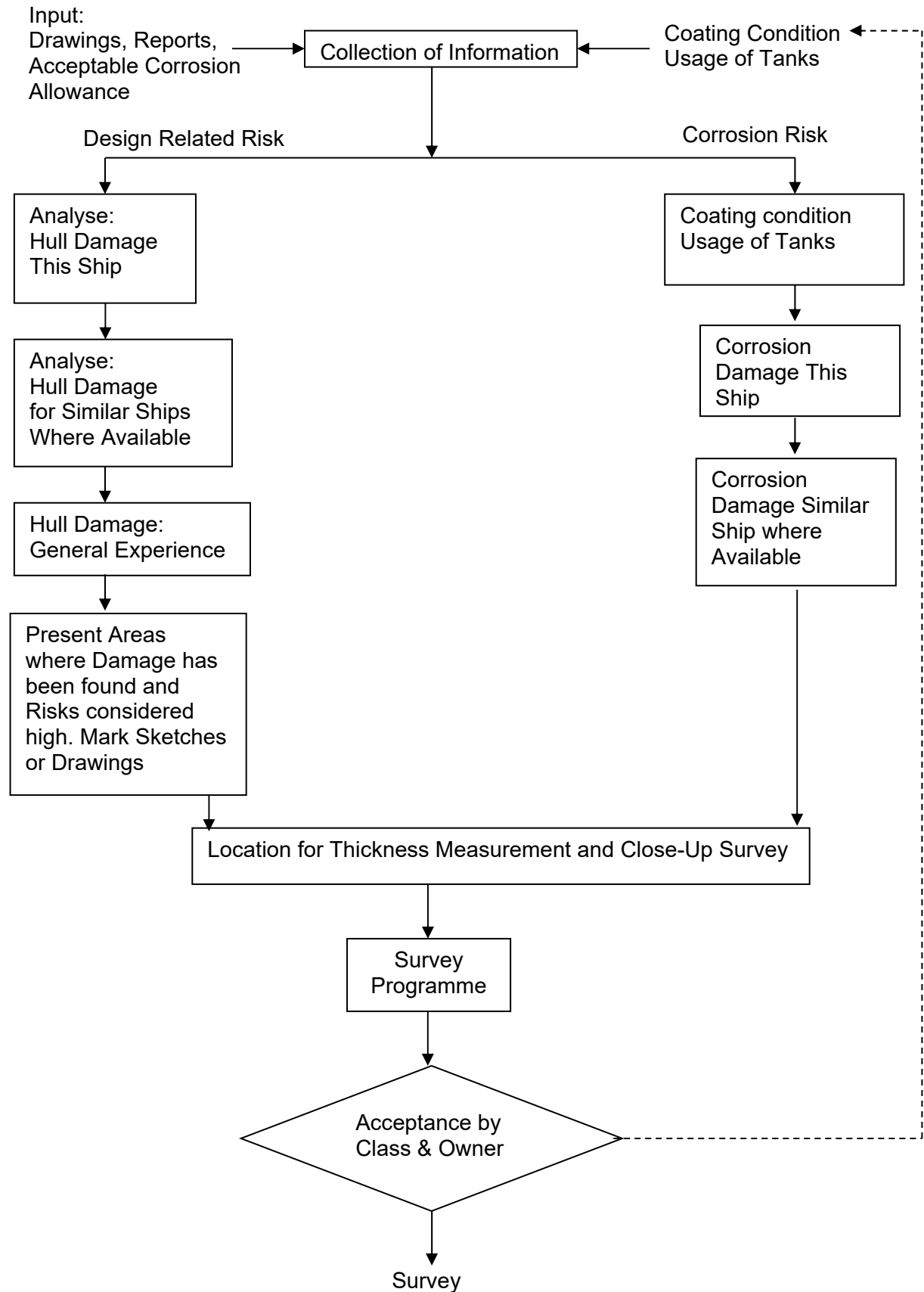


Figure 1: Technical Assessment and the Survey Planning Process

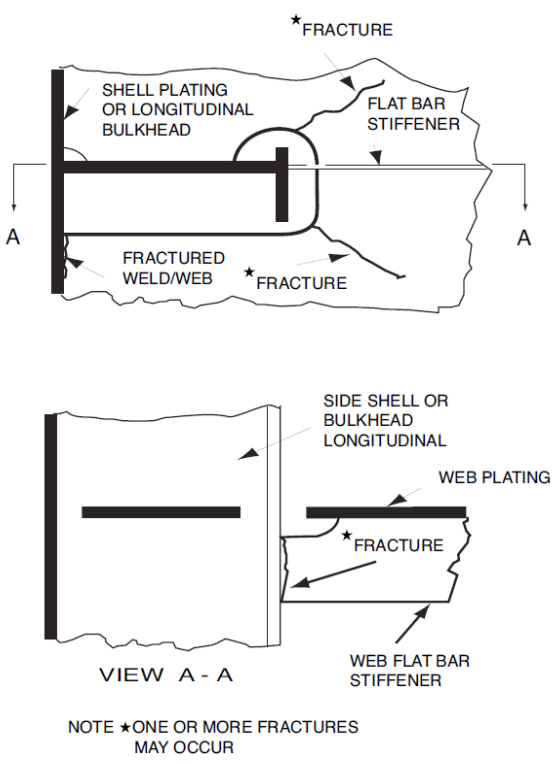
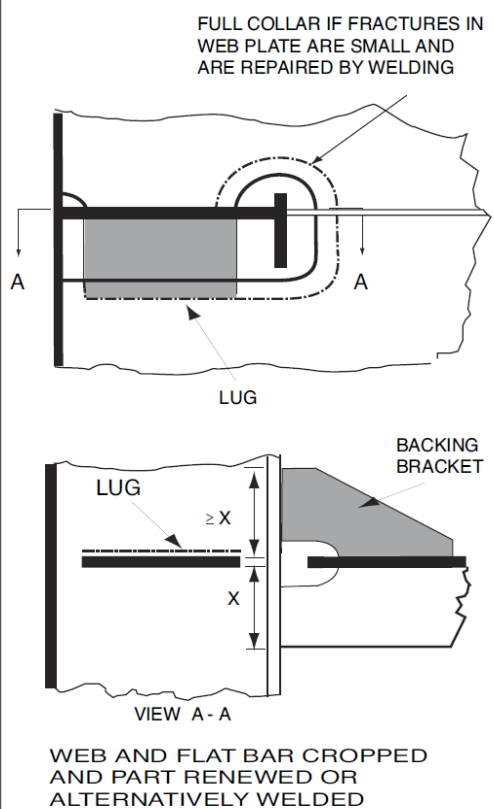
LOCATION: Connection of longitudinals to transverse webs		
EXAMPLE No. 1 : Web and flat bar fractures at cut-outs for longitudinal stiffener connections		
TYPICAL DAMAGE		PROPOSED REPAIR
		
FACTORS CONTRIBUTING TO DAMAGE <ol style="list-style-type: none"> 1. Asymmetrical connection of flat bar stiffener resulting in high peak stresses at the heel of the stiffener under fatigue loading. 2. Insufficient area of connection of longitudinal to web plate. 3. Defective weld at return around the plate thickness. 4. High localised corrosion at areas of stress concentration such as flat bar stiffener connections, corners of cut-out for the longitudinal and connection of web to shell at cut-outs. 5. High stress in the web of the transverse. 6. Dynamic sea way load/ship motions. 		
FIGURE 1	TANKER STRUCTURE CO-OPERATIVE FORUM	FIGURE 1
	SUBJECT: CATALOGUE OF STRUCTURAL DETAILS	

Figure 2: Typical Damage and Repair Example (Reproduced from Ref. 2)

ANNEX II

Recommended Procedures for Thickness Measurements of Oil Tankers, Ore/Oil Ships and etc.*

*

Note: Annex II is recommendatory.

CONTENTS

Sheet 1

- Sheet 1 - Contents
- Sheet 2 - Instructions
- Sheet 3 - General Particulars

REPORTS

- Sheet 4 - Report TM1-T for recording the thickness measurements of all deck plating, all bottom shell plating and side shell plating
- Sheet 5 - Report TM2-T (i) for recording the thickness measurement of shell and deck plating at transverse sections - strength deck and sheerstrake plating
- Sheet 6 - Report TM2-T (ii) for recording the thickness measurement of shell and deck plating at transverse sections - shell plating
- Sheet 7 - Report TM3-T for recording the thickness measurement of longitudinal members at transverse sections
- Sheet 8 - Report TM4-T recording the thickness measurement of transverse structural members
- Sheet 9 - Report TM5-T for recording the thickness measurement of W.T./O.T. transverse bulkheads
- Sheet 10 - Report TM6-T for recording the thickness measurement of miscellaneous structural members

GUIDANCE

- Sheet 11 - Oil tanker typical transverse sections. The diagram includes details of the items to be measured and the report forms to be used.
- Sheet 12 - Ore/Oil ship typical transverse section. The diagram includes details of the items to be measured and the report forms to be used.
- Sheet 13 - Transverse section outline. The diagram may be used for those ships where the diagrams on sheet 11 and sheet 12 are not suitable
- Sheet 14 - Oil tank and Ore/Oil Ship, diagrams showing the typical longitudinal members in a transverse section
- Sheet 15 - Transverse sections of oil tankers and ore/oil ships showing typical areas for thickness measurement in association with close-up survey requirements

INSTRUCTIONS

Sheet 2

Recommended Procedures for Thickness Measurements of Oil Tankers, Ore/Oil Ships, etc.

1. This document is to be used for recording thickness measurements as required by BCS- R Z10.1.
2. Reporting forms TM1-T, TM2-T, TM3-T, TM4-T, TM5-T and TM6-T (sheets 4-10) are to be used for recording thickness measurements and the maximum allowable diminution is to be stated.

The maximum allowable diminution could be stated in an attached document.

3. The remaining sheets 11-15 are guidance diagrams and notes relating to the reporting forms and the procedure for the thickness measurements.

GENERAL PARTICULARS

Ship's name:-

IMO Number:-

Class Identification number:-

Port of registry:-

Gross tons:-

Deadweight:-

Date of build:-

Classification society:-

Name of Firm performing thickness measurement:-

Thickness measurement firm certified by:-

Certificate No.:-

Certificate valid from.....to.....

Place of measurement:-

First date of measurement:-

Last date of measurement:-

Special survey/intermediate survey due:-*

Details of measurement equipment:-

Qualification of operator:-

Report Number:-

consisting of.....Sheets

Names of operator:-

Name of surveyor:-

Signature of operator:-

Signature of surveyor:-

Firm official stamp:-

Classification Society
Official Stamp:-

* Delete as appropriate

TM1-T

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

(* - delete as appropriate)

Sheet 4

Ship's name.....

Class Identity No.

Report No.

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

Operators Signature.....

NOTES – See Reverse

NOTES

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

TM2-T (i)

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

Sheet 5

Ship's name.....

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									
STRAKE POSITION	No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S	
		mm	mm	P	S	mm	%	mm	%		mm	mm	P	S	mm	%	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																											
sheer strake																											
TOPSIDE TOTAL																											

Operators Signature.....

NOTES – See Reverse

NOTES

1. This report form is to be used for recording the thickness measurements of:

Strength deck plating and sheerstrake plating transverse sections:

One, two or three sections within the cargo area comprising of the structural items (1), (2) and (3) as shown on the diagrams of typical transverse sections.
2. For oil tankers all deck plating strakes are to be recorded and for ore/oil ships only the deck plating strakes outside the line of openings are to be recorded.
3. The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
4. The exact frame station of measurement is to be stated.
5. The single measurements recorded are to represent the average of multiple measurements.
6. The maximum allowable diminution could be stated in an attached document.

TM2-T (ii)

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

Sheet 6

Ship's name.....

Class Identity No.

Report No.

SHELL PLATING

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

Operators Signature.....

NOTES – See Reverse

NOTES

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

TM3-T

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

Sheet 7

Ship's name.....

Class Identity No.

Report No.

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES

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

TM4-T

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

Sheet 8

Ship's name.....

Class Identity No.

Report No.

TANK DESCRIPTION:

LOCATION OF STRUCTURE:

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES

1. This report is to be used for recording the thickness measurements of transverse structural members, comprising of the appropriate structural items (25) to (33) as shown on diagrams of typical transverse section.
2. Guidance for areas of measurement is indicated on sheet 15 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

TM5-T

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

Sheet 9

Ship's name.....

Class Identity No.

Report No.

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES

1. This report is to be used for recording the thickness measurement of W.T./O.T. transverse bulkheads.
2. Guidance for areas of measurement is indicated on sheet 15 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

TM6-T

Report on THICKNESS MEASUREMENT OF MISCELLANEOUS STRUCTURAL MEMBERS

Sheet 10

Ship's name.....

Class Identity No.

Report No.

[illegible]

Operators Signature.....

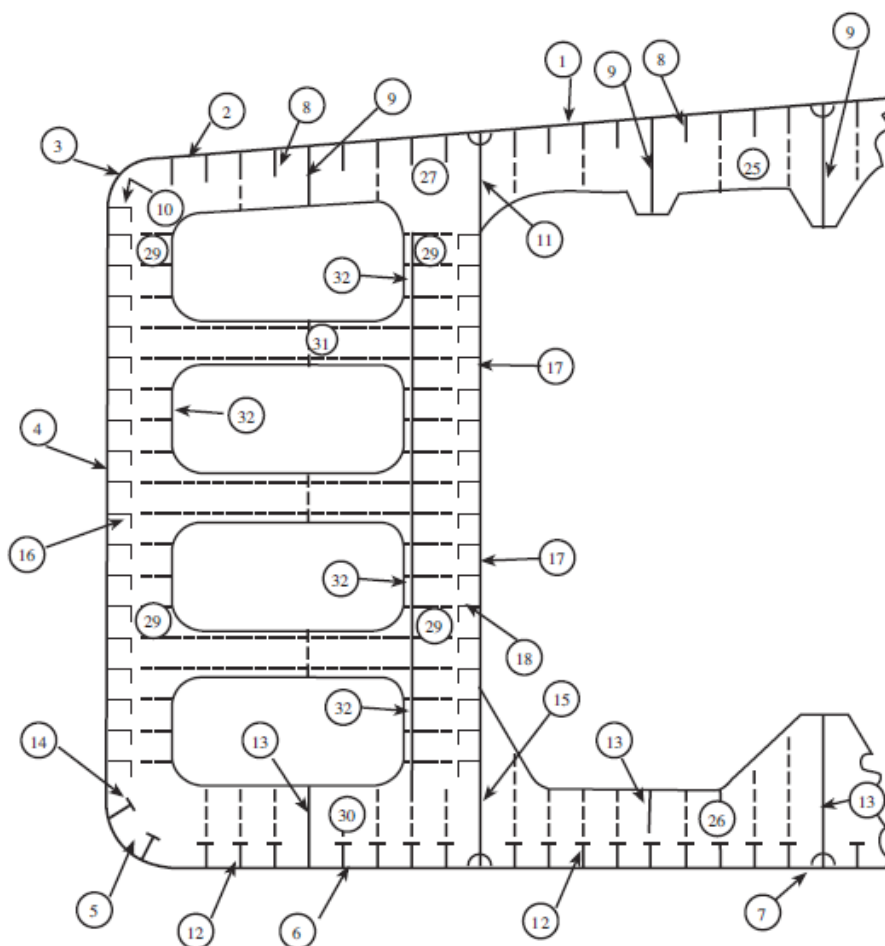
NOTES – See Reverse

NOTES

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

Thickness Measurement - Oil Tankers, Ore/Oil ships and etc.

Oil tanker - Typical transverse section indication longitudinal and transverse members



Report on TM2-T (i) & (ii)

1. Strength deck plating
2. Stringer plate
3. Sheerstrake
4. Side shell plating
5. Bilge plating
6. Bottom shell plating
7. Keel plate

Report on TM3-T

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

Report on TM4-T

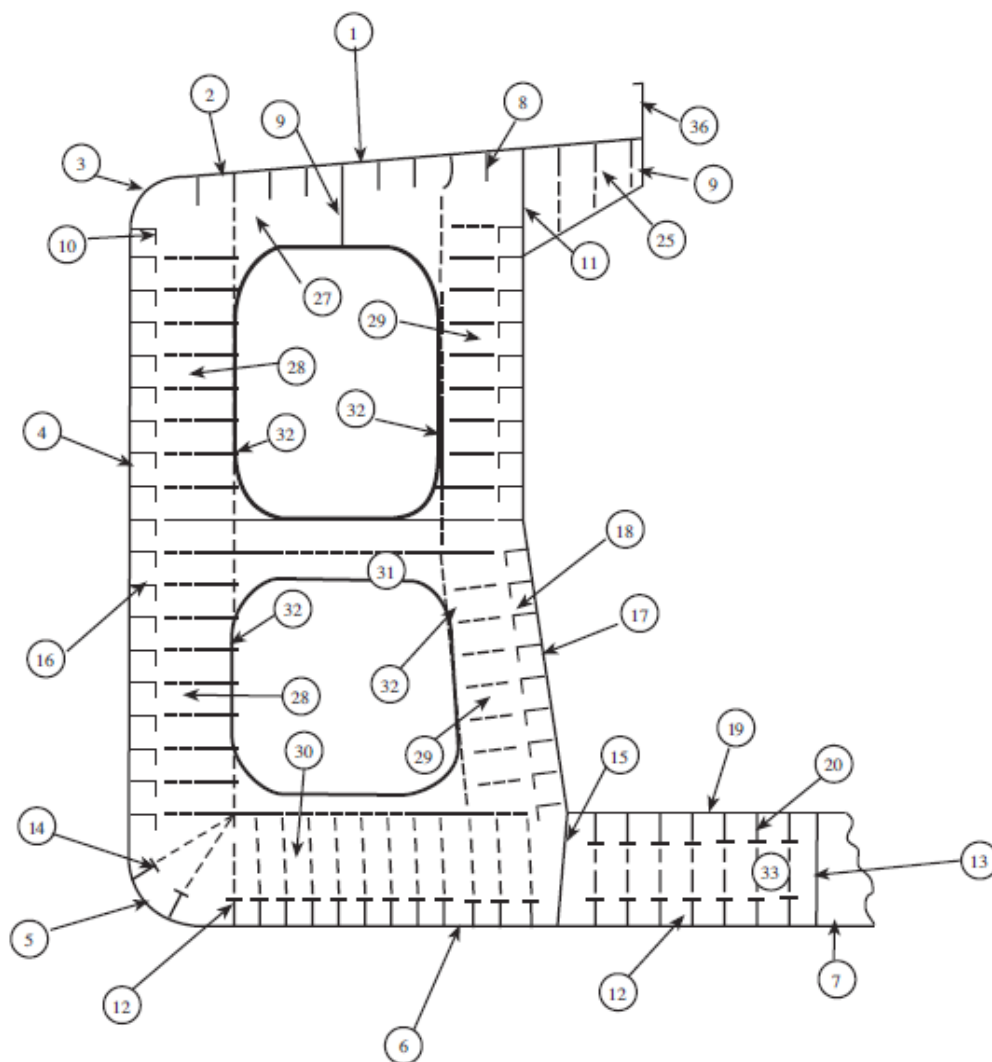
25. Deck transverse centre tank
26. Bottom transverse centre tank
27. Deck transverse wing tank
28. Side shell vertical web
29. Longitudinal bulkhead vertical web
30. Bottom transverse wing tank
31. Struts
32. Transverse web face plate
33. D.B. Floors
- 34.
- 35.

Report on TM6-T

36. Hatch coamings
37. Deck plating between hatches
38. Hatch covers
- 39.
- 40.

Thickness Measurement - Oil Tankers, Ore/Oil ships and etc.

Oil/Ore Ship - Typical transverse section indication longitudinal and transverse members



Report on TM2-T (i) & (ii)

1. Strength deck plating
2. Stringer plate
3. Sheerstrake
4. Side shell plating
5. Bilge plating
6. Bottom shell plating
7. Keel plate

Report on TM3-T

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

Report on TM4-T

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.

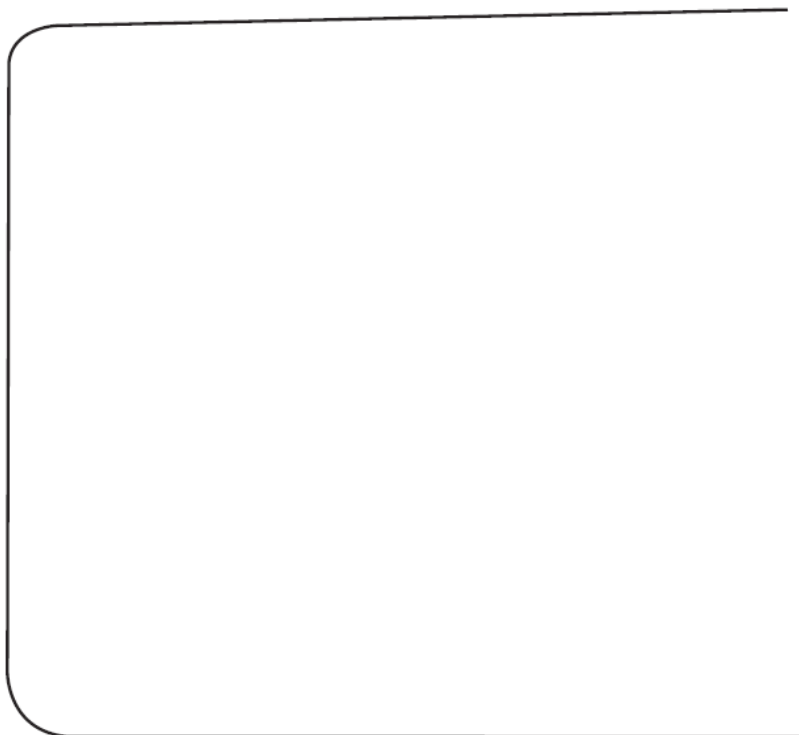
Report on TM6-T

36. Hatch coamings
37. Deck plating between hatches
38. Hatch covers
- 39.
- 40.

Thickness Measurement - Oil Tankers, Ore/Oil ships and etc.

Transverse section outline.

To be used for longitudinal and transverse members where typical Oil Tanker
or Oil/Ore ship sections are not applicable



Report on TM2-T (i) & (ii)

- | | |
|----|-----------------------|
| 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-T

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

Report on TM4-T

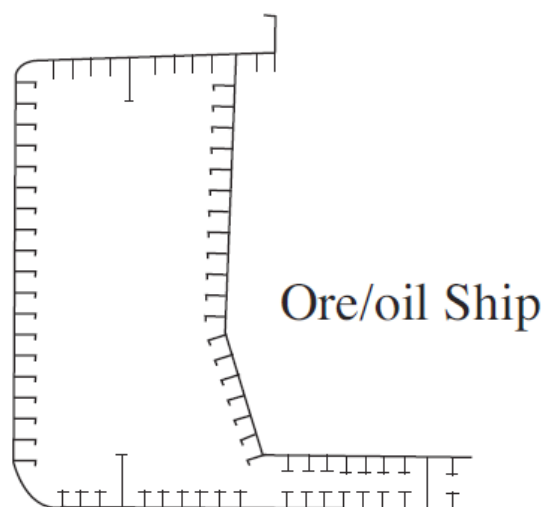
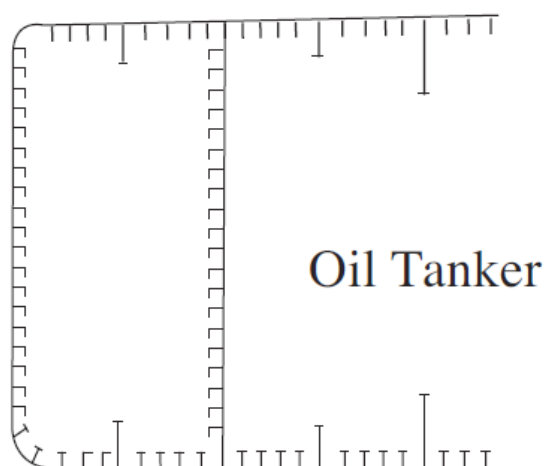
- | | |
|-----|------------------------------------|
| 25. | Deck transverse centre tank |
| 26. | Bottom transverse centre tank |
| 27. | Deck transverse wing tank |
| 28. | Side shell vertical web |
| 29. | Longitudinal bulkhead vertical web |
| 30. | Bottom transverse wing tank |
| 31. | Struts |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

Report on TM6-T

- | | |
|-----|------------------------------|
| 36. | Hatch coamings |
| 37. | Deck plating between hatches |
| 38. | Hatch covers |
| 39. | |
| 40. | |

Thickness Measurement - Oil Tankers, Ore/Oil ships and etc.

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

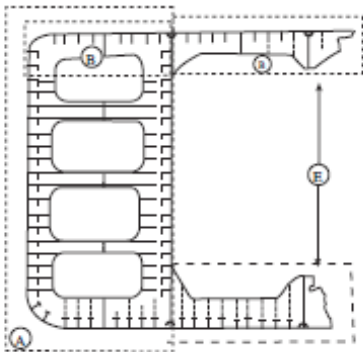


Thickness Measurement - Oil Tankers, Ore/Oil ships and etc.

Close-up survey requirements

Oil Tanker

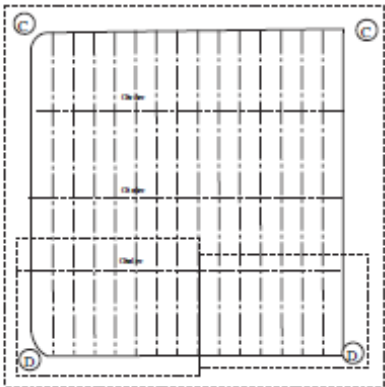
Typical transverse section close-up survey



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

Oil Tanker

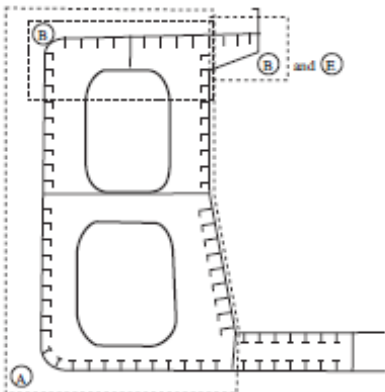
Typical transverse bulkhead



Thickness to be reported on TM5-T

Oil/Ore ship

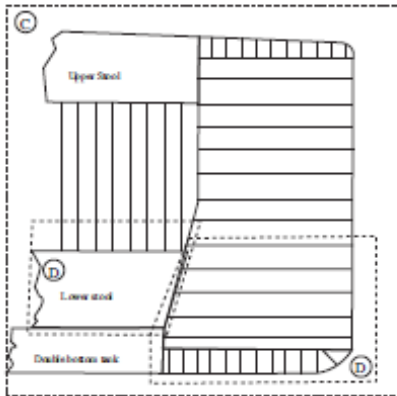
Typical transverse section close-up survey



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

Oil/Ore ship

Typical transverse bulkhead



Thickness to be reported on TM5-T

Close-up survey area

Recommendations for the extent and pattern of gaugings are indicated in Table IV of the IACS Unified Requirements

ANNEX III

Criteria for Longitudinal Strength of Hull Girder for Oil Tankers

Annex III

Criteria for Longitudinal Strength of Hull Girder for Oil Tankers

1 General

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

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

2 Evaluation of longitudinal strength

On oil tankers of 130 m in length and upwards and of over 10 years of age, the longitudinal strength of the ship's hull girder is to be evaluated in compliance with the requirements of this annex on the basis of the thickness measured, renewed or reinforced, as appropriate, during the **special survey**.

The condition of the hull girder for longitudinal strength evaluation is to be determined in accordance with the methods specified in appendix 3.

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

2.1.1 The transverse sectional areas of deck flange (deck plating and deck longitudinals) and bottom flange (bottom shell plating and bottom longitudinals) of the ship's hull girder are to be calculated by using the thickness measured, renewed or reinforced, as appropriate, during the **special survey**.

2.1.2 If the diminution of sectional areas of either deck or bottom flange exceeds 10% of their respective as-built area (i.e. original sectional area when the ship was built), either one of the following measures is to be taken:

- .1 to renew or reinforce the deck or bottom flanges so that the actual sectional area is not less than 90% of the as-built area; or
- .2 to calculate the actual section moduli (Z_{act}) of transverse section of the ship's hull girder by applying the calculation method specified in appendix 1, by using the thickness measured, renewed or reinforced, as appropriate, during the **special survey**.

2.2 Requirements for transverse section modulus of hull girder

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

- .1 for ships constructed on or after 1 July 2002, the actual section moduli (Z_{act}) of the transverse section of the ship's hull girder calculated in accordance with the requirements of the foregoing paragraph 2.1.2.2 is not to be less than the diminution limits determined by BCS*; or

-
- .2 for ships constructed before 1 July 2002, the actual section moduli (Z_{act}) of the transverse section of the ship's hull girder calculated in accordance with the requirements of the foregoing paragraph 2.1.2.2 is to meet the criteria for minimum section modulus for ships in service required by BCS, provided that in no case Z_{act} is to be less than the diminution limit of the minimum section modulus (Z_{mc}) as specified in appendix 2.

* The actual transverse section modulus of the hull girder of oil tankers calculated under paragraph 2.2.1.1 of Annex III to BCS- R Z10.1 is not to be less than 90% of the required section modulus for new buildings specified in BCS- R S7* or S11, whichever is the greater.

* $C = 1.0 c_n$ is to be used for the purpose of this calculation.

APPENDIX 1

CALCULATION CRITERIA OF SECTION MODULI OF MIDSHIP SECTION OF HULL GIRDER

- 1 When calculating the transverse section modulus of the ship's hull girder, the sectional area of all continuous longitudinal strength members is to be taken into account.
- 2 Large openings, i.e. openings exceeding 2.5m in length or 1.2m in breadth and scallops, where scallop welding is applied, are always to be deducted from the sectional areas used in the section modulus calculation.
- 3 Smaller openings (manholes, lightening holes, single scallops in way of seams, etc.) need not be deducted provided that the sum of their breadths or shadow area breadths in one transverse section does not reduce the section modulus at deck or bottom by more than 3% and provided that the height of lightening holes, draining holes and single scallops in longitudinals or longitudinal girders does not exceed 25% of the web depth, for scallops maximum 75mm.
- 4 A deduction-free sum of smaller opening breadths in one transverse section in the bottom or deck area of $0.06(B - \sum b)$ (where B = breadth of ship, $\sum b$ = total breadth of large openings) may be considered equivalent to the above reduction in sectional modulus.
- 5 The shadow area will be obtained by drawing two tangent lines with an opening angle of 30° .
- 6 The deck modulus is related to the moulded deck line at side.
- 7 The bottom modulus is related to the base line.
- 8 Continuous trunks and longitudinal hatch coamings are to be included in the longitudinal sectional area provided they are effectively supported by longitudinal bulkheads or deep girders. The deck modulus is then to be calculated by dividing the moment of inertia by the following distance, provided this is greater than the distance to the deck line at side:

$$y_t = y \left(0.9 + 0.2 \frac{x}{B} \right)$$

where:

- y = distance from neutral axis to top of continuous strength member,
 x = distance from top of continuous strength member to centreline of the ship.
 x and y to be measured to the point giving the largest value of y_t .

- 9 Longitudinal girders between multi-hatchways will be considered by special calculations.

APPENDIX 2

DIMINUTION LIMIT OF MINIMUM LONGITUDINAL STRENGTH OF SHIPS IN SERVICE

1 The diminution limit of the minimum section modulus (Z_{mc}) of oil tankers in service is given by the following formula:

$$Z_{mc} = cL^2B (C_b + 0.7)k \quad (\text{cm}^3)$$

where

L = Length of ships. L is the distance, in metres, on the summer load waterline from the fore side of stem to the after side of the rudder post, or the centre of the rudder stock if there is no rudder post. L is not to be less than 96%, and need not be greater than 97%, of the extreme length on the summer load waterline. In ships with unusual stern and bow arrangement the length L may be specially considered.

B = Greatest moulded breadth in metres.

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

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

$$c = 0.9 c_n$$

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

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

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

k = material factor, e.g.

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

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

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

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

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

APPENDIX 3

Sampling method of thickness measurements for longitudinal strength evaluation and repair methods

1 Extent of longitudinal strength evaluation

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

2 Sampling method of thickness measurement

2.1 Pursuant to the requirements of section 2.4 of Z10.1, transverse sections should be chosen such that thickness measurements can be taken for as many different tanks in corrosive environments as possible, e.g. ballast tanks sharing a common plane boundary with cargo tanks fitted with heating coils, other ballast tanks, cargo tanks permitted to be filled with sea water and other cargo tanks. Ballast tanks sharing a common plane boundary with cargo tanks fitted with heating coils and cargo tanks permitted to be filled with sea water should be selected where present.

2.2 The minimum number of transverse sections to be sampled should be in accordance with Table II of BCS- R Z10.1. The transverse sections should be located where the largest thickness reductions are suspected to occur or are revealed from deck and bottom plating measurements prescribed in 2.3 and should be clear of areas which have been locally renewed or reinforced.

2.3 At least two points should be measured on each deck plate and/or bottom shell plate required to be measured within the cargo area in accordance with the requirements of Table II of BCS- R Z10.1.

2.4 Within 0.1D (where D is the ship's moulded depth) of the deck and bottom at each transverse section to be measured in accordance with the requirements of Table II of BCS- R Z10.1, every longitudinal and girder should be measured on the web and face plate, and every plate should be measured at one point between longitudinals.

2.5 For longitudinal members other than those specified in 2.4 to be measured at each transverse section in accordance with the requirements of Table II of BCS- R Z10.1, every longitudinal and girder should be measured on the web and face plate, and every plate should be measured at least in one point per strake.

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

3 Additional measurements where the longitudinal strength is deficient

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

3.2 Additional thickness measurements should also be performed on one transverse section forward and one aft of each repaired area to the extent necessary to ensure that the areas bordering the repaired section also comply with the requirements of BCS- R Z10.1.

4 Effective repair methods

4.1 The extent of renewal or reinforcement carried out to comply with this annex should be in accordance with 4.2.

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

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

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

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

ANNEX IV

ANNEX IVA

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:
Classification Society:
Class ID:
Date of build of the ship:
Owner:
Thickness measurement firm:

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 area, cargo tanks, ballast tanks, including fore and aft peak tanks, required by BCS- R Z10.1.

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

1.2 Documentation

All documents used in the development of the survey programme are to be available onboard during the survey as required by section 6.

2 Arrangement of tanks and spaces

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

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

This section of the survey programme is to indicate any changes relating to (and is to update) the information on the use of the 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 is to 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 is to indicate any changes relating to (and is to 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 is to 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 is to identify and list the spaces that are to undergo an overall survey for the ship in accordance with 2.3.1.

7.2 Close-up survey

This section of the survey programme is to identify and list the hull structures that are to undergo a close-up survey for the ship in accordance with 2.3.2.

8 Identification of tanks for tank testing

This section of the survey programme is to identify and list the tanks that are to undergo tank testing for the ship in accordance with 2.5.

9 Identification of areas and sections for thickness measurements

This section of the survey programme is to identify and list the areas and sections where thickness measurements are to be taken in accordance with 2.4.1.

10 Minimum thickness of hull structures

This section of the survey programme is to specify the minimum thickness for hull structures of the ship that are subject to BCS- R Z10.1 (indicate either (a) or preferably (b), if such information is available):

- (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			
Bottom			
Plating			
Longitudinals			
Longitudinal girders			
Ship side			
Plating			
Longitudinals			
Longitudinal girders			
Longitudinal bulkhead			
Plating			
Longitudinals			
Longitudinal girders			
Inner bottom			
Plating			
Longitudinals			
Longitudinal girders			
Transverse bulkheads			
Plating			
Stiffeners			
Transverse web frames, floors and stringers			
Plating			
Flanges			
Stiffeners			
Cross ties			
Flanges			
Webs			

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

11 Thickness measurement firm

This section of the survey programme is to identify changes, if any, relating to the information on the thickness measurement firm provided in the Survey Planning Questionnaire.

12 Damage experience related to the ship

This section of the survey programme is to, using the tables provided below, provide details of the hull damages for at least the last three years in way of the cargo and ballast tanks and void spaces within the cargo area. These damages are subject to survey.

Hull damages sorted by location for the ship

Tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

Hull damages for sister or similar ships (if available) in the case of design related damage

Tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

13 Areas identified with substantial corrosion from previous surveys

This section of the survey programme is to identify and list the areas of substantial corrosion from previous surveys.

14 Critical structural areas and suspect areas

This section of the survey programme is to identify and list the critical structural areas and the suspect areas, if such information is available.

15 Other relevant comments and information

This section of the survey programme is to provide any other comments and information relevant to the survey.

Appendices

Appendix 1 - List of plans

Paragraph 5.1.3.2 requires that main structural plans of cargo and ballast tanks (scantling drawings), including information regarding use of high tensile steel (HTS), to be available. This appendix of the survey programme is to identify and list the main structural plans which form part of the survey programme.

Appendix 2 - Survey Planning Questionnaire

The Survey Planning Questionnaire (annex IVB), which has been submitted by the owner, is to be appended to the survey programme.

Appendix 3 - Other documentation

This part of the survey programme is to identify and list any other documentation that forms part of the Plan.

Prepared by the owner in co-operation with BCS for compliance with 5.1.3.

Date:..... (name and signature of authorized owner's representative)

Date:..... (name and signature of authorized representative of BCS)

ANNEX IVB

SURVEY PLANNING QUESTIONNAIRE

The following information will enable the owner in co-operation with BCS to develop a survey programme complying with the requirements of BCS- R Z10.1. It is essential that the owner provides, when completing the present questionnaire, up-to-date information. The present questionnaire, when completed, is to provide all information and material required by BCS- R Z10.1.

Particulars

Ship's name:
IMO number:
Flag State:
Port of registry:
Owner:
Classification Society:
Class ID:
Gross tonnage:
Deadweight (metric tonnes):
Date of build:

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

The owner is to 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. normally within reach of hand.

Tank No.	Structure	C(Cargo)/ B(Ballast)	Temporary staging	Rafts	Ladders	Direct access	Other means (please specify)
F.P.	Fore peak						
A.P.	Aft peak						
Wing Tanks	Under deck						
	Side shell						
	Bottom transverse						
	Longitudinal						
	Transverse						
Centre Tanks	Under deck						
	Bottom transverse						
	Transverse						

History of cargo with H₂S content or heated cargo for the last 3 years together with indication as to whether cargo was heated and, where available, Marine Safety Data Sheets (MSDS)*

* Refer to resolution MSC. 150(77) on Recommendation for material safety data sheets for MARPOL Annex I cargoes and marine fuel oils.

Owner's inspections

Using a format similar to that of the table below (which is given as an example), the owner is to provide details of the results of their inspections for the last 3 years on all cargo and ballast tanks and void spaces within the cargo area, including peak tanks.

Tank No.	Corrosion protection (1)	Coating extent (2)	Coating condition (3)	Structural deterioration (4)	Tank damage history (5)
Cargo centre tanks					
Cargo wing tanks					
Slop					

Tank No.	Corrosion protection (1)	Coating extent (2)	Coating condition (3)	Structural deterioration (4)	Tank damage history (5)
Ballast tanks					
Aft peak					
Fore peak					
Miscellaneous spaces					

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

- 1) HC=hard coating; SC=soft coating;
SH=semi-hard coating; 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 3 years)
- 4) N=no findings recorded; Y=findings recorded,
description of findings is to be attached to the questionnaire
- 5) DR=damage & repair; L=leakages;
CV=conversion
(description is 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 firm:

BCS- R Z10.2 Hull Surveys of Bulk Carriers

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ENCLOSURES:

Table I:	Minimum Requirement for Close-up Survey at Special Hull Surveys of Bulk Carriers
Table II:	Minimum Requirements of Thickness Measurement at Special Hull Surveys of Bulk Carriers
Table III:	Owners Inspection Report
Table IV:	(Superseded by Annex 1)
Table V:	Procedures for certification of Firms Engaged in Thickness Measurement of Hull Structures
Table VI:	Survey Reporting Principles
Table VII:	Executive Hull Summary
Table VIII:	Requirements of extent of thickness measurements at those areas of substantial corrosion

Annex I:	Guidelines for Technical Assessment in conjunction with planning for Enhanced Survey for Bulk Carriers
Annex II:	Recommended Procedures for Thickness Measurements of Bulk Carriers Recommended Procedures for Thickness Measurements of Bulk Carriers Built Under BCS Common Structural Rules
Annex III:	Guidelines for the Gauging of the Vertically Corrugated Transverse Watertight Bulkhead between Holds Nos. 1 and 2
Annex IV:	Additional annual survey requirements for the foremost cargo hold of ships subject to SOLAS XII/9.1
Annex V:	Guidelines for the Gauging of the Side Shell Frames and Brackets in Single Side Skin Bulk Carriers
Annex VIA:	Survey Programme Appendix 1 List of Plans Appendix 2 Survey Planning Questionnaire Appendix 3 Other Documentation
Annex VIB:	Survey Planning Questionnaire

Notes:

1. This requirement is applied for surveys commenced on or after 1 July 2020.

1. GENERAL

1.1 Application

1.1.1 The requirements apply to all self-propelled Bulk Carriers other than Double Skin Bulk Carriers as defined in 1.1.1 of BCS- R Z10.5.

1.1.2 The Requirements apply to surveys of hull structure and piping systems in way of the cargo holds, cofferdams, pipe tunnels, void spaces, fuel oil tanks within the cargo length area and all ballast tanks. The requirements are additional to the classification requirements applicable to the remainder of the ship. Refer to BCS- R Z7.

1.1.3 The requirements contain the minimum extent of examination, thickness measurement and tank testing. The survey is to be extended when Substantial Corrosion and/or structural defects are found and include additional Close-Up Survey when necessary.

1.1.4 Ships which are required to comply with BCS- R S19 are subject to the additional thickness measurement guidance contained in Annex III with respect to the vertically corrugated transverse watertight bulkhead between cargo holds Nos. 1 and 2 for purposes of determining compliance with BCS- R S19 prior to the relevant compliance deadline stipulated in BCS- R S23 and at subsequent intermediate surveys (for ships over 10 years of age) and special surveys for purposes of verifying continuing compliance with BCS- R S19.

1.1.5 Ships which are required to comply with BCS- R S31 are subject to the additional thickness measurement guidance contained in Annex V with respect to the side shell frames and brackets for the purposes of determining compliance with BCS- R S31 prior to the relevant compliance deadline stipulated in BCS- R S31 and at subsequent intermediate and special surveys for purposes of verifying continuing compliance with BCS - R S31

1.1.6 For bulk carriers with hybrid cargo hold arrangements, e.g. with some cargo holds of single side skin and others of double side skin, the requirements of BCS- R Z10.5 are to apply to cargo holds of double side skin and associated wing spaces.

1.2 Definitions

1.2.1 Bulk Carrier

A Bulk Carrier is a ship which is constructed generally with single deck, double bottom, topside tanks and hopper side tanks in cargo spaces, and is intended primarily to carry dry cargo in bulk. Combination carriers are included.¹ Ore and combination carriers are not covered by the BCS Common Structural Rules.

1. For single skin combination carriers additional requirements are specified in BCS- R Z10.1.

1.2.2 Ballast Tank

A Ballast Tank is a tank which is used solely for salt water ballast, or, where applicable, a space which is used for both cargo and salt water ballast will be treated as a Ballast tank when substantial corrosion has been found in that space.

1.2.3 Spaces

Spaces are separate compartments including holds, tanks, cofferdams and void spaces bounding cargo holds, decks and the outer hull.

1.2.4 Overall Survey

An Overall Survey is a survey intended to report on the overall conditions of the hull structure and determine the extent of additional Close-Up Surveys.

1.2.5 Close-Up Survey

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

1.2.6 Transverse Section

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

1.2.7 Representative Spaces

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 is to be taken of the service and repair history on board and identifiable Critical Structural Areas and/or Suspect Areas.

1.2.8 Suspect Areas

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

1.2.9 Critical Structural Area

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

1.2.10 Renewal Thickness

Renewal thickness (t_{ren}) is the minimum allowable thickness, in mm, below which renewal of structural members is to be carried out.

1.2.11 Substantial Corrosion

Substantial Corrosion is an extent of corrosion such that assessment of corrosion pattern indicates a wastage in excess of 75% of allowable margins, but within acceptable limits. For vessels built under BCS Common Structural Rules, substantial corrosion is an extent of corrosion such that the assessment of the corrosion pattern indicates a measured thickness between $t_{ren} + 0.5\text{mm}$ and t_{ren} .

1.2.12 Corrosion Prevention System

A Corrosion Prevention System is normally considered a full hard protective coating.

Hard Protective Coating is usually to be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives

provided that they are applied and maintained in compliance with the manufacturer's specifications.

1.2.13 Coating Condition

Coating Condition is defined as follows:

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

1.2.14 Cargo Length Area

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

1.2.15 Special consideration

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

1.2.16 Prompt and Thorough Repair

A Prompt and Thorough Repair is a permanent repair completed at the time of survey to the satisfaction of the Surveyor, therein removing the need for the imposition of any associated condition of classification.

1.2.17 Pitting Corrosion

Pitting corrosion is defined as scattered corrosion spots/areas with local material reductions which are greater than the general corrosion in the surrounding area. Pitting intensity is defined in Figure 1.

1.2.18 Edge Corrosion

Edge corrosion is defined as local corrosion at the free edges of plates, stiffeners, primary support members and around openings. An example of edge corrosion is shown in Figure 2.

1.2.19 Grooving Corrosion

Grooving corrosion is typically local material loss adjacent to weld joints along abutting stiffeners and at stiffener or plate butts or seams. An example of groove corrosion is shown in Figure 3.

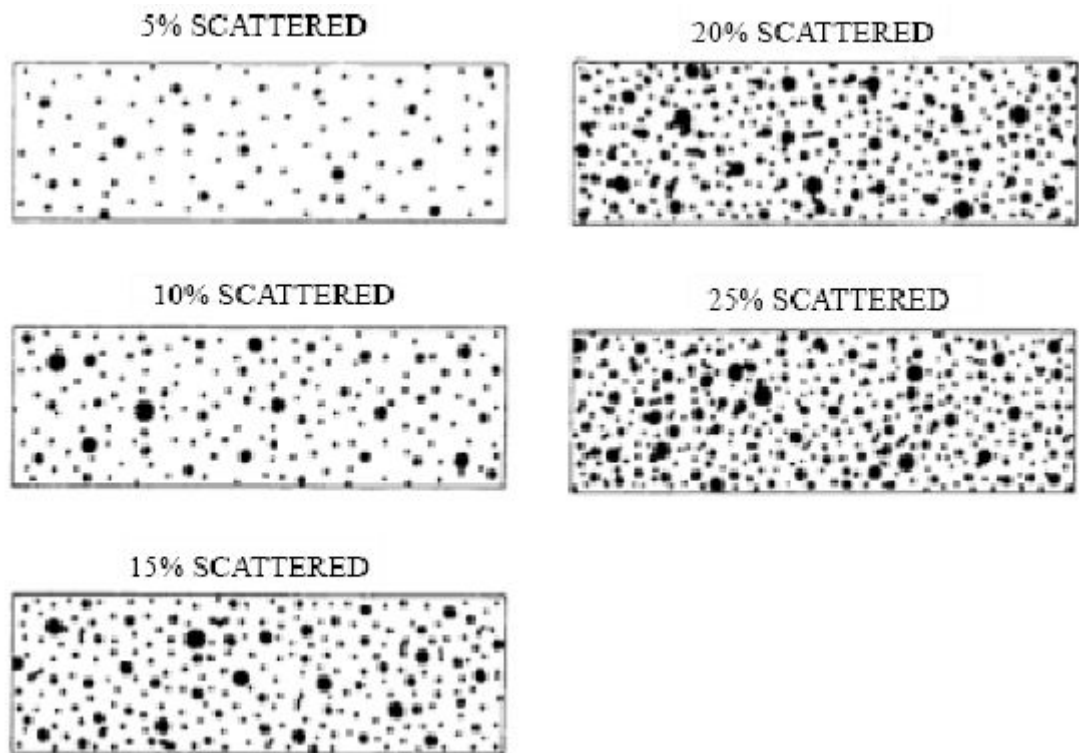


Figure 1 - Pitting intensity diagrams

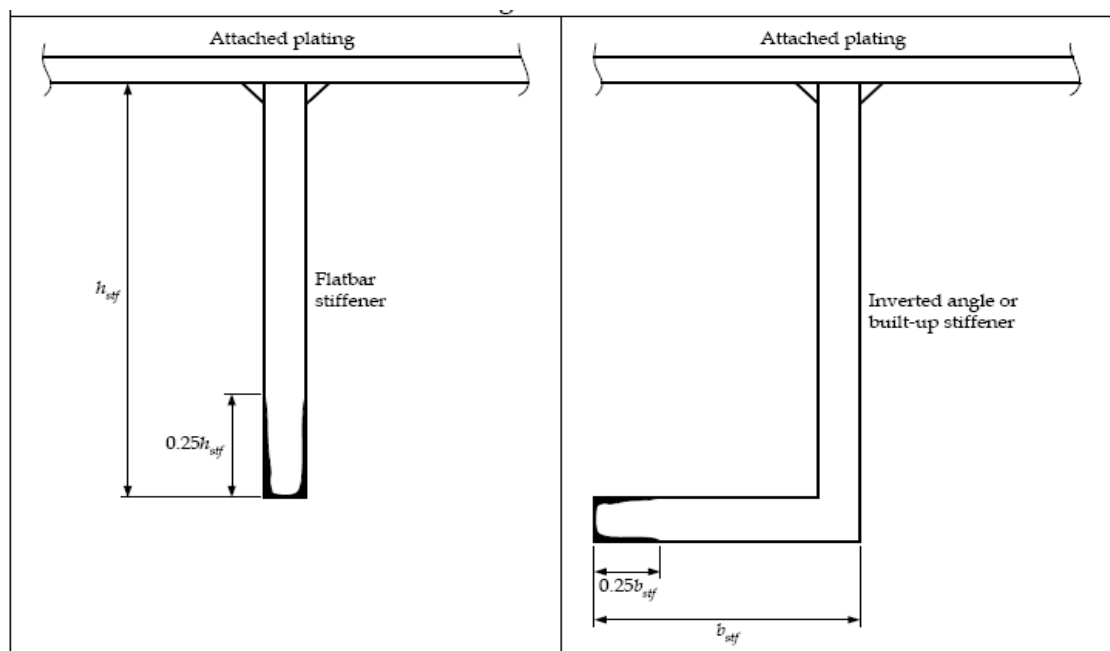


Figure 2 - Edge corrosion

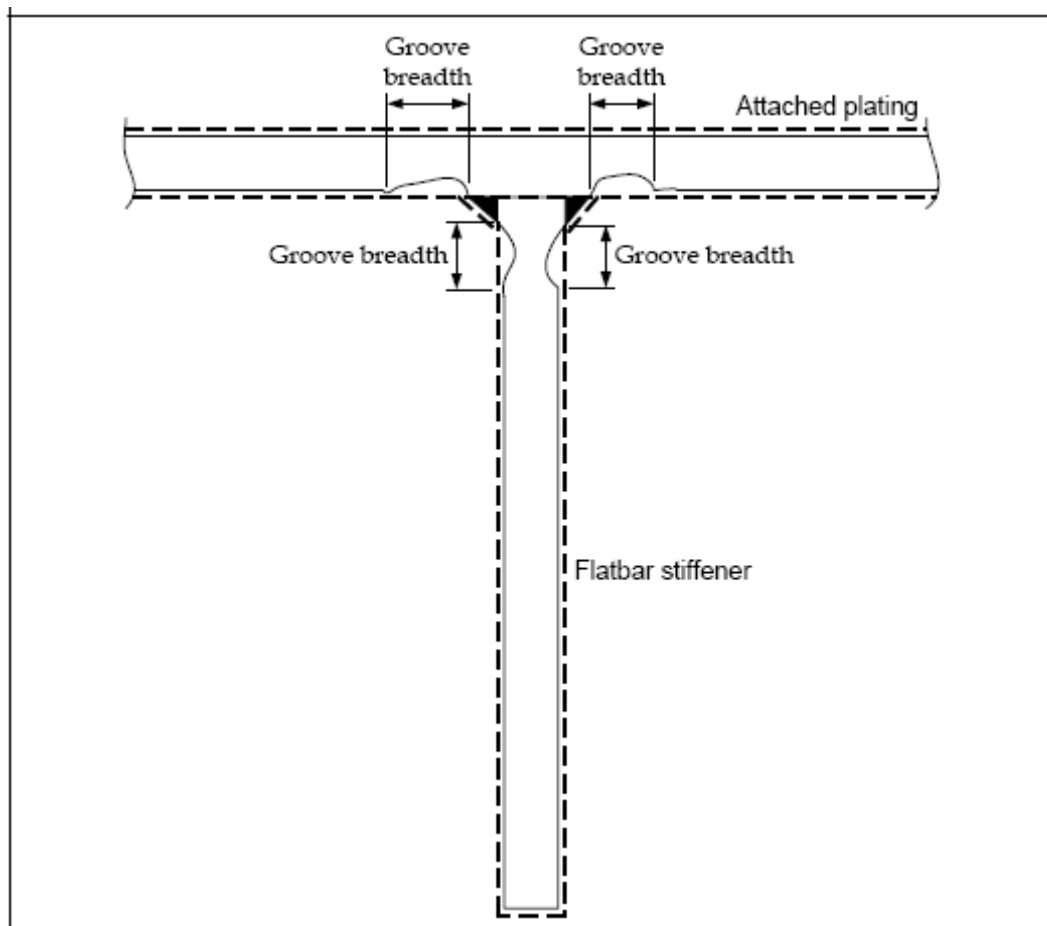


Figure 3 - Grooving corrosion

1.3 Repairs

1.3.1 Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Surveyor, **will** affect the vessel's structural, watertight or weathertight integrity, is to be **promptly and thoroughly** (see 1.2.16) repaired. Areas to be considered include:

- bottom structure and bottom plating
- side structure and side plating
- deck structure and deck plating
- inner bottom structure and inner bottom plating
- inner side structure and inner side plating
- watertight or oiltight bulkheads
- hatch covers or hatch coamings
- items in 3.2.3.10.

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

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

1.3.3 Where the damage found on structure mentioned in Para. 1.3.1 is isolated and of a localised nature which does not affect the ship's structural integrity, consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weather tight integrity and impose a condition of class in accordance with BCS- PR 35, with a specific time limit.

1.4 Thickness measurements and close-up surveys

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

2. SPECIAL SURVEY¹

2.1 Schedule

2.1.1 Special Surveys are to be carried out at a 5 year intervals to renew the Classification certificate.

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

2.1.3 For surveys completed within 3 months before the expiry date of the Special Survey, the next period of class will start from the expiry date of the Special Survey. For surveys completed more than 3 months before the expiry date of the Special Survey, the period of class will start from the survey completion date. In cases where the vessel has been laid up or has been out of service for a considerable period because of a major repair or modification and the owner elects to only carry out the overdue surveys, the next period of class will start from the expiry date of the special survey. If the owner elects to carry out the next due special survey, the period of class will start from the survey completion date.

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

2.1.5 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

2.2 Scope

2.2.1 General

2.2.1.1 The Special Survey is to include, in addition to the requirements of the Annual Survey, examination, tests, and checks of sufficient extent to ensure that the hull and related piping as required in 2.2.1.3, is in a satisfactory condition and is fit for its intended purpose for the new period of class of 5 years to be assigned subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

2.2.1.2 All cargo holds, Ballast Tanks, including double bottom tanks, pipe tunnels, cofferdams and void spaces bounding cargo holds, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing as required in 2.4 and 2.5, to ensure that the structural integrity remains effective. The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

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

1 Some Societies use the term "Special Periodical Survey" others use the term "Class Renewal Survey" instead of the term "Special Survey".

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

2.2.2 Dry dock Survey

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

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

2.2.3 Tank Protection

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

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

2.2.3.2 Where a hard protective coating is provided in cargo holds, as defined by Z9 and is found in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.

2.2.4 Hatch Covers and Coamings

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

2.2.4.1 A thorough inspection of the items listed in 3.2.3 is to be carried out, in addition to all hatch covers and coamings.

2.2.4.2 Checking of the satisfactory operation of all mechanically operated hatch covers is to be made, including:

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

2.2.4.3 Checking the effectiveness of sealing arrangements of all hatch covers by hose testing or equivalent.

2.2.4.4 Close-up survey and thickness measurement² of the hatch cover and coaming plating and stiffeners is to be carried out as given in Table I and Table II.

² Subject to cargo hold hatch covers of approved design which structurally have no access to the internals, close-up survey/thickness measurement shall be done of accessible parts of hatch covers structures.

2.3 Extent of Overall and Close-up Survey

2.3.1 An Overall Survey of all tanks and spaces is to be carried out at each Special Survey. Fuel oil tanks in the cargo length area are to be surveyed as follows:

Special Survey No.1 Age ≤ 5	Special Survey No.2 $5 < \text{Age} \leq 10$	Special Survey No.3 $10 < \text{Age} \leq 15$	Special Survey No.4 and Subsequent $15 < \text{Age}$
None	One	Two	Half, minimum two
<p>Notes</p> <ol style="list-style-type: none">1. These requirements apply to tanks of integral (structural) type.2. If a selection of tanks is accepted to be examined, then different tanks are to be examined at each special survey, on a rotational basis.3. Peak tanks (all uses) are subject to internal examination at each special survey.4. At special survey No.3 and subsequent special surveys, one deep tank for fuel oil in the cargo area is to be included, if fitted.			

2.3.2 The minimum requirements for close-up surveys at special survey are given in Table I.

2.3.3 The Surveyor may extend the close-up survey as deemed necessary taking into account the maintenance of the spaces under survey, the condition of the corrosion prevention system and where spaces have structural arrangements or details which have suffered defects in similar spaces or on similar ships according to available information.

2.3.4 For areas in spaces where hard protective coatings are found to be in a GOOD condition, the extent of close-up surveys according to Table I may be specially considered. Refer also to 2.2.3.2.

2.4 Extent of Thickness Measurement

2.4.1 The minimum requirements for thickness measurement at Special Survey are given in Table II.

For additional thickness measurement guidelines applicable to the vertically corrugated transverse watertight bulkhead between cargo hold Nos. 1 and 2 on ships subject to compliance with BCS- Rs S19 and S23, reference is to be made to 1.1.4 and Annex III. For additional thickness measurement guidelines applicable to the side shell frames and brackets on ships subject to compliance with BCS- R S31, reference is to be made to 1.1.5 and Annex V.

2.4.2 Provisions for extended measurements for areas with Substantial Corrosion are given in Table VIII and as may be additionally specified in the Survey Programme as required by 5.1. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

For vessels built under IACS Common Structural Rules, the identified substantial corrosion areas may be:

a) protected by coating applied in accordance with the coating manufacturer's requirements and examined at annual intervals to confirm the coating in way is still in good condition, or alternatively

b) required to be measured at annual intervals.

2.4.3 The Surveyor may further extend the thickness measurements as deemed necessary.

2.4.4 For areas in tanks where hard protective coatings are found to be in a GOOD condition, the extent of thickness measurement according to Table II may be specially considered. Refer also to 2.2.3.2

2.4.5 Transverse sections are to be chosen where largest reductions are suspected to occur or are revealed from deck plating measurements, one of which is to be in the amidships area.

2.4.6 Representative thickness measurement to determine both general and local levels of corrosion in the shell frames and their end attachments in all cargo holds and water ballast tanks is to be carried out. Thickness measurement is also to be carried out to determine the corrosion levels on the transverse bulkhead plating. The extent of thickness measurements may be specially considered provided the Surveyor is satisfied by the close-up survey, that there is no structural diminution, and the hard protective coating where applied remains efficient.

2.5 Extent of Tank Testing

2.5.1 All boundaries of water ballast tanks, deep tanks and cargo holds used for water ballast within the cargo length area are to be pressure tested. For Fuel Oil Tanks, only representative tanks are to be pressure tested.

2.5.2 The Surveyor may extend the tank testing as deemed necessary

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

2.5.4 Boundaries of ballast holds are to be tested with a head of liquid to near to the top of hatches.

2.5.5 Boundaries of fuel oil tanks are to be tested with a head of liquid to the highest point that liquid will rise under service conditions. Tank testing of fuel oil tanks may be specially considered based on a satisfactory external examination of the tank boundaries, and a confirmation from the Master stating that the pressure testing has been carried out according to the requirements with satisfactory results.

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

2.6 Additional special survey requirements after determining compliance with SOLAS XII/12 and XII/13

2.6.1 For ships complying with the requirements of SOLAS XII/12 for hold, ballast and dry space water level detectors, the special survey is to include an examination and a test of the water ingress detection systems and of their alarms.

2.6.2 For ships complying with the requirements of SOLAS XII/13 for the availability of pumping systems, the special survey is to include an examination and a test of the means for draining and pumping ballast tanks forward of the collision bulkhead and bilges of dry spaces any part of which extends forward of the foremost cargo hold, and of their controls.

3. ANNUAL SURVEY

3.1 Schedule

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

3.2 Scope

3.2.1 General

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

3.2.2 Examination of the Hull

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

3.2.2.2 Examination of watertight penetrations as far as practicable.

3.2.3 Examination of weather decks, Hatch covers and coamings

3.2.3.1 Confirmation is to be obtained that no unapproved changes have been made to the hatch covers, hatch coamings and their securing and sealing devices since the last survey.

3.2.3.2 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, the hatch cover sets within the forward 25% of the ship's length and at least one additional set, such that all sets on the ship are assessed at least once in every 5-year period, are to be surveyed open, closed and in operation to the full extent on each direction at each annual survey, including:

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

3.2.3.3 If there are indications of difficulty in operating and securing hatch covers, additional sets above those required by 3.2.3.2, at the discretion of the surveyor, are to be tested in operation.

3.2.3.4 Where the cargo hatch securing system does not function properly, repairs are to be carried out under the supervision of BCS. Where hatch covers or coamings undergo substantial repairs, the strength of securing devices should be upgraded to comply with S21.5 of BCS- R S21

3.2.3.5 For each cargo hatch cover set, at each annual survey, the following items are to 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 non return 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. guide rails 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.

3.2.3.6 At each hatchway, at each annual survey, the coamings, with plating, stiffeners and brackets are to be checked for corrosion, cracks and deformation, especially of the coaming tops, including close-up survey.

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

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

- wooden covers and portable beams, carriers or sockets for the portable beam, and their securing devices;
- steel pontoons, including close-up survey of hatchcover plating.
- tarpaulins;
- cleats, battens and wedges;
- hatch securing bars and their securing devices;
- loading pads/bars and the side plate edge;
- guide plates and chocks;
- compression bars, drainage channels and drain pipes (if any).

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

3.2.3.10 Examination of bunker and vent piping systems, including ventilators.

3.2.4 Examination of Cargo Holds

3.2.4.1 Bulk Carriers 10-15 years of age, the following is to apply:

- a) Overall Survey of all cargo holds.
- b) Close-up survey of sufficient extent, minimum 25% of frames, to establish the condition of the lower region of the shell frames including approx. lower one third length of side frame at side shell and side frame end attachment and the adjacent shell plating in the forward cargo hold. Where this level of survey reveals the need for remedial measures, the survey is to be extended to include a Close-up Survey of all of the shell frames and adjacent shell plating of that cargo hold as well as a Close-up survey of sufficient extent of all remaining cargo holds.
- c) When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with Table VIII. These thickness measurements are to be carried out before the annual survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

For vessels built under BCS Common Structural Rules, the annual thickness gauging may be omitted where a protective coating has been applied in accordance with the coating manufacturer's requirements and is maintained in good condition.

- d) Where the protective coating in cargo holds, as defined by BCS- R Z9 is found to be in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.
- e) All piping and penetrations in cargo holds, including overboard piping, are to be examined.

3.2.4.2 Bulk Carriers over 15 years of age, the following is to apply:

- a) Overall Survey of all cargo holds.
- b) Close-up survey of sufficient extent, minimum 25% of frames, to establish the condition of the lower region of the shell frames including approx. lower one third length of side frame at side shell and side frame end attachment and the adjacent shell plating in the forward cargo hold and one other selected cargo hold. Where this level of survey reveals the need for remedial measures, the survey is to be extended to include a Close-up Survey of all of the shell frames and adjacent shell plating of that cargo hold as well as a Close-up Survey of sufficient extent of all remaining cargo holds.
- c) When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with Table VIII. These extended thickness measurements are to be carried out before the annual survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

For vessels built under BCS Common Structural Rules, the annual thickness gauging may be omitted where a protective coating has been applied in accordance with the coating manufacturer's requirements and is maintained in good condition.

- d) Where a hard protective coating is fitted in cargo holds, as defined by BCS- R Z.9 and is found in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.
- e) All piping and penetrations in cargo holds, including overboard piping, are to be examined.

3.2.5 Examination of Ballast Tanks

3.2.5.1 Examination of Ballast Tanks when required as a consequence of the results of the Special Survey and Intermediate Survey is to be carried out. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurements are to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with Table VIII. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous survey are to have thickness measurements taken.

For vessels built under TLCommon Structural Rules, the annual thickness gauging may be omitted where a protective coating has been applied in accordance with the coating manufacturer's requirements and is maintained in good condition.

3.3 Additional annual survey requirements for the foremost cargo hold of ships subject to SOLAS XII/9.1

3.3.1 Ships subject to SOLAS XII/9.1 are those meeting all the following conditions:

- Bulk Carriers of 150m in length and upwards of single side skin construction,
- carrying solid bulk cargoes having a density of 1780 kg/m³ and above,
- contracted for construction (see Note 1) before 1 July 1999, and
- constructed with an insufficient number of transverse watertight bulkheads to enable them to withstand flooding of the foremost cargo hold in all loading conditions and remain afloat in a satisfactory condition of equilibrium as specified in SOLAS XII/4.3.

3.3.2 In accordance with SOLAS XII/9.1, for the foremost cargo hold of such ships, the additional survey requirements listed in Annex IV shall apply.

3.4 Additional annual survey requirements after determining compliance with SOLAS XII/12 and XII/13

3.4.1 For ships complying with the requirements of SOLAS XII/12 for hold, ballast and dry space water level detectors, the annual survey is to include an examination and a test, at random, of the water ingress detection systems and of their alarms.

3.4.2 For ships complying with the requirements of SOLAS XII/13 for the availability of pumping systems, the annual survey is to include an examination and a test, of the means for draining and pumping ballast tanks forward of the collision bulkhead and bilges of dry spaces any part of which extends forward of the foremost cargo hold, and of their controls.

Note 1: "The "contracted for construction" date means the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. For further details regarding the date of "contract for construction", refer to BCS- PR 29."

4. INTERMEDIATE SURVEY

4.1 Schedule

4.1.1 The intermediate Survey is to be held at or between either the 2nd or 3rd Annual Survey.

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

4.1.3 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

4.2 Scope

4.2.1 General

4.2.1.1 The survey extent is dependent on the age of the vessel as specified in 4.2.2 to 4.2.4.

4.2.2 Bulk Carriers 5 -10 years of age. The following is to apply:

4.2.2.1 Ballast Tanks

- a) For tanks used for water ballast, an overall survey of representative spaces selected by the Surveyor is to be carried out. The selection is to include fore and aft peak tanks and a number of other tanks, taking into account the total number and type of ballast tanks. If such overall survey reveals no visible structural defects, the examination may be limited to verification that the corrosion prevention system remains efficient.
- b) Where POOR coating condition, corrosion or other defects are found in water Ballast tanks or where a hard Protective Coating was not applied from the time of construction, the examination is to be extended to other Ballast tanks of the same type.
- c) In ballast tanks other than double bottom tanks, where a hard Protective Coating is found in POOR condition, and it is not renewed, or where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the tanks in question are to be examined and thickness measurements carried out as considered necessary at annual intervals. When such breakdown of hard protective coating is found in ballast double bottom tanks, or where a soft or semi-hard coating has been applied, or where a hard protective coating has not been applied, the tanks in question may be examined at annual intervals. When considered necessary by the Surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.
- d) In addition to the requirements above, suspect areas identified at previous surveys are to be overall and close-up surveyed.

4.2.2.2 Cargo Holds

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

- 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;
 - Areas found suspect at previous surveys.
- b) Where considered necessary by the surveyor as a result of the overall and close-up survey as described in 4.2.2.2a, the survey is to be extended to include a close-up survey of all of the shell frames and adjacent shell plating of that cargo hold as well as a close-up survey of sufficient extent of all remaining cargo holds.

4.2.2.3 Extent of Thickness Measurements

- a) Thickness measurements are to be carried out to an extent sufficient to determine both general and local corrosion levels at areas subject to close-up survey as described in 4.2.2.2a. The minimum requirement for thickness measurements at the Intermediate Survey are areas found to be Suspect Areas at previous surveys.
- b) The extent of thickness measurement may be specially considered provided the Surveyor is satisfied by the close-up survey, that there is no structural diminution and the hard protective coatings are found to be in a GOOD condition.
- c) Where Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with the requirements of Table VIII. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

For vessels built under BCS Common Structural Rules, the identified substantial corrosion areas may be:

- a) protected by coating applied in accordance with the coating manufacturer's requirements and examined at annual intervals to confirm the coating in way is still in good condition, or alternatively
 - b) required to be measured at annual intervals.
- d) Where the hard protective coating in cargo holds, as defined by BCS- R Z9 is found to be in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.

Explanatory note:

For existing bulk carriers, where owners may elect to coat or recoat cargo holds as noted above, consideration may be given to the extent of the close-up and thickness measurement surveys. Prior to the coating of cargo holds of existing ships, scantlings should be ascertained in the presence of a surveyor.

4.2.3 Bulk Carriers 10 - 15 years of age. The following is to apply:

- 4.2.3.1 The requirements of the Intermediate Survey are to be to the same extent to the previous Special Survey as required in 2 and 5.1. However, internal examination of fuel tanks and pressure testing of all tanks are not required unless deemed necessary by the attending surveyor.

4.2.3.2 In application of 4.2.3.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.4.

4.2.3.3 In application of 4.2.3.1, an under water survey may be considered in lieu of the requirements of 2.2.2.

4.2.4. Bulk Carriers over 15 years of age. The following is to apply:

4.2.4.1 The requirements of the Intermediate Survey are to be to the same extent to the previous Special Survey as required in 2 and 5.1. However, internal examination of fuel tanks and pressure testing of all tanks are not required unless deemed necessary by the attending surveyor.

4.2.4.2 In application of 4.2.4.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.4.

4.2.4.3 In application of 4.2.4.1, a survey in dry dock is to be part of the intermediate survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo holds and water ballast tanks are to be carried out in accordance with the applicable requirements for intermediate surveys, if not already performed.

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

5 PREPARATION FOR SURVEY

5.1 Survey Programme

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

- the Special Survey
- the Intermediate Survey for bulk carriers over 10 years of age.

The Survey Programme is to be in a written format based on the information in Annex VIA. The survey is not to commence until the Survey programme has been agreed.

5.1.1.1 Prior to the development of the survey programme, the survey planning questionnaire is to be completed by the owner based on the information set out in Annex VIB, and forwarded to BCS.

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

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

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

- Survey status and basic ship information,
- Documentation on-board, as described in 6.2 and 6.3,
- Main structural plans (scantlings drawings), including information regarding use of high tensile steels (HTS),
- Relevant previous survey and inspection reports from both BCS and the Owner,
- Information regarding the use of the ship's holds and tanks, typical cargoes and other relevant data,
- Information regarding corrosion prevention level on the newbuilding,
- 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 Tables I, II and paragraph 2.5 for close-up survey, thickness measurement and tank testing, respectively, and is to include relevant information including at least :

- Basic ship information and particulars,
- Main structural plans (scantling drawings), including information regarding use of high tensile steels (HTS)

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- Plan of holds and tanks,
 - List of holds and tanks with information on use, protection and condition of coating,
 - Conditions for survey (e.g., information regarding hold and tank cleaning, gas freeing, ventilation, lighting, etc.),
 - Provisions and methods for access to structures,
 - Equipment for surveys,
 - Nomination of holds and tanks and areas for close-up survey (per 2.3),
 - Nominations of sections for thickness measurement (per 2.4),
 - Nomination of tanks for tank testing (per 2.5),
 - Damage experience related to the ship in question.

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

5.1.5 Use may also be made of the Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Bulk Carriers Special Survey - Hull, contained in Annex I. These guidelines are a recommended tool which may be invoked at the discretion of BCS, 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 is to 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, are to be agreed between the owner and BCS are to be in accordance with BCS- PR 37.

5.2.1.2 Details of the means of access are to 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 surveyor(s) not to be adequate, the survey of the spaces involved is not to proceed.

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

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

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

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

5.3 Access to Structures

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

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

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

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

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

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

Annual Surveys, Intermediate Survey under 10 years of age and Special Survey No. 1

- permanent staging and passages through structures;

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- temporary staging and passages through structures;
 - hydraulic arm vehicles such as conventional cherry pickers, lifts and movable platforms;
 - boats or rafts provided the structural capacity of the hold is sufficient to withstand static loads at all levels of water;
 - other equivalent means.

Subsequent Intermediate Surveys and Special Surveys:

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

Notwithstanding the above requirements:

- a) The use of a portable ladder fitted with a mechanical device to secure the upper end of the ladder is acceptable for the "close-up examination of sufficient extent, minimum 25% of frames, to establish the condition of the lower region of the shell frames including approx. lower one third length of side frame at side shell and side frame end attachment and the adjacent shell plating of the forward cargo hold" at Annual Survey, required in 3.2.4.1.b, and the "one other selected cargo hold" required in 3.2.4.2.b.
- b) The use of hydraulic arm vehicles or aerial lifts ("Cherry picker") may be accepted by the attending surveyor for the close-up survey of the upper part of side shell frames or other structures in all cases where the maximum working height is not more than 17 m.

5.4 Equipment for Survey

5.4.1 Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required.

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

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

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

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

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

5.5 Rescue and emergency response equipment

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

5.6 Survey at Sea or at Anchorage

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

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

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

5.6.4 When rafts or boats will be used for close-up survey the following conditions are to be observed:

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

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

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

-
- .1 when the coating of the under deck structure is in GOOD condition and there is no evidence of wastage; or
 - .2 if a permanent means of access is provided in each bay to allow safe entry and exit.

This means:

- i. access direct from the deck via a vertical ladder and a small platform fitted approximately 2 m below the deck in each bay; or
- ii. access to deck from a longitudinal permanent platform having ladders to deck in each end of the tank. The platform shall, for the full length of the tank, be arranged in level with, or above, the maximum water level needed for rafting of under deck structure. For this purpose, the ullage corresponding to the maximum water level is to be assumed not more than 3m from the deck plate measured at the midspan of deck transverses and in the middle length of the tank.

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

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

Reference is made to BCS- G 39 - Guidelines for the use of Boats or Rafts for Close-up surveys.

5.7 Survey Planning Meeting

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

5.7.2 Prior to commencement of any part of the renewal and intermediate survey, a survey planning meeting is to be held between the attending surveyor(s), the owner's representative in attendance, the TM firm representative, where involved, and the master of the ship or an appropriately qualified representative appointed by the master or Company for the purpose to ascertain that all the arrangements envisaged in the survey programme are in place, so as to ensure the safe and efficient conduct of the survey work to be carried out. See also 7.1.2.

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

- .1 schedule of the vessel (i.e. the voyage, docking and undocking manoeuvres, periods alongside, cargo and ballast operations, etc.)
- .2 provisions and arrangements for thickness measurements (i.e. access, cleaning/de-scaling, illumination, ventilation, personal safety);
- .3 extent of the thickness measurements;
- .4 acceptance criteria (refer to the list of minimum thicknesses);
- .5 extent of close-up survey and thickness measurement considering the coating condition and suspect areas/areas of substantial corrosion;

-
- .6 execution of thickness measurements;
 - .7 taking representative readings in general and where uneven corrosion/pitting is found;
 - .8 mapping of areas of substantial corrosion; and
 - .9 communication between attending surveyor(s) the thickness measurement firm operator(s) and owner representative(s) concerning findings.

6. DOCUMENTATION ON BOARD

6.1 General

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

6.1.2 The documentation is to be kept on board for the life time of the ship.

6.1.3 For tankers and bulk carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10, the Owner is to arrange the updating of the Ship Construction File (SCF) throughout the ship's life whenever a modification of the documentation included in the SCF has taken place. Documented procedures for updating the SCF are to be included within the Safety Management System.

6.2 Survey Report File

6.2.1 A Survey Report File is to be a part of the documentation on board consisting of

- Reports of structural surveys
- Executive Hull Summary
- Thickness measurement reports

6.2.2 The Survey Report File is to be available also in the Owner's and BCS's management offices.

6.3 Supporting Documents

6.3.1 The following additional documentation is to be available on board:

- Survey Programme as required by 5.1 until such time as the Special Survey or Intermediate Survey, as applicable, has been completed
- Main structural plans of cargo holds and Ballast Tanks (for CSR ships these plans are to include for each structural element both the as-built and renewal thickness. Any thickness for voluntary addition is also to be clearly indicated on the plans. The midship section plan to be supplied on board the ship is to include the minimum allowable hull girder sectional properties for hold transverse section in all cargo holds)
- Previous repair history
- Cargo and ballast history
- Inspection by ship's personnel with reference to
 - structural deterioration in general
 - leakages in bulkheads and piping
 - condition of corrosion prevention system, if any
- A guidance for reporting is shown in Table III.

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

6.3.2 For tankers and bulk carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10, the Ship Construction File (SCF), limited to the items to be retained on board, is to be available on board.

6.4 Review of Documentation On Board

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

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

6.4.2.1 For the SCF stored on board ship, the surveyor is to examine the information on board ship.

In cases where any major event, including, but not limited to, substantial repair and conversion, or any modification to the ship structures, the surveyor is to also verify that the updated information is kept on board the ship.

If the updating of the SCF onboard is not completed at the time of survey, the Surveyor records it and requires confirmation at the next periodical survey.

6.4.2.2 For the SCF stored on shore archive, the surveyor is to examine the list of information included on shore archive.

In cases where any major event, including, but not limited to, substantial repair and conversion, or any modification to the ship structures, the surveyor is to also verify that the updated information is stored on shore archive by examining the list of information included on shore archive or kept on board the ship.

In addition, the surveyor is to confirm that the service contract with of the Archive Center is valid.

If the updating of the SCF Supplement ashore is not completed at the time of survey, the Surveyor records it and requires confirmation at the next periodical survey.

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

7. PROCEDURES FOR THICKNESS MEASUREMENT

7.1 General

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

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

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

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

7.2 Certification of Thickness Measurement Firm

7.2.1 The thickness measurement is to be carried out by a qualified firm certified by BCS according to principles stated in Table V.

7.3 Number and Locations of Measurements

7.3.1 Application

The item 7.3 only applies to vessels built under the BCS Common Structural Rules¹. For vessels not built under BCS- Common Structural Rules, the requirements for number and locations of measurements are according to the Rules of BCS and/or specific BCS - Rs depending on ship's age and structural elements concerned.

7.3.2 Number of measurements

Considering the extent of thickness measurements according to the different structural elements of the ship and surveys (special, intermediate and annual), the locations of the points to be measured are given for the most important items of the structure.

7.3.3 Locations of measurements

Table 1 provides explanations and/or interpretations for the application of those requirements indicated in the Rules, which refer to both systematic thickness measurements related to the calculation of global hull girder strength and specific measurements connected to close-up surveys.

Fig 4 to Fig 9 are provided to facilitate the explanations and/or interpretations given in Table 1, to show typical arrangements of single side skin bulk carriers.

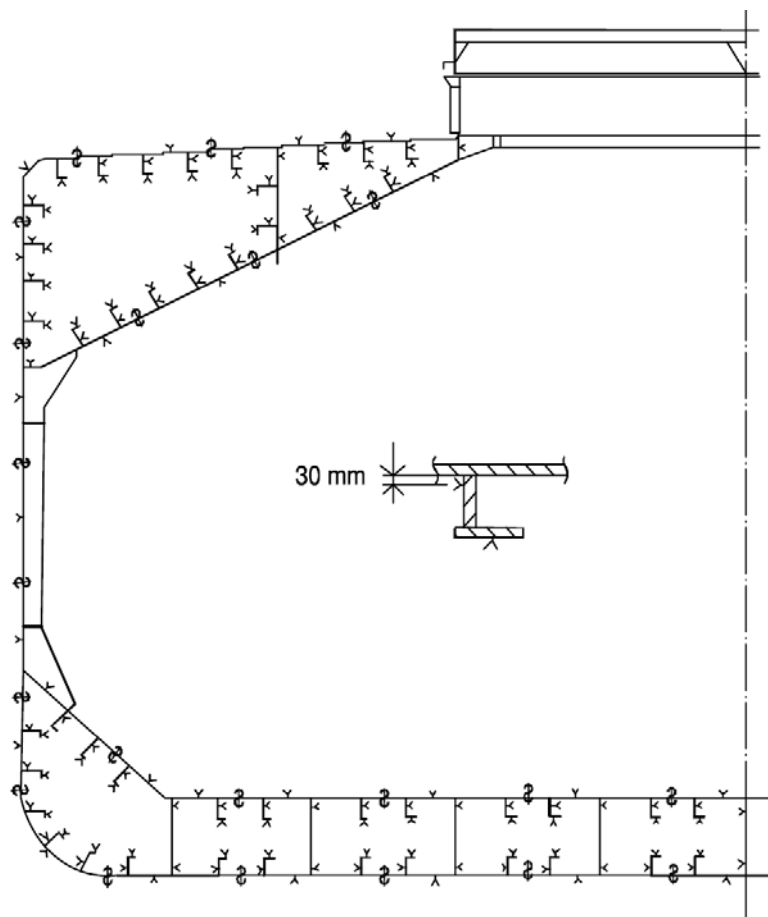
¹ BCS Common Structural Rules mean BCS Common Structural Rules for Bulk Carriers (BCS CSR for Bulk Carriers) or BCS- Common Structural Rules for Bulk Carriers and Oil Tankers (BCS CSR BC&OT).

Table 1: Interpretations of rule requirements for the locations and number of points to be measured for CSR bulk carriers (single skin)

Item	Interpretation	Figure reference
Selected plates on deck, tank top, bottom, double bottom and wind-and-water area	«Selected» means at least a single point on one out of three plates, to be chosen on representative areas of average corrosion	
All deck, tank top and bottom plates and wind-and-water strakes	At least two points on each plate to be taken either at each 1/4 extremity of plate or at representative areas of average corrosion	
Transverse section	A transverse section includes all longitudinal members such as plating, longitudinals and girders at the deck, side, bottom; inner bottom and hopper side plating, longitudinal bulkhead and bottom plating in top wing tanks.	Fig 4
All cargo hold hatch covers and coamings	Including plates and stiffeners	Locations of points are given in Fig 5
Transverse section of deck plating outside line of cargo hatch openings	Two single points on each deck plate (to be taken either at each 1/4 extremity of plate or at representative areas of average corrosion) between the ship sides and hatch coamings in the transverse section concerned	
All deck plating and underdeck structure inside line of hatch openings between cargo hold hatches	«All deck plating» means at least two points on each plate to be taken either at each 1/4 extremity of plate or at representative areas of average corrosion. “Under deck structure”: at each short longitudinal girder: three points for web plating (fwd/middle/aft), single point for face plate, one point for web plating and one point for face plating of transverse beam in way. At each ends of transverse beams, one point for web plating and one point for face plating	Extent of areas is shown in Annex II Sheet 14 Location of points are given in Fig 9

Item	Interpretation	Figure reference
Selected side shell frames in cargo holds	<p>Includes side shell frame, upper and lower end attachments and adjacent shell plating.</p> <p>25% of frames: one out of four frames should preferably be chosen throughout the cargo hold length on each side.</p> <p>50% of frames: one out of two frames should preferably be chosen throughout the cargo hold length on each side.</p> <p>«Selected frames» means at least 3 frames on each side of cargo holds</p>	<p>Extent of areas is shown in Annex II Sheet 14</p> <p>Locations of points are given in Fig 6</p>
Transverse bulkheads in cargo holds	Includes bulkhead plating, stiffeners and girders, including internal structure of upper and lower stools, where fitted. Two selected bulkheads: one is to be the bulkhead between the two foremost cargo holds and the second may be chosen in other positions	<p>Areas of measurements are shown in Annex II Sheet 14</p> <p>Locations of points are given in Fig 7</p>
One transverse bulkhead in each cargo hold	This means that the close-up survey and related thickness measurements are to be performed on one side of the bulkhead; the side is to be chosen based on the outcome of the overall survey of both sides. In the event of doubt, the Surveyor may also require (possibly partial) close-up survey on the other side	<p>Areas of measurements are shown in Annex II Sheet 14</p> <p>Locations of points are given in Fig 7</p>
Transverse bulkheads in one topside, hopper and double bottom ballast tank	<p>Includes bulkhead and stiffening systems.</p> <p>The ballast tank is to be chosen based on the history of ballasting among those prone to have the most severe conditions</p>	Locations of points are given in Fig 8

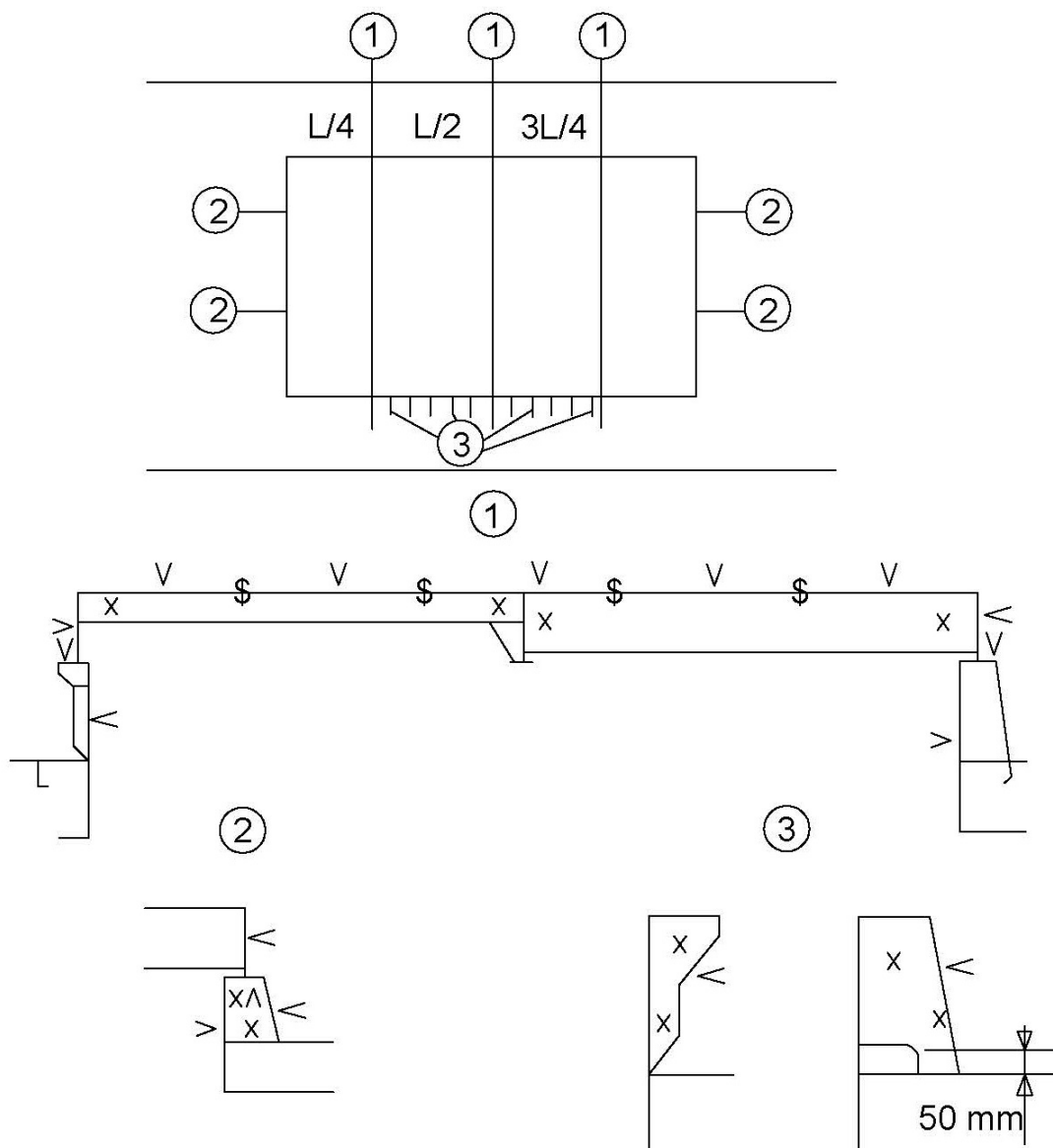
Item	Interpretation	Figure reference
Transverse webs in ballast tanks	Includes web plating, face plates, stiffeners and associated plating and longitudinals. One of the representative tanks of each type (i.e. topside or hopper or side tank) is to be chosen in the forward part	Areas of measurements are shown in Annex II Sheet 14 Locations of points are given in Fig 6



Single side bulk carriers

Note: Measurements are to be taken on both port and starboard sides of the selected transverse section.

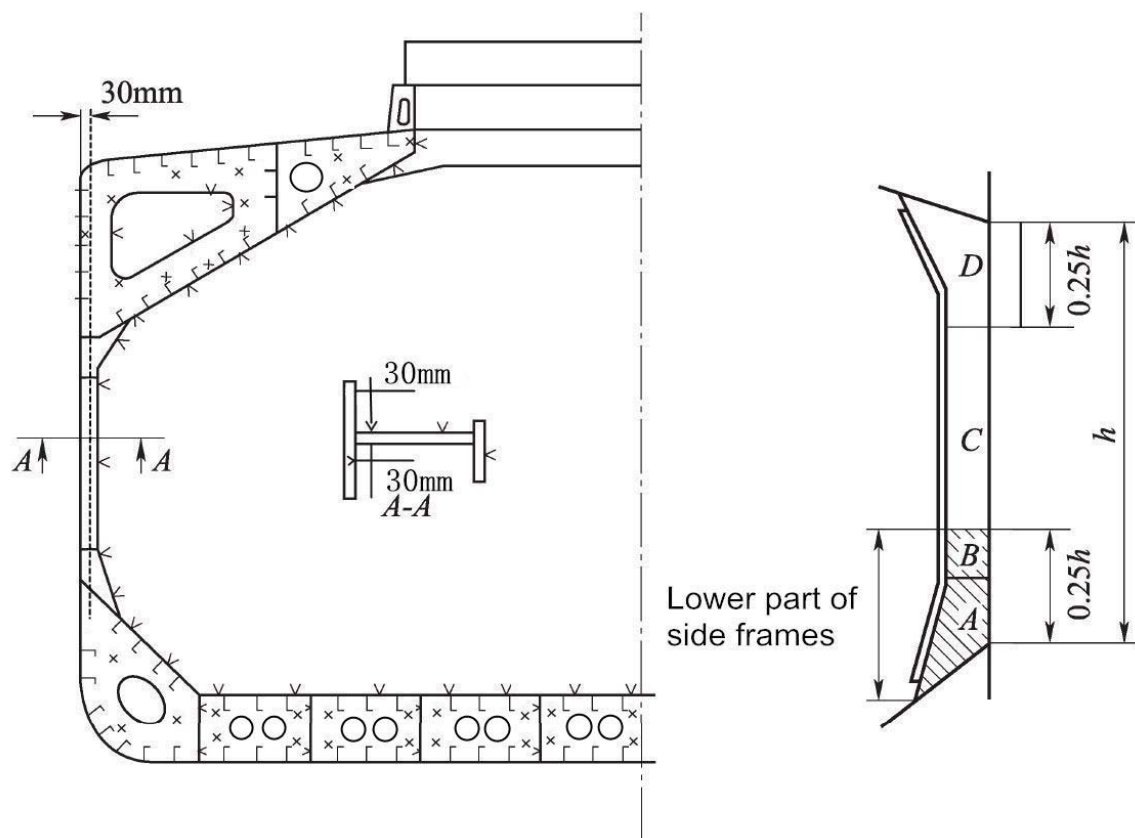
Figure 4 - Transverse section of a single skin bulk carrier



Notes:

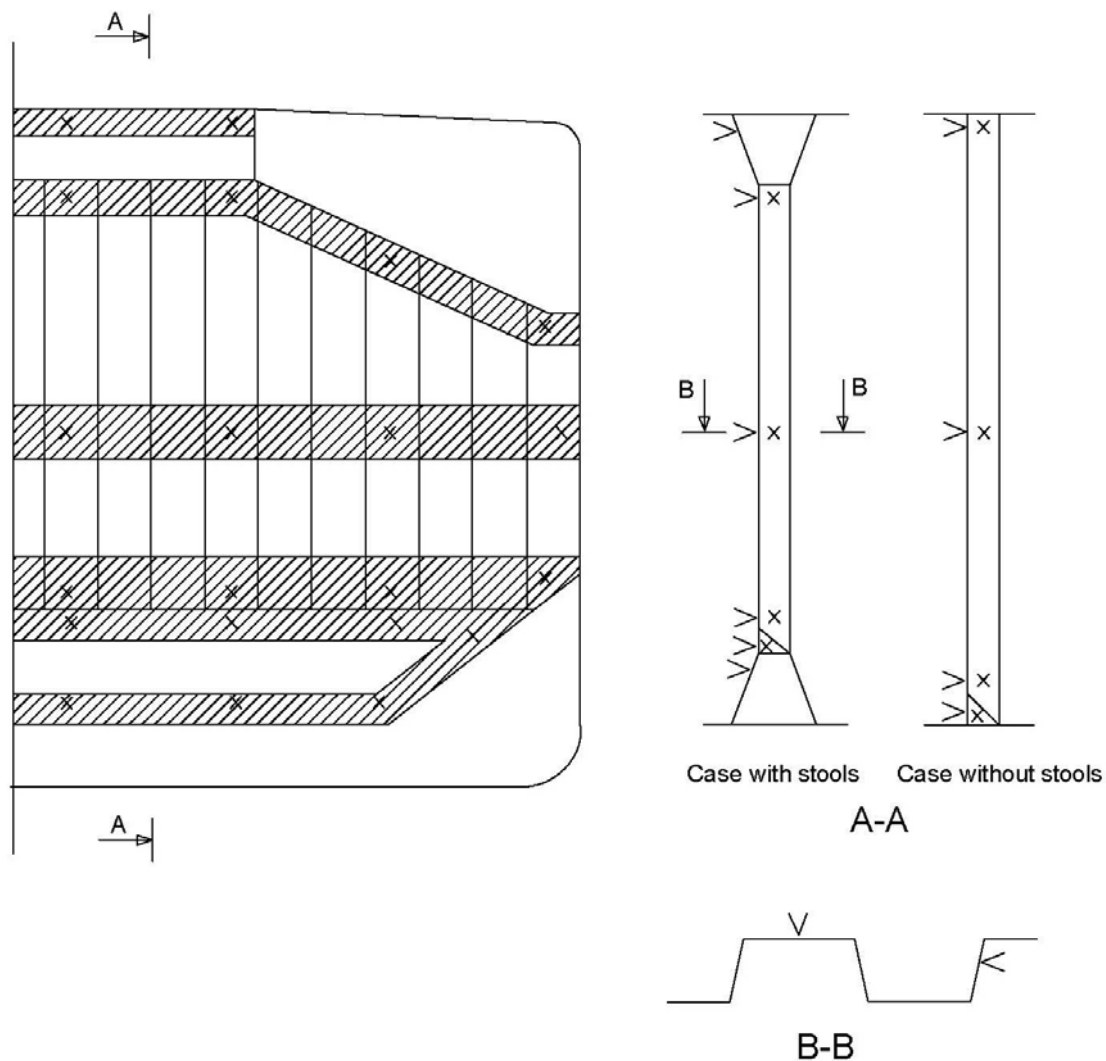
1. Three sections at $L/4$, $L/2$, $3L/4$ of hatch cover length, including:
 - one measurement of each hatch cover plate and skirt plate
 - measurements of adjacent beams and stiffeners
 - one measurement of coaming plates and coaming flange, each side
2. Measurements of both ends of hatch cover skirt plate, coaming plate and coaming flange
3. One measurement (two points for web plate and one point for face plate) of one out of three hatch coaming brackets and bars, on both sides and both ends

Figure 5 - Locations of measurements on hatch covers and coamings



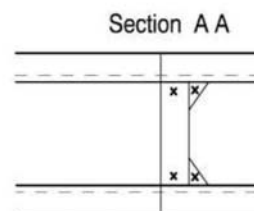
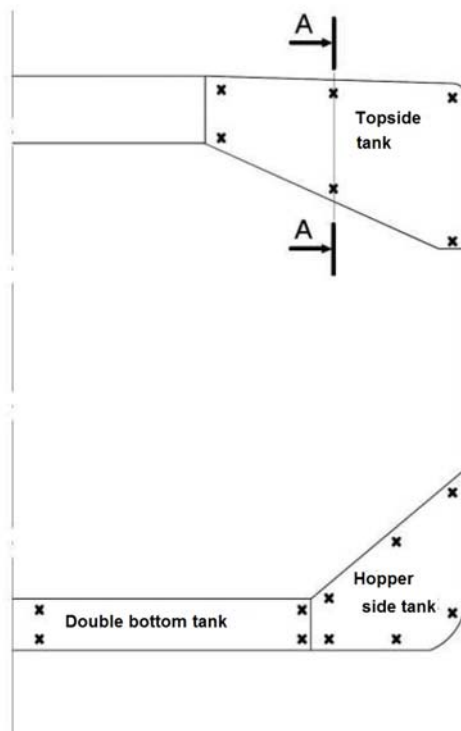
Note: The gauging pattern for web plating is to be a three point pattern for zones A, C and D, and a two point pattern for zone B (see figure). The gauging report is to reflect the average reading. The average reading is to be compared with the allowable thickness. If the web plating has general corrosion then this pattern is to be expanded to a five-point pattern.

Figure 6 - Locations of measurements on structural members in cargo holds and ballast tanks of single side skin bulk carriers



Note: Measurements to be taken in each shaded area as per views A - A and B - B

Figure 7 - Locations of measurements on cargo hold transverse bulkheads (additional measurements to internal structure of upper and lower stools to be added, e. g. two points in the upper and two points in the lower stools to be indicated in section A - A)



Note: Measurements to be taken in each vertical section as per view A - A

Figure 8 - Locations of measurements on transverse bulkheads of topside, hopper and double bottom tanks (two additional measurements to internal structure of double bottom tank to be added at midspan)

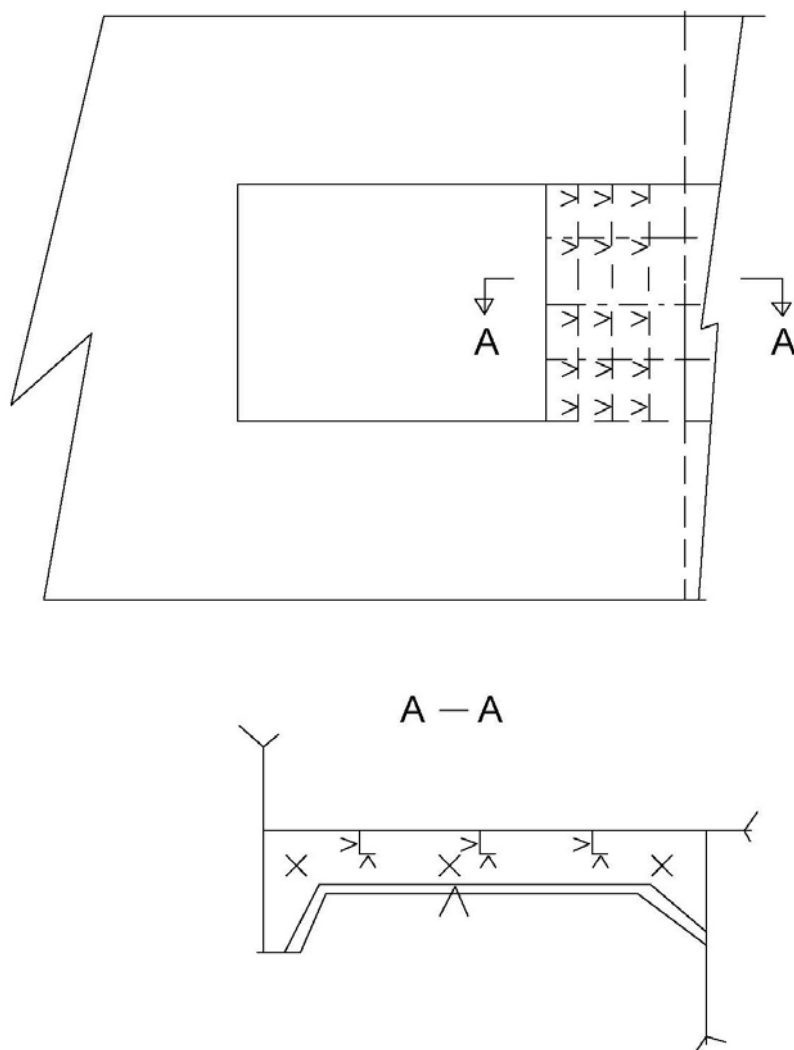


Figure 9 - Locations of measurements on underdeck structure

7.4 Reporting

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

The thickness measurement report is to follow the principles as specified in the Recommended Procedures for Thickness Measurement of Bulk Carriers, contained in Annex II.

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

8. ACCEPTANCE CRITERIA

8.1 General

8.1.1 For vessels built under BCS Common Structural Rules, the Acceptance Criteria is according to BCS Common Structural Rules¹ and as specified in 8.2, 8.3 and 8.4.

8.1.2 For vessels not built under BCS Common Structural Rules, the Acceptance Criteria are according to the Rules of BCS and/or specific BCS- Rs depending on ship's age and structural elements concerned, e.g BCS- R S18 for corrugated transverse watertight bulkheads, BCS- R S19 for the transverse watertight corrugated bulkhead between Cargo Holds Nos. 1 and 2, and BCS- R S21 for all cargo hatch covers and hatch forward and side coamings on exposed decks in position 1 (as defined in ILLC), BCS- R S31 for side shell frames, as applicable.

8.2 Acceptance criteria for pitting corrosion of CSR ships

8.2.1 Side structures

If pitting intensity in an area where coating is required, according to BCS Common Structural Rules² is higher than 15% (see Figure 1), thickness measurements are to be performed to check the extent of pitting corrosion. The 15% is based on pitting or grooving on only one side of a plate.

In cases where pitting is exceeding 15%, as defined above, an area of 300 mm or more, at the most pitted part of the plate, is to be cleaned to bare metal and the thickness is to be measured in way of the five deepest pits within the cleaned area. The least thickness measured in way of any of these pits is to be taken as the thickness to be recorded. The minimum remaining thickness in pits, grooves or other local areas is to be greater than the following without being greater than the renewal thickness (t_{ren}):

- 75% of the as-built thickness, in the frame and end brackets webs and flanges
- 70% of the as-built thickness, in the side shell, hopper tank and topside tank plating attached to the each side frame, over a width up to 30 mm from each side of it.

8.2.2 Other structures

For plates with pitting intensity less than 20%, see Figure 1, the measured thickness, t_m of any individual measurement is to meet the lesser of the following criteria:

$$t_m \geq 0.7 (t_{as-built} - t_{vol add}) \text{ mm}$$

$$t_m \geq t_{ren} - 1 \text{ mm}$$

Where:

$t_{as-built}$ As-built thickness of the member, in mm

$t_{vol add}$ Voluntary thickness addition; thickness, in mm, voluntarily added as the Owner's extra margin for corrosion wastage in addition to t_c

¹ Ch.13 of BCS CSR for Bulk Carriers, or Ch. 13, Part 1 of BCS CSR BC&OT

² Sec. 5, Ch. 3 of BCS CSR for Bulk Carriers, or Sec. 4, Ch. 3, Part 1 of BCS- CSR BC&OT

t_{ren}	Renewal thickness; minimum allowable thickness, in mm, below which renewal of structural members is to be carried out
t_C	Total corrosion addition, in mm, defined in BCS Common Structural Rules ¹
t_m	Measured thickness, in mm, on one item, i.e. average thickness on one item using the various measurements taken on this same item during periodical ship's in service surveys

The average thickness across any cross section in the plating is not to be less than the renewal criteria for general corrosion given in BCS Common Structural Rules².

8.3 Acceptance criteria for edge corrosion of CSR ships

8.3.1 Provided that the overall corroded height of the edge corrosion of the flange, or web in the case of flat bar stiffeners, is less than 25%, see Figure 2, of the stiffener flange breadth or web height, as applicable, the measured thickness, t_m , is to meet the lesser of the following criteria:

$$t_m \geq 0.7 (t_{as-built} - t_{vol add}) \text{ mm}$$

$$t_m \geq t_{ren} - 1 \text{ mm}$$

8.3.2 The average measured thickness across the breadth or height of the stiffener is not to be less than that defined in BCS Common Structural Rules².

8.3.3 Plate edges at openings for manholes, lightening holes etc. may be below the minimum thickness given in BCS Common Structural Rules² provided that:

- (a) the maximum extent of the reduced plate thickness, below the minimum given in BCS Common Structural Rules², from the opening edge is not more than 20% of the smallest dimension of the opening and does not exceed 100mm.
- (b) rough or uneven edges may be cropped-back provided that the maximum dimension of the opening is not increased by more than 10% and the remaining thickness of the new edge is not less than $t_{ren} - 1 \text{ mm}$.

8.4 Acceptance criteria for grooving corrosion of CSR ships

8.4.1 Where the groove breadth is a maximum of 15% of the web height, but not more than 30mm, see Figure 3, the measured thickness, t_m , in the grooved area is to meet the lesser of the following criteria:

$$t_m \geq 0.75 (t_{as-built} - t_{vol add}) \text{ mm}$$

$$t_m \geq t_{ren} - 0.5 \text{ mm}$$

but is not to be less than

$$t_m = 6 \text{ mm}$$

¹ Sec. 3, Ch. 3 of BCS CSR for Bulk Carriers, or Sec. 3, Ch. 3, Part 1 of BCS CSR BC & OT ² Ch. 13 of BCS CSR for Bulk Carriers, or Ch. 13, Part 1 of BCS CSR BC & OT

8.4.2 Structural members with areas of grooving greater than those in 8.4.1 above are to be assessed based on the criteria for general corrosion as defined in BCS Common Structural Rules¹ using the average measured thickness across the plating/stiffener.

¹ Ch. 13 of BCS CSR for Bulk Carriers, or Ch. 13, Part 1 of BCS CSR BC & OT

9. REPORTING AND EVALUATION OF SURVEY

9.1 Evaluation of Survey Report

9.1.1 The data and information on the structural condition of the vessel collected during the survey is to be evaluated for acceptability and continued structural integrity of the vessel.

9.1.1.1 For CSR bulk carriers, the ship's longitudinal strength is to be evaluated by using the thickness of structural members measured, renewed and reinforced, as appropriate, during the special surveys carried out after the ship reached 15 years of age (or during the special survey no. 3, if this is carried out before the ship reaches 15 years) in accordance with the criteria for longitudinal strength of the ship's hull girder for CSR bulk carriers specified in BCS Common Structural Rules¹.

9.1.1.2 The final result of evaluation of the ship's longitudinal strength required in 9.1.1.1, after renewal or reinforcement work of structural members, if carried out as a result of initial evaluation, is to be reported as a part of the Executive Hull Summary.

9.2 Reporting

9.2.1 Principles for survey reporting are shown in table VI.

9.2.2 When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items examined and / or tested (pressure testing, thickness measurements etc.) and an indication of whether the item has been credited, are to be made available to the next attending surveyor(s), prior to continuing or completing the survey.

9.2.3 An Executive Hull Summary of the survey and results is to be issued to the Owner as shown in table VII and placed on board the vessel for reference at future surveys. The Executive Hull Summary is to be endorsed by BCS's head office or regional managerial office.

¹ Ch. 13 of BCS CSR for Bulk Carriers, or Ch. 13, Part 1 of BCS CSR BC & OT

TABLE I

**TABLE OF MINIMUM REQUIREMENT FOR CLOSE-UP SURVEY AT
SPECIAL HULL SURVEYS OF BULK CARRIERS**

Special Survey No. 1 Age ≤ 5	Special Survey No. 2 5 < Age ≤ 10	Special Survey No. 3 10 < Age ≤ 15	Special Survey No. 4 and Subsequent Age > 15
(A) - 25% of shell frames in the forward cargo hold at representative positions.	(A) - All shell frames in the forward cargo hold and 25% of shell frames in each of the remaining cargo holds, including upper and lower end attachments and adjacent shell plating. For Bulk Carriers 100,000 DWT and above, all shell frames in the forward cargo hold and 50% of shell frames in each of the remaining cargo holds, including upper and lower end attachments and adjacent shell plating.	(A) - All shell frames in the forward and one other selected cargo hold and 50% of frames in each of the remaining cargo holds, including upper and lower end attachments and adjacent shell plating.	(A) - All shell frames in all cargo holds including upper and lower end attachments and adjacent shell plating.
(A) - Selected frames in remaining cargo holds.			Areas (B) - (E) as for Special Survey No. 3
(B) - One transverse web with associated plating and longitudinals in two representative water ballast tanks of each type (i.e. topside, or hopper side tank).		(B) - All transverse webs with associated plating and longitudinals in each water ballast tank.	
(C) - Two selected cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted.		(B) - All transverse bulkheads in ballast tanks, including stiffening system.	
(D) - All cargo hold hatch covers and coamings (plating and stiffeners).	(B) - One transverse web with associated plating and longitudinals in each water ballast tank.	Areas (C), (D) and (E) as for Special Survey No. 2	
	(B) - Forward and aft transverse bulkhead in one ballast tank, including stiffening system.		
	(C) - All cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted.		
	(D) - All cargo hold hatch covers and coamings (plating and stiffeners).		
	(E) - All deck plating and under deck structure inside line of hatch openings between all cargo hold hatches.		

(A) - Cargo hold transverse frames

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

(C) - Cargo hold transverse bulkheads plating, stiffeners and girders

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

(E) - Deck plating and under deck structure inside line of hatch openings between cargo hold hatches

See sketches of sheet 14 for the areas corresponding to (A), (B), (C), (D) and (E)

See also sketch in Annex V for zones of side shell frames for ships subject to compliance with BCS- R S31

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 tanks.

TABLE II

**MINIMUM REQUIREMENTS FOR THICKNESS MEASUREMENTS AT SPECIAL HULL
SURVEY OF BULK CARRIERS**

Special Survey No. 1 Age ≤ 5	Special Survey No. 2 5 < Age ≤ 10	Special Survey No. 3 10 < Age ≤ 15	Special Survey No. 4 and Subsequent Age > 15
Suspect areas	Suspect areas	Suspect areas	Suspect areas
	Within the cargo length: Two transverse sections of deck plating outside line of cargo hatch openings	Within the cargo length: - each deck plate outside line of cargo hatch openings - two transverse sections, one in the amidship area, outside line of cargo hatch openings - all wind and water strakes	Within the cargo length: - each deck plate outside line of cargo hatch openings - three transverse sections, one in the amidship area, outside line of cargo hatch openings - each bottom plate
	Wind and water strakes in way of the two transverse sections considered above Selected wind and water strakes outside the cargo length area	Selected wind and water strakes outside the cargo length area	All wind and water strakes, full length
	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close- up survey according to Table I	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close- up survey according to Table I	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I
		See 1.1.4 and Annex III for additional thickness measurement guidelines applicable to the vertically corrugated transverse watertight bulkhead between cargo hold Nos. 1 and 2 on ships subject to compliance with BCS- Rs S19 and S23.	See 1.1.4 and Annex III for additional thickness measurement guidelines applicable to the vertically corrugated transverse watertight bulkhead between cargo hold Nos. 1 and 2 on ships subject to compliance with BCS- Rs S19 and S23.
	See 1.1.5 and Annex V for additional thickness measurement guidelines applicable to the side shell frames and brackets on ships subject to compliance with BCS-RS31.	See 1.1.5 and Annex V for additional thickness measurement guidelines applicable to the side shell frames and brackets on ships subject to compliance with BCS-RS31.	See 1.1.5 and Annex V for additional thickness measurement guidelines applicable to the side shell frames and brackets on ships subject to compliance with BCS-S31.

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TABLE IV

PRINCIPLES FOR PLANNING DOCUMENT

Note: Table IV is superseded by Annex I: Guidelines for Technical Assessment in conjunction with planning for Enhanced Surveys of Bulk Carriers Special Survey - Hull.

TABLE V

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

1. Application

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

2. Procedures for Certification

(1) Submission of Documents:

Following documents are to be submitted to BCS for approval:

- a) Outline of firms, e.g. organisation and management structure.
- b) Experiences of the firms on thickness measurement inter alia of hull structures of the vessels.
- c) Technicians careers, i.e. experiences of technicians as thickness measurement operators, technical knowledge of hull structure etc. Operators, are to be qualified according to a recognized industrial NDT Standard.
- d) Equipment used for thickness measurement such as ultra-sonic testing machines and its maintenance/calibration procedures.
- e) A guide for thickness measurement operators.
- f) Training programmes of technicians for thickness measurement.
- g) Measurement record format in accordance with the Recommended Procedures for Thickness Measurements of Bulk Carriers, contained in Annex II.

(2) Auditing of the firms:

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

(3) Certification is conditional on an onboard demonstration at thickness measurements as well as satisfactory reporting.

3. Certification

(1) Upon satisfactory results of both the audit of the firm in 2(2) and the demonstration tests in 2(3) above, BCS will issue a Certificate of Approval as well as a notice to the effect that the thickness measurement operation system of the firm has been certified by BCS.

(2) Renewal/endorsement of the Certificate is to be made at intervals not exceeding 3 years by verification that original conditions are maintained.

4. Information of any alteration to the Certified Thickness Measurement Operation System

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

5. Cancellation of Approval

Approval may be cancelled in the following cases:

- (1) Where the measurements were improperly carried out or the results were improperly reported.
- (2) Where BCS's surveyor found any deficiencies in the approved thickness measurement operation systems of the firm.
- (3) Where the firm failed to inform of any alteration in 4 above to BCS.

TABLE VI

SURVEY REPORTING PRINCIPLES

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

1. General

1.1 A survey report is to be generated in the following cases:

- In connection with commencement, continuation and / or completion of periodical hull surveys, i.e. annual, intermediate and special surveys, as relevant
- When structural damages / defects have been found
- When repairs, renewals or modifications have been carried out
- When condition of class has been imposed or deleted

1.2 The purpose of reporting is to provide:

- Evidence that prescribed surveys have been carried out in accordance with applicable classification rules
- Documentation of surveys carried out with findings, repairs carried out and condition of class imposed or deleted
- Survey records, including actions taken, which shall form an auditable documentary trail. Survey reports are to be kept in the survey report file required to be on board
- Information for planning of future surveys
- Information which may be used as input for maintenance of classification rules and instructions

1.3 When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items surveyed, relevant findings and an indication of whether the item has been credited, 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 of 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 is to include a confirmation with description of individual structural members corresponding to the extent of requirements stipulated in BCS- R Z10. 2 based on type of periodical survey and the ship's age.

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

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 are to 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:

- Examination including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been carried out
- 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).

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

- Identification of findings, such as:
 - Corrosion with description of location, type and extent
 - Areas with substantial corrosion
 - Cracks / fractures with description of location and extent
 - Buckling with description of location and extent
 - Indents with description of location and extent
- Identification of compartments where no structural damages / defects are found

The report may be supplemented by sketches / photos.

3.3 Thickness measurement report is to be verified and signed by the surveyor controlling the measurements on board.

4. Actions taken with respect to findings

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

4.2 Repairs carried out are to be reported with identification of:

- Compartment
- Structural member
- Repair method (i.e. renewal or modification) including:
 - steel grades and scantlings (if different from the original);
 - sketches/photos, as appropriate;
- Repair extent

- NDT / Tests

4.3 For repairs not completed at the time of survey, condition of class is to be imposed with a specific time limit for the repairs. In order to provide correct and proper information to the surveyor attending for survey of the repairs, condition of class is to be sufficiently detailed with identification of each item to be repaired. For identification of extensive repairs, reference may be given to the survey report.

TABLE VII (i)

**IACS UNIFIED REQUIREMENTS FOR ENHANCED SURVEYS
EXECUTIVE HULL SUMMARY**

Issued upon Completion of Special Survey

GENERAL PARTICULARS

SHIP'S NAME:

CLASS IDENTIFY NUMBER:

IMO IDENTIFY NUMBER:

PORT OF REGISTRY:

NATIONAL FLAG:

DEADWEIGHT (M. TONNES):

GROSS TONNAGE:

NATIONAL:

ITC (69):

DATE OF BUILD:

CLASSIFICATION NOTATION:

DATE OF MAJOR CONVERSION:

TYPE OF CONVERSION:

- a) The survey reports and documents listed below have been reviewed by the undersigned and found to be satisfactory
- b) A summary of the survey is attached herewith on sheet 2
- c) The hull special survey has been completed in accordance with the Regulations on [date]

Executive Summary Report completed by:	Name Signature	Title
OFFICE	DATE	
Executive Summary Report verified by:	Name Signature	Title
OFFICE	DATE	

Attached reports and documents:

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)

TABLE VII (ii)
EXECUTIVE HULL SUMMARY

- | | | | |
|----|-------------------------------------|---------------------------|--|
| A) | General Particulars: | - | Ref.Table VII (i) |
| B) | Report Review: | - | Where and how survey was done |
| C) | Close-up Survey: | - | Extent (Which tanks) |
| D) | Thickness measurements: | - | Reference to Thickness Measurement report |
| | | - | Summary of where measured |
| | | - | Separate form indicating the tanks/areas with Substantial Corrosion, and corresponding |
| | | - | Thickness diminution |
| | | - | Corrosion pattern |
| E) | Tank Protection: | Separate form indicating: | |
| | | - | Location of coating |
| | | - | Condition of coating (if applicable) |
| F) | Repairs: | - | Identification of tanks/areas |
| G) | Condition of Class/Recommendations: | | |
| H) | Memoranda: | - | Acceptable defects |
| | | - | Any points of attention for future surveys, e.g. for Suspect Areas. |
| | | - | Extended Annual/Intermediate survey due to coating breakdown |
| I) | Conclusion: | - | Statement on evaluation/verification of survey report |

TABLE VII (iii) A – non CSR vessels

EXTRACT OF THICKNESS MEASUREMENT

Reference is made to the thickness measurements report:

1) Position of substantially corroded Tanks/Areas or Areas with deep pitting	Thickness diminution[%]	2) Corrosion pattern	Remarks: e.g. Ref. attached sketches

Remarks

- 1) Substantial corrosion, i.e. 75 – 100% of acceptable margins wasted.
- 2) P = Pitting
C = Corrosion in General
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 1/3 or more of actual plate thickness is to be noted.

TABLE VII (iii) B – CSR vessels
EXTRACT OF THICKNESS MEASUREMENTS

Reference is made to the thickness measurements report:

1) Position of substantially corroded Tanks/Areas or Areas with deep pitting	$t_m - t_{ren}$ (mm)	2) Corrosion pattern	Remarks: e.g. Ref. Attached sketches

Remarks

- 1) Substantial corrosion, an extent of corrosion such that the assessment of the corrosion pattern indicates a measured thickness between $t_{ren} + 0.5\text{mm}$ and t_{ren} .
- 2) P = Pitting
C = Corrosion in General
Areas with deep pitting assessed according to 8.2 are to be recorded in this column.

TABLE VII (iv)
TANK PROTECTION

1) Tank/hold Nos.	2) Tank/hold protection	3) Coating condition	Remarks

Remarks:

- 1) All ballast tanks and cargo holds to be listed.
- 2) C = Coating NP = No Protection
- 3) Coating condition according to the following standard

GOOD condition with only minor spot rusting.

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

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

If coating condition "**POOR**" is given, extended annual surveys are to be introduced. This is to be noted in part H) of the Executive Hull Summary.

TABLE VIII
Sheet 1

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENT AT THOSE
AREAS OF SUBSTANTIAL CORROSION
SPECIAL SURVEY OF BULK CARRIERS WITHIN THE CARGO AREA**

SHELL STRUCTURES

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1. Bottom and Side Shell plating	a. Suspect plate, plus four adjacent plates b. See other tables for particulars on gauging in way of tanks and cargo holds	a. 5 point pattern for each panel between longitudinals
2. Bottom/Side Shell longitudinals	Minimum of three longitudinals in way of suspect areas	3 measurements in line across web 3 measurements on flange

TABLE VIII
Sheet 2

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENT AT THOSE
AREAS OF SUBSTANTIAL CORROSION
SPECIAL SURVEY OF BULK CARRIERS WITHIN THE CARGO AREA**

TRANSVERSE BULKHEADS IN CARGO HOLDS

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1. Lower Stool	a. Transverse band within 25mm of welded connection to inner bottom b. Transverse band within 25 mm of welded connection to shelf plate	a. 5 point between stiffeners over 1 metre length b. Ditto
2. Transverse Bulkhead	a. Transverse band at approximately mid height b. Transverse band at part of bulkhead adjacent to upper deck or below upper stool shelf plate (for those ships fitted with upper stools)	a. 5 point pattern over 1 sq. metre of plating b. 5 point pattern over 1 sq. metre of plating

TABLE VIII
Sheet 3

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENT AT THOSE
AREAS OF SUBSTANTIAL CORROSION
SPECIAL SURVEY OF BULK CARRIERS WITHIN THE CARGO AREA**

**DECK STRUCTURE INCLUDING CROSS STRIPS, MAIN CARGO HATCHWAYS, HATCH
COVERS, COAMINGS AND TOPSIDE TANKS**

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1. Cross Deck Strip plating	Suspect cross deck strip plating	a. 5 point pattern between underdeck stiffeners over 1 metre length
2. Underdeck Stiffeners	a. Transverse members	a. 5 point pattern at each end and mid span
	b. Longitudinal member	b. 5 point pattern on both web and flange
3. Hatch Covers	a. Side and end skirts, each 3 locations	a. 5 point pattern at each location
	b. 3 longitudinal bands outboard strakes (2) and centreline strake (1)	b. 5 point measurement each band
4. Hatch Coamings	Each side and end coaming, one band lower 1/3, one band upper 2/3 of coaming	5 point measurement each band i.e. end or side coaming
5. Topside Water Ballast Tanks	a. Watertight transverse bulkheads	
	i. lower 1/3 of bulkhead	i. 5 point pattern over 1 sq. metre of plating
	ii. upper 2/3 of bulkhead	ii. 5 point pattern over 1 sq. metre of plating
	iii. stiffeners	iii. 5 point pattern over 1 metre length
	b. 2 representative swash transverse bulkheads	
	i. lower 1/3 of bulkhead	i. 5 point pattern over 1 sq. metre of plating
	ii. upper 2/3 of bulkhead	ii. 5 point pattern over 1 sq. metre of plating
	iii. stiffeners	iii. 5 point pattern over 1 metre length
	c. 3 representative bays of slope plating	
	i. lower 1/3 of tank	i. 5 point pattern over 1 sq. metre of plating
	ii. upper 2/3 of tank	ii. 5 point pattern over 1 sq. metre of plating
	d. Longitudinals, suspect and adjacent	d. 5 point pattern both web and flange over 1 metre length
6. Main Deck Plating	Suspect plates and adjacent (4)	5 point pattern over 1 sq. metre of plating
7. Main Deck Longitudinals	Minimum of 3 longitudinals where plating measured	5 point pattern on both web and flange over 1 metre length
8. Web frames/Transverses	Suspect plates	5 point pattern over 1 sq. metre

TABLE VIII
Sheet 4

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENT AT THOSE
AREAS OF SUBSTANTIAL CORROSION
SPECIAL SURVEY OF BULK CARRIERS WITHIN THE CARGO AREA**

DOUBLE BOTTOM AND HOPPER STRUCTURE

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1. Inner/Double Bottom Plating	Suspect plate plus all adjacent plates	5 point pattern for each panel between longitudinals over 1 metre length
2. Inner/Double Bottom Longitudinals	Three longitudinals where plates measured	+3 measurements in line across web and 3 measurements on flange
3. Longitudinal Girders or Transverse floors	b. Suspect plates	b. 5 point pattern over about 1 sq. metre
4. Watertight Bulkheads (WT Floors)	a. lower 1/3 of tank	a. 5 point pattern over 1 sq. metre of plating
	b. upper 2/3 of tank	b. 5 point pattern alternate plates over 1 sq. metre of plating
5. Web Frames	Suspect plate	5 point pattern over 1 sq. metre of plating
6. Bottom/side shell longitudinals	Minimum of three longitudinals in way of suspect areas	3 measurements in line across web 3 measurements on flange

TABLE VIII
Sheet 5

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENT AT THOSE
AREAS OF SUBSTANTIAL CORROSION
SPECIAL SURVEY OF BULK CARRIERS WITHIN THE CARGO AREA**

CARGO HOLDS

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1. Side Shell frames	Suspect frame and each adjacent	a. At each end and mid span: 5 point pattern of both web and flange b. 5 point pattern within 25 mm of welded attachment to both shell and lower slope plate

ANNEX I

GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH PLANNING FOR ENHANCED SURVEYS OF BULK CARRIERS SPECIAL SURVEY - HULL

Contents:

1. INTRODUCTION
2. PURPOSE AND PRINCIPLES
 - 2.1 Purpose
 - 2.2 Minimum Requirements
 - 2.3 Timing
 - 2.4 Aspects to be Considered
3. TECHNICAL ASSESSMENT
 - 3.1 General
 - 3.2 Methods
 - 3.2.1 Design Details
 - 3.2.2 Corrosion
 - 3.2.3 Locations for Close-up Survey and Thickness Measurement

REFERENCES

1. BCS- R Z10.2, "Hull Surveys of Bulk Carriers."
- 2.TSCF, "Guidance Manual for the Inspection and Condition Assessment of Tanker Structures, 1986."
- 3.TSCF, "Condition Evaluation and Maintenance of Tanker Structures, 1992."
4. IACS, "Bulk Carriers: Guidelines for Surveys, Assessment and Repair of Hull Structures, 1994."

1. INTRODUCTION

These guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of enhanced special surveys of bulk carriers. As indicated in section 5.1.5 of BCS- R Z10.2, "Hull Surveys of Bulk Carriers," (Ref. 1), the guidelines are a recommended tool which may be invoked at the discretion of BCS, 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.

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

2.2 Minimum Requirements

However, these guidelines may not be used to reduce the requirements pertaining to thickness measurement, close-up survey and tank testing contained in Tables I, II and paragraph 2.5, respectively, of BCS- R Z10.2; which are, in all cases, to be complied with as a minimum.

2.3 Timing

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

2.4 Aspects to be Considered

Technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of holds, tanks and areas for survey:

- *Design features such as stress levels on various structural elements, design details and extent of use of high tensile steel.

- *Former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available.

- *Information with respect to types of cargo carried, protection of tanks, and condition of coating, if any, of holds and tanks.

Technical assessments of the relative risks of susceptibility to damage or deterioration of various structural elements and areas are to be judged and decided on the basis of recognized principles and practices, such as may be found in the publication "Bulk Carriers: Guidelines for Surveys, Assessment and Repair of Hull Structure," (Ref. 4).

3. TECHNICAL ASSESSMENT

3.1 General

There are three basic types of possible failure which may be the subject of technical assessment in connection with planning of surveys; corrosion, cracks and buckling. Contact damages are not normally covered by the survey plan since indents are usually noted in memoranda and assumed to be dealt with as a normal routine by Surveyors.

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

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

The design is to be considered with respect to structural details which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue. Corrosion is related to the ageing process, and is closely connected with the quality of corrosion protection at newbuilding, and subsequent maintenance during the service life. Corrosion may also lead to cracking and/or buckling.

3.2 Methods

3.2.1 Design Details

Damage experience related to the ship in question and similar ships, where available, is the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings is to be included.

Typical damage experience to be considered will consist of:

- Number, extent, location and frequency of cracks.
- Location of buckles.

This information may be found in the survey reports and/or the Owner's files, including the results of the Owner's own inspections. The defects are to be analyzed, noted and marked on sketches.

In addition, general experience is to be utilized. For example, Figure 2 shows typical locations in bulk carriers which experience has shown may be susceptible to structural damage. Also, reference is to be made to "Bulk Carriers: Guidelines for Survey, Assessment and Repair," (Ref. 4) which contains a catalogue of typical damages and proposed repair methods for various bulk carrier structural details.

Such figures are to be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage. An example is shown in Figure 3.

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

The use of high tensile steel (HTS) is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favorable, e.g. side structures.

In this respect, stress calculations of typical and important components and details, in accordance with the latest Rules or other relevant methods, may prove useful and are to be considered.

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

3.2.2 Corrosion

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

- Usage of Tanks, Holds and Spaces
- Condition of Coatings
- Cleaning Procedures
- Previous Corrosion Damage
- Ballast use and time for Cargo Holds
- Risk of Corrosion in Cargo Holds and Ballast Tanks
- Location of Ballast Tanks Adjacent to Heated Fuel Oil Tanks

Ref. 3 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

For bulk carriers, Ref. 4 is to be used as the basis for the evaluation, together with relevant information on the anticipated condition of the ship as derived from the information collected in order to prepare the Survey Programme and the age of the ship.

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

3.2.3 Locations for Close-up Survey and Thickness Measurement

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

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

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

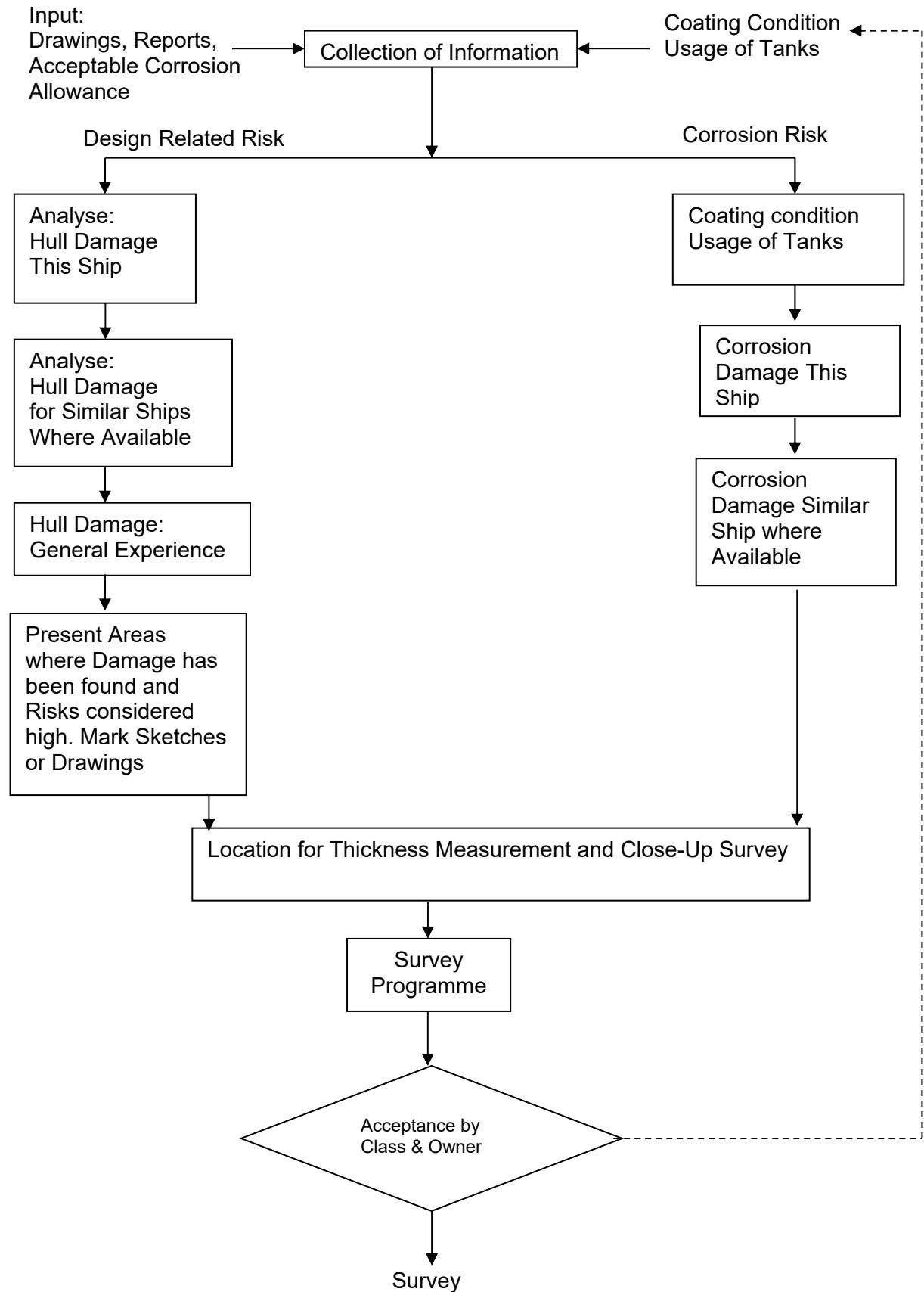


Figure 1: Technical Assessment & the Survey Planning Process

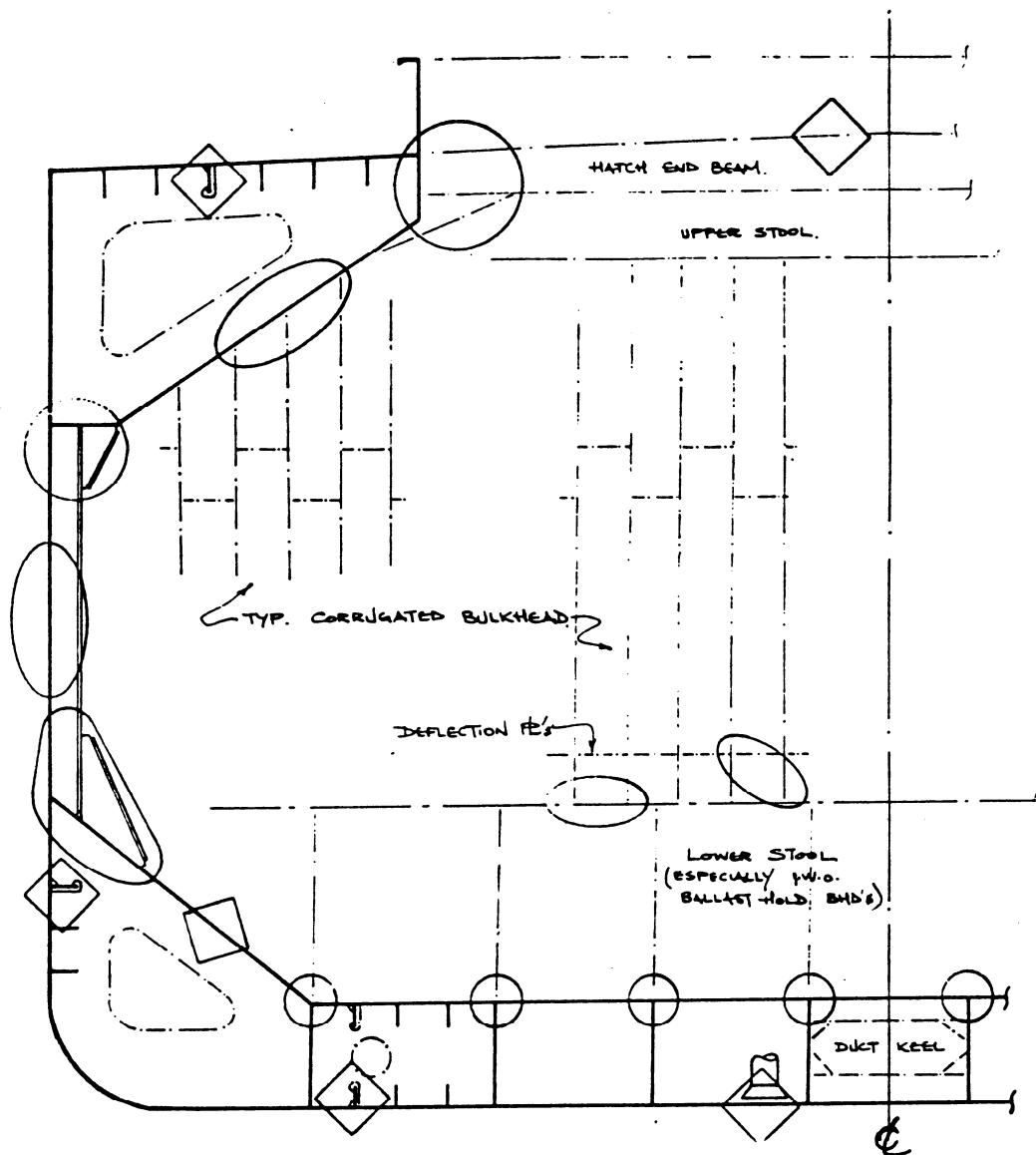


Figure 2: Typical Locations Susceptible to Structural Damage or Corrosion

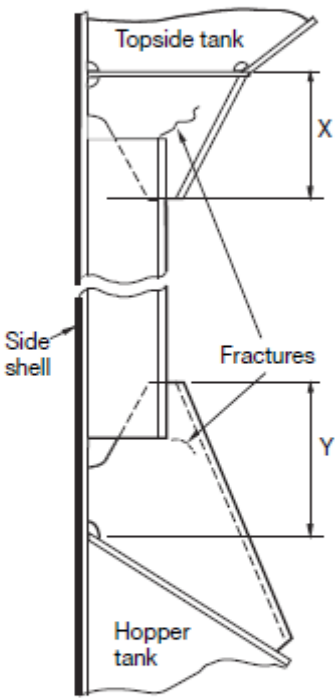
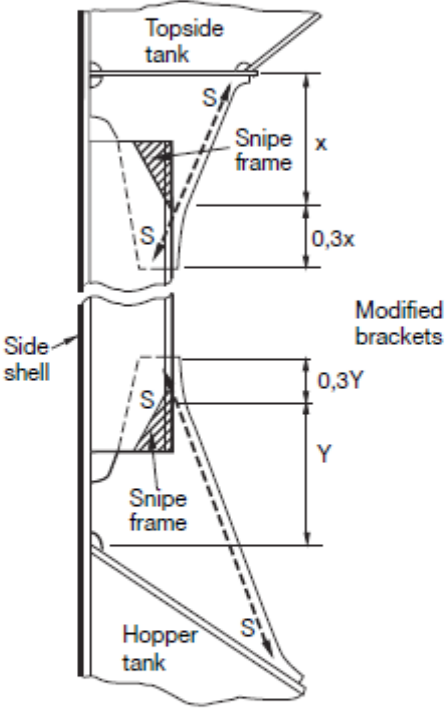
AREA 1	Structural item	Side shell frames and end brackets (separate bracket configuration)	EXAMPLE 1
Detail of damage		Fractures in brackets at termination of frame	
Sketch of damage		Sketch of repair	
 <p>Separate Bracket Configuration</p> <p>32715/04</p>		 <p>S = Sniped end</p>	
Notes on possible cause of damage 1. This type of damage is due to stress concentration.		Notes on repairs 1. For small fractures e.g. hairline fractures, the fracture can be 'veed' out, welded up, ground and examined by NDT for fractures. 2. For larger/ significant fractures consideration is to be given to cropping and partly renewing/ renewing the frame brackets. If renewing the brackets, ends of frames can be sniped to soften them. 3. If felt prudent, soft toes are to be incorporated at the boundaries of the bracket to the wing tanks. 4. Attention to be given to the structure in wing tanks in way of the extended bracket arm i.e. reinforcement provided in line with the bracket arm.	

Figure 3: Typical Damage and Repair Example (Reproduced from Ref: 4)

ANNEX II

Sheet 1

RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS OF BULK CARRIERS*

*

Note: Annex II is recomendatory.

-
1. This document is to be used for recording thickness measurements as required by BCS- R Z10.2.
 2. Reporting forms TM1-BC, TM2-BC, TM3-BC, TM4-BC, TM5-BC, TM6-BC and TM7-BC (sheets 4-11) are to be used for recording thickness measurements and the maximum allowable diminution is to be stated.
The maximum allowable diminution could be stated in an attached document.
 3. The remaining sheets 12-14 are guidance diagrams and notes relating to the reporting forms and BCS Requirements for thickness measurement.
 4. The reporting forms shall where appropriate, be supplemented by data presented on structural sketches.

CONTENTS

Sheet 2

- Sheet 1 - Front cover
- Sheet 2 - Contents
- Sheet 3 - General particulars

REPORTS

- Sheet 4 - Report TM1-BC for recording the thickness measurement of all deck plating, all bottom shell plating and side shell plating.
- Sheet 5 - Report TM2-BC (i) for recording the thickness measurement of shell and deck plating at transverse sections - strength deck and sheerstrake plating.
- Sheet 6 - Report TM2-BC (ii) for recording the thickness measurement of shell and deck plating at transverse sections - shell plating.
- Sheet 7 - Report TM3-BC for recording the thickness measurement of longitudinal members at transverse sections.
- Sheet 8 - Report TM4-BC for recording the thickness measurement of transverse structural members.
- Sheet 9 - Report TM5-BC for recording the thickness measurement of cargo hold transverse bulkheads.
- Sheet 10 - Report TM6-BC for recording the thickness measurement of miscellaneous structural members.
- Sheet 11 - Report TM7-BC for recording the thickness measurement of cargo hold transverse frames.
- Sheet 11 bis - Report TM7-BC S31 for recording thickness measurement of cargo hold side shell frames under BCS- R S31.

GUIDANCE

- Sheet 12 - Bulk Carrier typical transverse section. The diagram includes details of the items to be measured and the report forms to be used.
- Sheet 13 - Transverse section outline. This diagram may be used for those ships where the diagram on sheet 12 is not suitable.
- Sheet 14 - Sketches of bulk carrier showing typical areas for thickness measurement of cargo hold frames, structural members and transverse bulkheads in association with close-up survey requirements.

GENERAL PARTICULARS

Ship's name:-

IMO number:-

Class identity number:-

Port of registry:-

Gross tons:-

Deadweight:-

Date of build:-

Classification Society:-

Name of Firm performing thickness measurement:-

Thickness measurement firm certified by:-

Certificate No:-

Certificate valid from.....to.....

Place of measurement:-

First date of measurement:-

Last date of measurement:-

Special survey/intermediate survey due:-*

Details of measurement equipment:-

Qualification of operators:-

Report Number:-

consisting of Sheets

Names of operator:-.....

Name of surveyor:-.....

Signature of operator:-.....

Signature of surveyor:-.....

Firm official stamp:-

Classification Society
Official Stamp:-

* Delete as appropriate

TM1-BC

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

(* - delete as appropriate)

Sheet 4

Ship's name.....

Class Identity No.

Report No.

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

Operators Signature.....

NOTES – See Reverse

NOTES

1. This report is to be used for recording the thickness measurement of:-
 - A - All strength deck plating within cargo length area.
 - B - Keel, bottom shell plating and bilge plating within the cargo length area.
 - C - Side shell plating that is all wind and water strakes within the cargo length area.
 - D - Side shell plating that is selected wind and water strakes outside the cargo length area.
2. The strake position is to be cleared indicates as follows:-
 - 2.1 For strength deck indicate the number of the strake of plating inboard from the stringer plate.
 - 2.2 For bottom plating indicate the number of the strake of plating outboard from the keel plate.
 - 2.3 For side shell plating give number of the strake of plating sheerstrake and letter as shown on shell expansion.
3. Only the deck plating strakes outside line of openings are to be recorded.
4. Measurements are to be taken at the forward and aft areas of all plates and the single measurements recorded are to represent the average of multiple measurements.
5. The maximum allowable diminution could be stated in an attached document.

TM2-BC (I)

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

Sheet 5

Ship's name.....

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									
STRAKE POSITION	No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S	
		mm	mm	P	S	mm	%	mm	%		mm	mm	P	S	mm	%	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																											
sheer strake																											
TOPSIDE TOTAL																											

Operators Signature.....

NOTES – See Reverse

NOTES

1. This report is to be used for recording the thickness measurement of:-
Strength deck plating and sheerstrake plating transverse sections:-

Two or three section within the cargo length area, comprising of the structural items (1), (2) and (3) as shown on the diagram of typical transverse section.
2. Only the deck plating strakes outside the line of openings are to be recorded.
3. The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
4. The exact frame station of measurement is to be stated.
5. The single measurements recorded are to represent the average of multiple measurements.
6. The maximum allowable diminution could be stated in an attached document.

TM2-BC (II)

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

Sheet 6

Ship's name.....

Class Identity No.

Report No.

SHELL PLATING

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

Operators Signature.....

NOTES – See Reverse

NOTES

1. This report is to be used for recording the thickness measurement of:-
Shell plating transverse sections:-

Two or three sections within cargo length area comprising of the structural items (4), (5), (6) and (7) as shown on the diagram of typical transverse section.
2. The bottom area comprises keel, bottom and bilge plating.
3. The exact frame station of measurement is to be stated.
4. The single measurements recorded are to represent the average of multiple measurements.
5. The maximum allowable diminution could be stated in an attached document.

TM3-BC

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

Sheet 7

Ship's name.....

Class Identity No.

Report No.

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES

1. This report is to be used for recording the thickness measurement of:-
Longitudinal Members at transverse sections:-

Two, or three sections within the cargo length area, comprising of the appropriate structural items (8) to (20) as shown on diagram of typical transverse section.
2. The exact frame station of measurement is to be stated.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

TM4-BC

Report on THICKNESS MEASUREMENT OF TRANSVERSE STRUCTURAL MEMBERS In the double bottom, hopper side and topside water ballast tanks

Sheet 8

Ship's name.....

Class Identity No.

Report No.

TANK DESCRIPTION:

LOCATION OF STRUCTURE:

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES

1. This report is to be used for recording the thickness measurement of transverse structural members, comprising of the appropriate structural items (23) to (25) as shown on diagram of typical transverse section, sheet 12 of this document.
2. Guidance for areas if measurement is indicated on the diagrams shown on sheet 14 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

TM5-BC

Report on THICKNESS OF CARGO HOLD TRANSVERSE BULKHEADS

Sheet 9

Ship's name.....

Class Identity No.

Report No.

LOCATION OF STRUCTURE:

FRAME NO.:

STRUCTURAL COMPONENT (PLATING/STIFFENER)

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES

1. This report form is to be used for recording the thickness measurement of cargo hold transverse bulkheads.
2. Guidance for areas of measurement is indicated on the diagrams shown on sheet 14 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

TM6-BC

Report on THICKNESS MEASUREMENT OF MISCELLANEOUS STRUCTURAL MEMBERS

Sheet 10

Ship's name.....

Class Identity No.

Report No.

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES

1. This report is to be used for recording the thickness measurement of miscellaneous structural members including the structural items (28), (29) and (30) as shown on diagram of typical transverse section, sheet 12 of this document.
2. Guidance for areas of measurement is indicated on sheet 14 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

TM7-BC

Report on THICKNESS MEASUREMENT OF CARGO HOLD TRANSVERSE FRAMES

Sheet 11

Ship's name.....

Class Identity No.

Report No.

[illegible]

Operators Signature.....

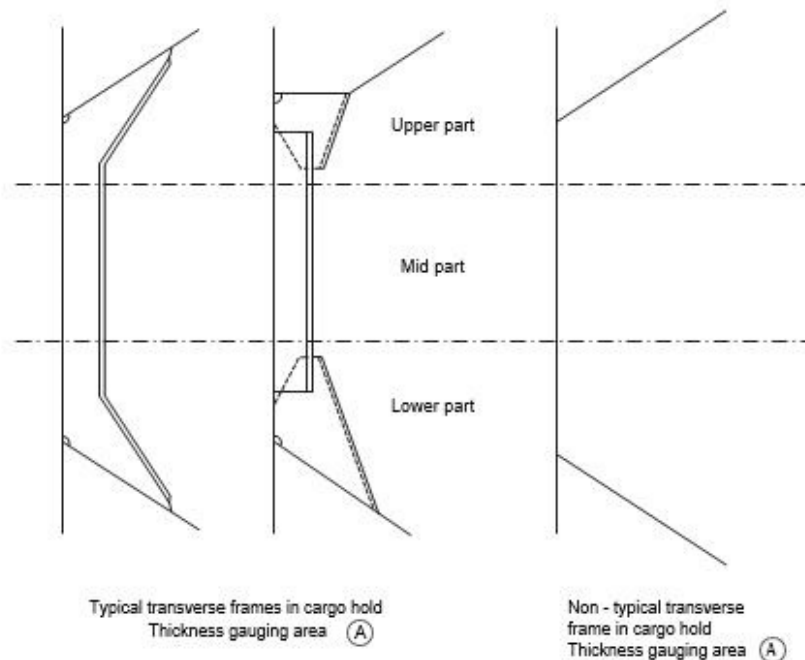
NOTES – See Reverse

NOTES

1. This report is to be used for recording the thickness measurement of:-

Cargo Hold Transverse Frames

Structural item number 34 as shown on the diagram of typical transverse section, sheet 12 of this document.
2. Guidance for areas of measurement is indicated on the diagrams shown on sheet 14 of this document.
The single measurements recorded are to represent the average of multiple measurements.
3. The location and pattern of measurements is to be indicated on the sketches of hold frames shown below.



4. The maximum allowable diminution could be stated in an attached document.

Sheet 11 bis

Report No.

[illegible]

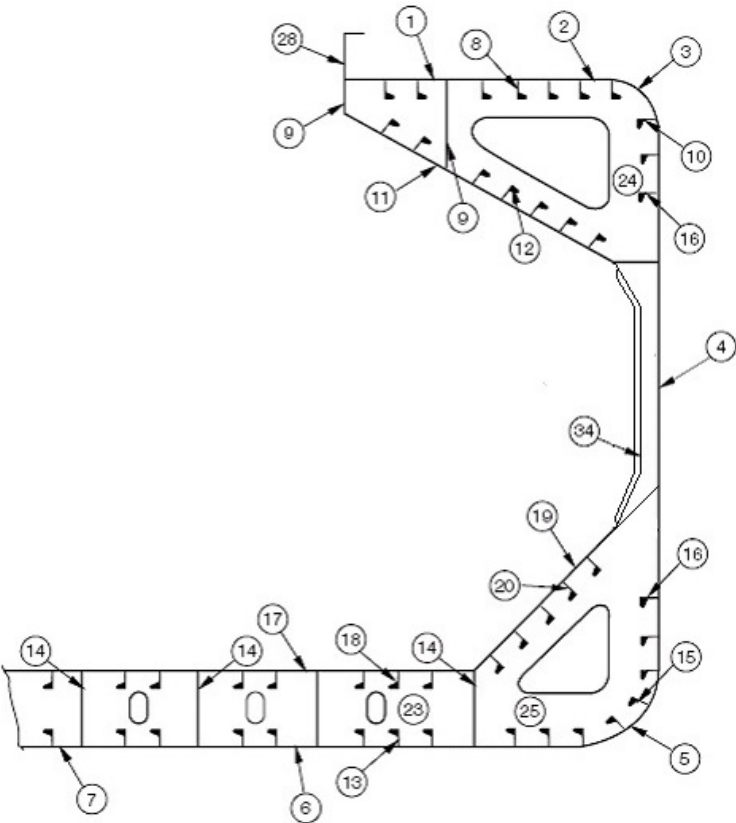
NOTES – See Reverse

NOTES

1. This report is to be used for recording the thickness measurement of:-Cargo Hold Transverse Frames for application of BCS- R S31
2. Guidance for areas of measurement is provided in Annex V.
3. The maximum allowable diminution could be stated in an attached document.

THICKNESS MEASUREMENT - BULK CARRIERS

Typical transverse section indicating longitudinal and transverse members



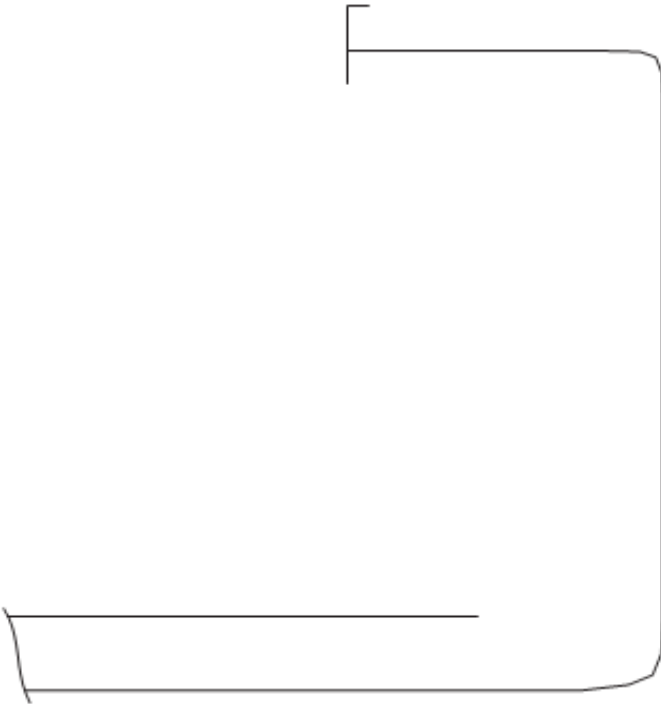
Report on TM2	Report on TM3-BC	
<div><div>1</div>Strength deck plating</div>	<div><div>8</div>Deck longitudinals</div>	<div><div>16</div>Side shell longitudinals</div>
<div><div>2</div>Stringer plate</div>	<div><div>9</div>Deck girders</div>	<div><div>17</div>Inner bottom plating</div>
<div><div>3</div>Sheerstrake</div>	<div><div>10</div>Sheerstrake longitudinals</div>	<div><div>18</div>Inner botom longitudinals</div>
<div><div>4</div>Side shell plating</div>	<div><div>11</div>Topside tank sloping plating</div>	<div><div>19</div>Hopper side plating</div>
<div><div>5</div>Bilge plating</div>	<div><div>12</div>Topside tank sloping plating longitudinals</div>	<div><div>20</div>Hopper side longitudinals</div>
<div><div>6</div>Bottom shell plating</div>	<div><div>13</div>Bottom longitudinals</div>	<div><div>21</div></div>
<div><div>7</div>Keel plate</div>	<div><div>14</div>Bottom girders</div>	<div><div>22</div></div>
	<div><div>15</div>Bilge Longitudinals</div>	

Report on TM4	Report on TM6-BC	Report on TM7-BC
<div><div>23</div>Double bottom tank floors</div>	<div><div>28</div>Hatch coamings</div>	<div><div>34</div>Hold frames or diaphragms</div>
<div><div>24</div>Topside tank transverses</div>	<div><div>29</div>Deck plating between hatches</div>	
<div><div>25</div>Hopper side tank transverses</div>	<div><div>30</div>Hatch covers</div>	
<div><div>26</div></div>	<div><div>31</div></div>	
<div><div>27</div></div>	<div><div>32</div></div>	
	<div><div>33</div></div>	

THICKNESS MEASUREMENT - BULK CARRIERS

Bulk Carriers : Typical transverse section outline

To be used for longitudinal and transverse members
where the typical Bulk Carrier section is not applicable



Report on TM2	Report on TM3-BC	
① Strength deck plating	⑧ Deck longitudinals	⑩ Side shell longitudinals
② Stringer plate	⑨ Deck girders	⑪ Inner bottom plating
③ Sheerstrake	⑩ Sheerstrake longitudinals	⑫ Inner botom longitudinals
④ Side shell plating	⑪ Topside tank sloping plating	⑬ Hopper side plating
⑤ Bilge plating	⑫ Topside tank sloping plating longitudinals	⑭ Hopper side longitudinals
⑥ Bottom shell plating	⑬ Bottom longitudinals	⑮
⑦ Keel plate	⑭ Bottom girders	⑯
	⑮ Bilge Longitudinals	⑰

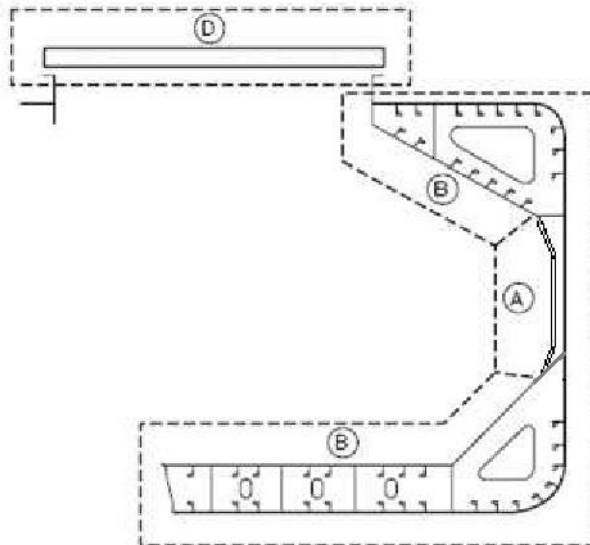
Report on TM4	Report on TM6-BC	Report on TM7-BC
⑳ Double bottom tank floors	㉔ Hatch coamings	㉔ Hold frames or diaphragms
㉑ Topside tank transverses	㉕ Deck plating between hatches	
㉒ Hopper side tank transverses	㉖ Hatch covers	
㉓	㉗ Inner bulkhead plating	
㉔	㉘	
㉕	㉙	

Close-up Survey and Thickness Measurement Areas

Sheet 14

Typical transverse section

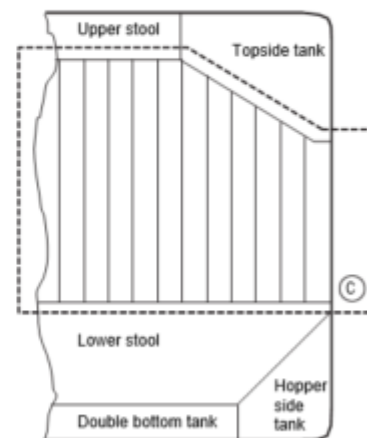
Areas (A), (B) and (D)



Thickness to be reported on TM3-BC, TM4-BC, TM6-BC and TM7-BC as appropriate

A cargo hold, transverse bulkhead

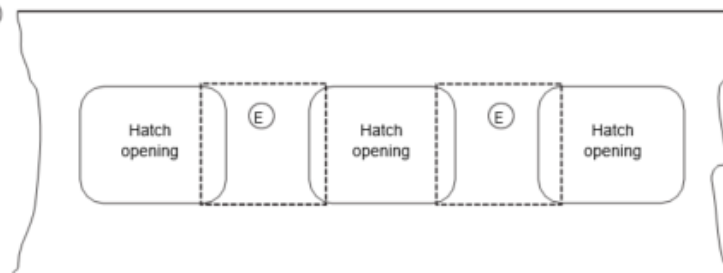
Area (C)



Thickness to be reported on TM5-BC

Typical areas of deck plating inside line of hatch openings between cargo hold hatches

Area (E)



Thickness to be reported on TM6-BC

ANNEX II (CSR)

Sheet 1

RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS OF BULK CARRIERS BUILT UNDER IACS COMMON STRUCTURAL RULES*

*

Note: Annex II (CSR) is recomendatory.

-
1. This document is to be used for recording thickness measurements of bulk carriers built under BCS Common Structural Rules as required by BCS- R Z10.2.
 2. Reporting forms TM1-BC(CSR), TM2-BC(CSR) (i) and (ii), TM3-BC(CSR), TM4-BC(CSR), TM5-BC(CSR), TM6-BC(CSR) and TM7-BC(CSR) (sheets 4-11) are to be used for recording thickness measurements. The as-built thickness and the voluntary thickness addition and renewal thickness (minimum allowable thickness) are to be stated in the said forms.
 3. The remaining sheets 12-14 are guidance diagrams and notes relating to the reporting forms and BCS Requirements for thickness measurement.

CONTENTS

Sheet 2

- Sheet 1 - Front cover
- Sheet 2 - Contents
- Sheet 3 - General particulars

REPORTS

- Sheet 4 - Report TM1-BC(CSR) for recording the thickness measurement of all deck plating, all bottom plating and side shell plating.
- Sheet 5 - Report TM2-BC(CSR) (i) for recording the thickness measurement of shell and deck plating at transverse sections - strength deck and sheerstrake plating.
- Sheet 6 - Report TM2-BC(CSR) (ii) for recording the thickness measurement of shell plating at transverse sections.
- Sheet 7 - Report TM3-BC(CSR) for recording the thickness measurement of longitudinal members at transverse sections.
- Sheet 8 - Report TM4-BC(CSR) for recording the thickness measurement of transverse structural members.
- Sheet 9 - Report TM5-BC(CSR) for recording the thickness measurement of cargo hold transverse bulkheads.
- Sheet 10 - Report TM6-BC(CSR) for recording the thickness measurement of miscellaneous structural members.
- Sheet 11 - Report TM7-BC(CSR) for recording the thickness measurement of cargo hold transverse frames.

GUIDANCE

- Sheet 12 - Bulk Carrier typical transverse section. The diagram includes details of the items to be measured and the report forms to be used.
- Sheet 13 - Transverse section outline. This diagram may be used for those ships where the diagram on sheet 12 is not suitable.
- Sheet 14 - Sketches of bulk carrier showing typical areas for thickness measurement of cargo hold frames, structural members and transverse bulkheads in association with close-up survey requirements.

GENERAL PARTICULARS

Ships name:-

IMO number:-

Class identity number:-

Port of registry:-

Gross tons:-

Deadweight:-

Date of build:-

Classification Society:-

Name of Firm performing thickness measurement:-

Thickness measurement firm certified by:-

Certificate No:-

Certificate valid from.....to.....

Place of measurement:-

First date of measurement:-

Last date of measurement:-

Special survey/intermediate survey due:-*

Details of measurement equipment:-

Qualification of operators:-

Report Number:-

consisting of Sheets

Names of operator:-.....

Name of surveyor:-.....

Signature of operator:-.....

Signature of surveyor:-.....

Firm official stamp:-

Classification Society
Official Stamp:-

* Delete as appropriate

TM1-BC(CSR)

**Report on THICKNESS MEASUREMENT of ALL DECK PLATING, ALL BOTTOM PLATING
or SIDE SHELL PLATING***
(* - delete as appropriate)

Sheet 4

Ship's name.....

Class Identity No.....

Report No.....

STRAKE POSITION														
PLATE POSITION	No. or Letter	As Built Thk. mm	Voluntary Thickness Addition mm	Renewal Thickness mm (a)	Forward Reading				Aft Reading				Mean Remaining Corr. Addition, mm	
					Gauged Thk. mm (b1)		Remaining Corr. Addition, mm (c1)=(b1)-(a)		Gauged Thk. mm (b2)		Remaining Corr. Addition, mm (c2)=(b2)-(a)		[(c1)+(c2)]/2	
					P	S	P	S	P	S	P	S	P	S
12th forward														
11th														
10th														
9th														
8th														
7th														
6th														
5th														
4th														
3rd														
2nd														
1st														
Amidships														
1st aft														
2nd														
3rd														
4th														
5th														
6th														
7th														
8th														
9th														
10th														
11th														
12th														

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM1-BC(CSR)

1. This report is to be used for recording the thickness measurement of:-
 - A - All strength deck plating within cargo length area.
 - B - Keel, bottom shell plating and bilge plating within the cargo length area.
 - C - Side shell plating that is all wind and water strakes within the cargo length area.
 - D - Side shell plating that is selected wind and water strakes outside the cargo length area.
2. The strake position is to be clearly indicated as follows:-
 - 2.1 For strength deck indicate the number of the strake of plating inboard from the stringer plate.
 - 2.2 For bottom plating indicate the number of the strake of plating outboard from the keel plate.
 - 2.3 For side shell plating give number of the strake of plating sheerstrake and letter as shown on shell expansion.
3. Only the deck plating strakes outside line of openings are to be recorded.
4. Measurements are to be taken at the forward and aft areas of all plates and the single measurements recorded are to represent the average of multiple measurements.
5. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM2-BC(CSR) (i)

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

Sheet 5

Ship's name.....

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							
STRAKE POSITION	No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)		No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)		No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)	
					P	S	P	S					P	S	P	S					P	S	P	S
Stringer Plate																								
1st strake inboard																								
2nd																								
3rd																								
4th																								
5th																								
6th																								
7th																								
8th																								
9th																								
10th																								
11th																								
12th																								
13th																								
14th																								
centre strake																								
sheer strake																								
TOPSIDE TOTAL																								

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM2-BC(CSR) (i)

1. This report is to be used for recording the thickness measurement of:-

Strength deck plating and sheerstrake plating transverse sections:-

One, two or three sections within the cargo length area, comprising of the structural items (1), (2) and (3) as shown on the diagram of typical transverse section.

2. Only the deck plating strakes outside the line of openings are to be recorded.
3. The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
4. The exact frame station of measurement is to be stated.
5. The single measurements recorded are to represent the average of multiple measurements.
6. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM2-BC(CSR) (ii) Report on THICKNESS MEASUREMENT OF SHELL PLATING
(one, two or three transverse sections)

Sheet 6

Ship's name.....

Class Identity No.

Report No.

SHELL PLATING

SHELL PLATING																								
	FIRST TRANSVERSE SECTION AT FRAME NUMBER							SECOND TRANSVERSE SECTION AT FRAME NUMBER							THIRD TRANSVERSE SECTION AT FRAME NUMBER									
STRAKE POSITION	No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)		No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)		No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)	
					P	S	P	S					P	S	P	S					P	S	P	S
1 st below sheer strake																								
2nd																								
3rd																								
4th																								
5th																								
6th																								
7th																								
8th																								
9th																								
10th																								
11th																								
12th																								
13th																								
14th																								
15th																								
16th																								
17th																								
18th																								
19th																								
20th																								
Keel strake																								
BOTTOM TOTAL																								

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM2-BC(CSR) (ii)

1. This report is to be used for recording the thickness measurement of:-

Shell plating transverse sections:-

One, two or three sections within cargo length area comprising of the structural items (4), (5), (6) and (7) as shown on the diagram of typical transverse section.

2. The bottom area comprises keel, bottom and bilge plating.
3. The exact frame station of measurement is to be stated.
4. The single measurements recorded are to represent the average of multiple measurements.
5. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM3-BC(CSR)

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

Sheet 7

Ship's name.....

Class Identity No.

Report No.

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM3-BC(CSR)

1. This report is to be used for recording the thickness measurement of:-

Longitudinal Members at transverse sections:-

One, two, or three sections within the cargo length area, comprising of the appropriate structural items (8) to (20) as shown on diagram of typical transverse section.

2. The exact frame station of measurement is to be stated.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM4-BC(CSR)

Report on THICKNESS MEASUREMENT OF TRANSVERSE STRUCTURAL MEMBERS In the double bottom, hopper side and topside water ballast tanks

Sheet 8

Ship's name.....

Class Identity No.

Report No.

TANK DESCRIPTION:

LOCATION OF STRUCTURE

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM4-BC(CSR)

1. This report is to be used for recording the thickness measurement of transverse structural members, comprising of the appropriate structural items (23) to (25) as shown on diagram of typical transverse section.
2. Guidance for areas if measurement is indicated on the diagrams shown on sheet 14 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

Class Identity No.

Report No.

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM5-BC(CSR)

1. This report form is to be used for recording the thickness measurement of cargo hold transverse bulkheads.
2. Guidance for areas of measurement is indicated on the diagrams shown on sheet 14 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

Class Identity No.

Report No.

[illegible]

NOTES – See Reverse

NOTES TO REPORT TM6-BC(CSR)

1. This report is to be used for recording the thickness measurement of miscellaneous structural members including the structural items (28), (29) and (30) as shown on diagram of typical transverse section, sheet 12 of this document.
2. Guidance for areas of measurement is indicated on sheet 14 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

Class Identity No.

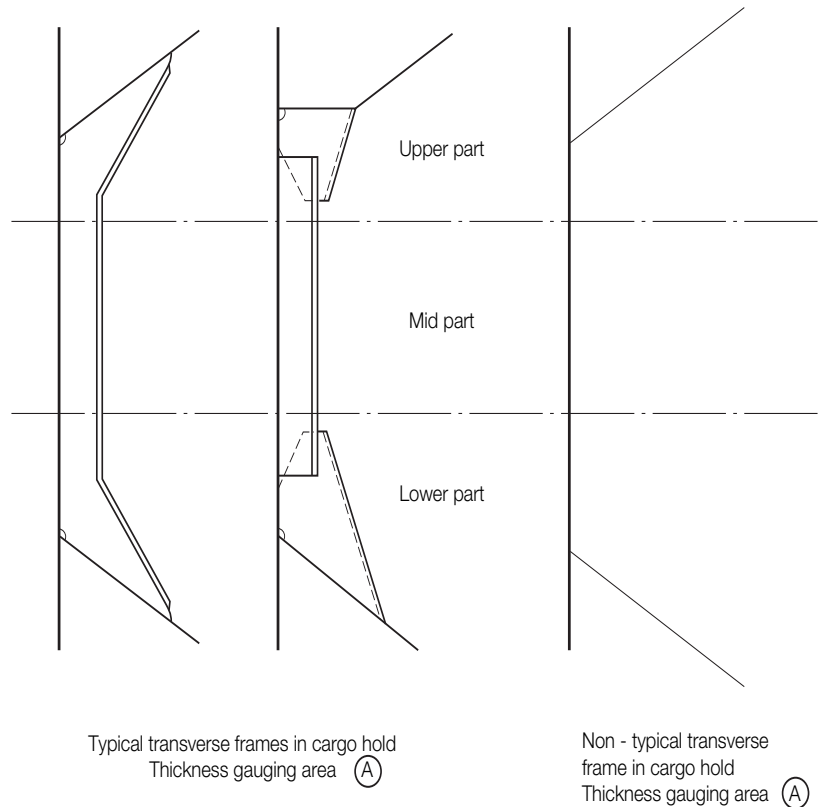
Report No.

[illegible]

Operators Signature.....

NOTES – See Reverse

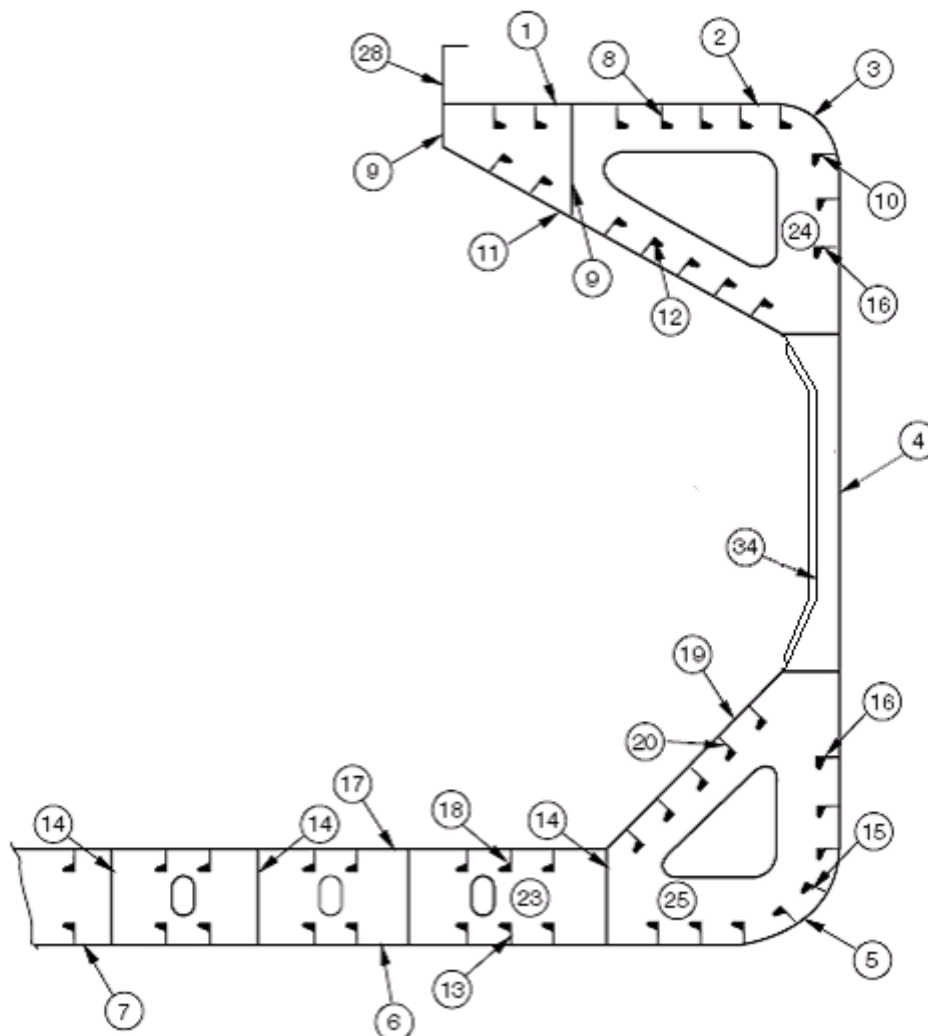
1. This report is to be used for recording the thickness measurement of:-
Cargo Hold Transverse Frames
Structural item number 34 as shown on the diagram of typical transverse section.
2. Guidance for areas of measurement is indicated on the diagrams shown on sheet 14 of this document.
The single measurement recorded are to represent the average of multiple measurements.
3. The location and pattern of measurements is to be indicated on the sketches of hold frames shown below.



4. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

Thickness Measurement - Bulk Carriers

Typical transverse section including longitudinal and transverse members



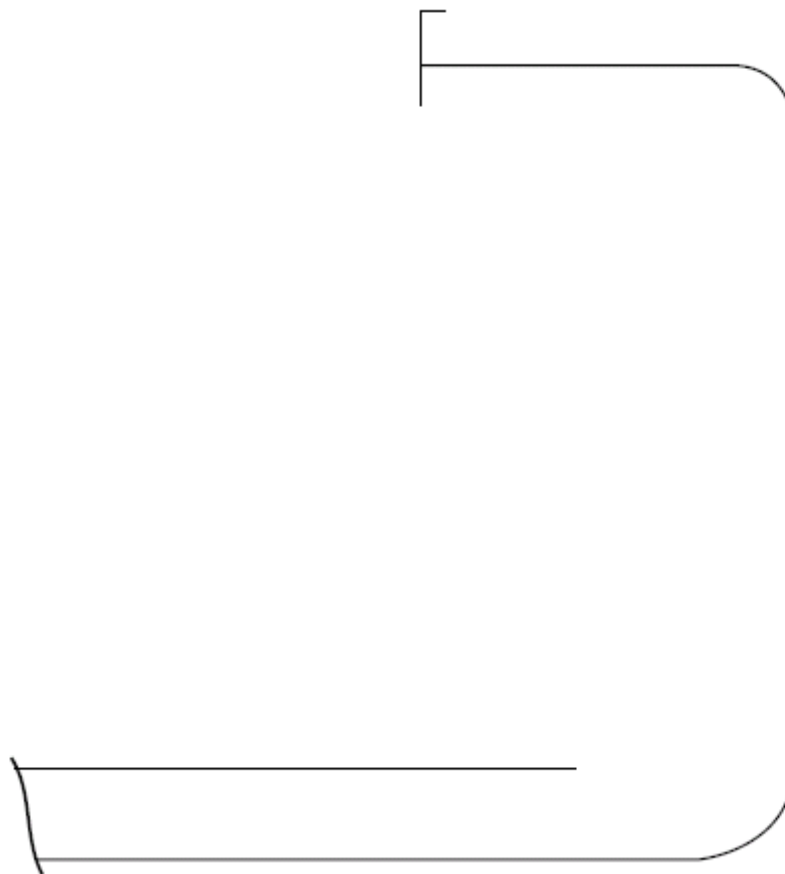
Report on TM2-BC(CSR) (i) & (ii)
1. Strength deck plating
2. Stringer plate
3. Sheerstrake
4. Side shell plating
5. Bilge plating
6. Bottom plating
7. Keel plate

Report on TM3-BC(CSR)	
8. Deck longitudinals	17. Inner bottom plating
9. Deck girders	18. Inner bottom longitudinals
10. Sheerstrake longitudinals	19. Hopper plating
11. Topside tank sloping plating	20. Hopper longitudinals
12. Topside tank sloping plating longitudinals	21.
13. Bottom longitudinals	22.
14. Bottom girders	Report on TM4-BC(CSR)
15. Bilge longitudinals	23. Double bottom tank floors
16. Side shell longitudinals, if any	24. Top side tank transverses
	25. Hopper side tank transverses
	26.
	27.

Report on TM6-BC(CSR)
28. Hatch coamings
29. Deck plating between hatches
30. Hatch covers
31.
32.
33.
Report on TM7-BC(CSR)
34. Cargo hold frames

Thickness Measurement - Bulk Carriers

Transverse section outline: The diagram may be used for those ships where the diagrams on sheet 12 are not suitable.



Report on TM2-BC(CSR) (i) & (ii)
1. Strength deck plating
2. Stringer plate
3. Sheerstrake
4. Side shell plating
5. Bilge plating
6. Bottom plating
7. Keel plate

Report on TM3-BC(CSR)	
8. Deck longitudinals	17. Inner bottom plating
9. Deck girders	18. Inner bottom longitudinals
10. Sheerstrake longitudinals	19. Hopper plating
11. Topside tank sloping plating	20. Hopper longitudinals
12. Topside tank sloping plating longitudinals	21.
13. Bottom longitudinals	22.
14. Bottom girders	Report on TM4-BC(CSR)
15. Bilge longitudinals	23. Double bottom tank floors
16. Side shell longitudinals, if any	24. Top side tank transverses
	25. Hopper side tank transverses
	26.
	27.

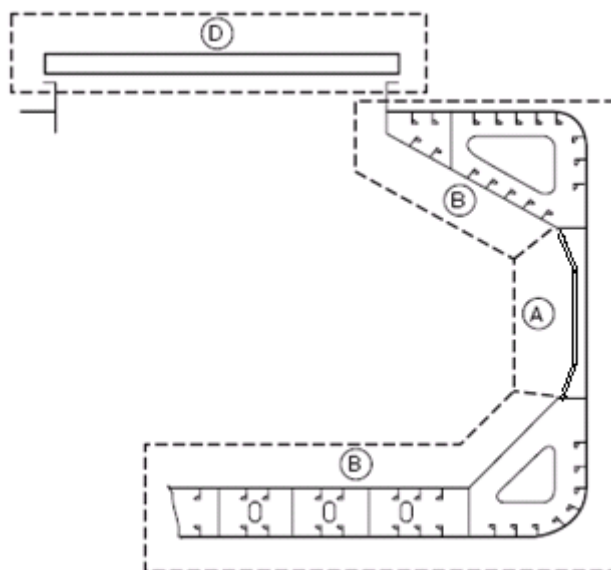
Report on TM6-BC(CSR)
28. Hatch coamings
29. Deck plating between hatches
30. Hatch covers
31.
32.
33.
Report on TM7-BC(CSR)
34. Cargo hold frames

Close-up Survey and Thickness Measurement Areas

Sheet 14

Typical transverse section

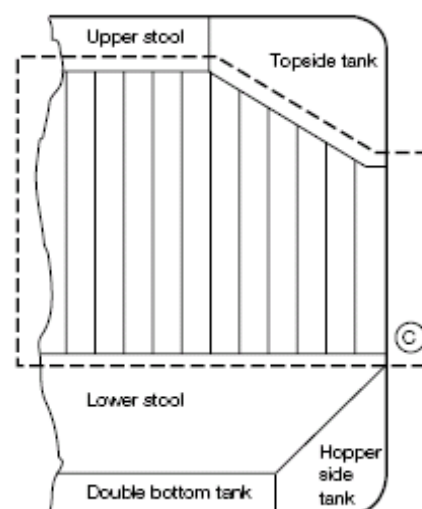
Areas A, B and D



Thickness to be reported on TM3-BC(CSR), TM4-BC(CSR), TM6-BC(CSR) and TM7-BC(CSR) as appropriate

A cargo hold, transverse bulkhead

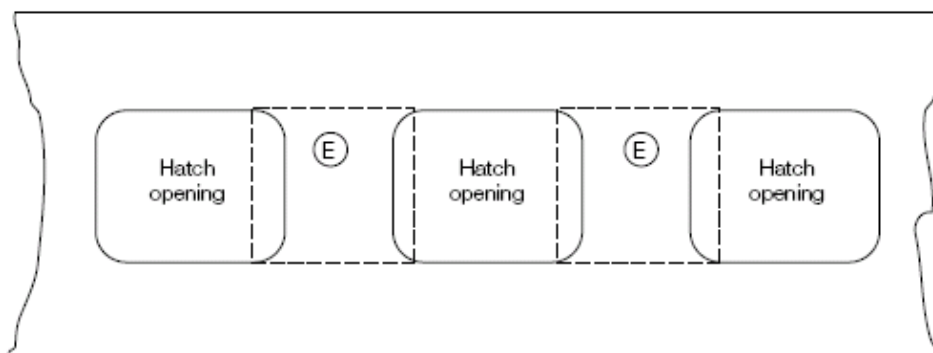
Area C



Thickness to be reported on TM5-BC(CSR)

Typical areas of deck plating inside line of hatch openings between cargo hold hatches

Area E



Thickness to be reported on TM6-BC(CSR)

ANNEX III

GUIDELINES FOR THE GAUGING OF THE VERTICALLY CORRUGATED TRANSVERSE WATERTIGHT BULKHEAD BETWEEN HOLDS NOS. 1 AND 2

1. Gauging is necessary to determine the general condition of the structure and to define the extent of possible repairs and/or reinforcements of the vertically corrugated transverse watertight bulkhead for verification of the compliance with BCS- R S19.
2. Taking into account the buckling model applied in BCS- R S19 in the evaluation of strength of the bulkhead, it is essential to determine the thickness diminution at the critical levels shown in Figures 1 and 2.
3. The gauging is to be carried out at the levels as described below. To adequately assess the scantlings of each individual vertical corrugation, each corrugation flange, web, shedder plate and gusset plate within each of the levels given below are to be gauged.

Level (a) Ships without lower stool (see Figure 1):

Locations:

- The mid-breadth of the corrugation flanges at approximately 200 mm above the line of shedder plates;
- The middle of gusset plates between corrugation flanges, where fitted;
- The middle of the shedder plates;
- The mid-breadth of the corrugation webs at approximately 200 mm above the line of shedder plates.

Level (b) Ships with lower stool (see Figure 2):

Locations:

- The mid-breadth of the corrugation flanges at approximately 200 mm above the line of shedder plates;
- The middle of gusset plates between corrugation flanges, where fitted;
- The middle of the shedder plates;
- The mid-breadth of the corrugation webs at approximately 200 mm above the line of shedder plates.

Level (c) Ships with or without lower stool (see Figures 1 and 2):

Locations:

- The mid-breadth of the corrugation flanges and webs at about the mid-height of the corrugation.
4. Where the thickness changes within the horizontal levels, the thinner plate is to be gauged.
 5. Steel renewal and/or reinforcement is to comply with BCS- R S19.

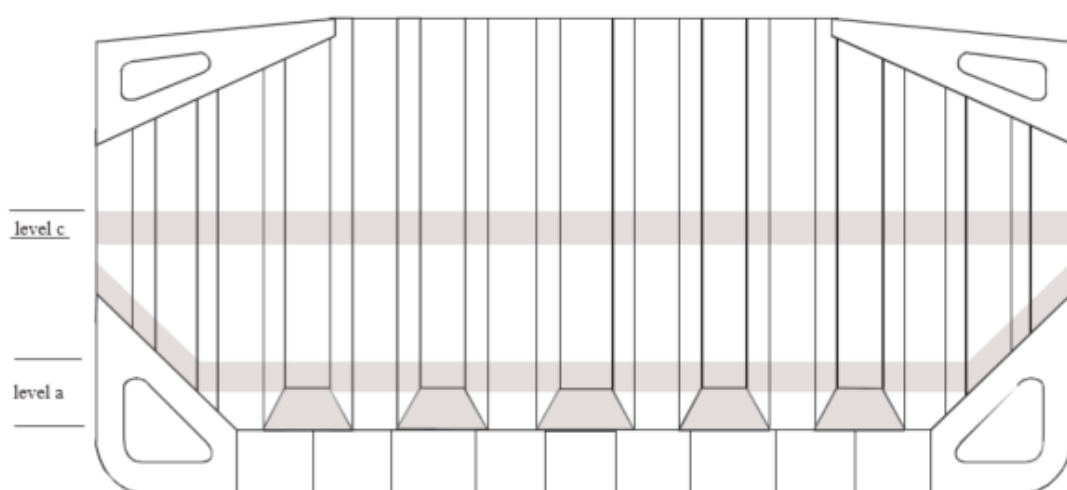


Figure 1

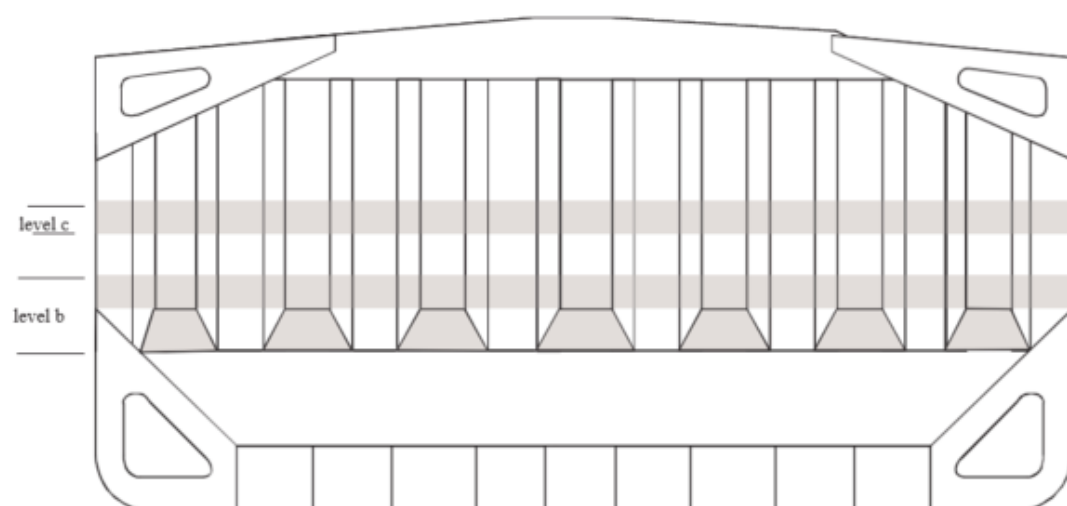


Figure 2

ANNEX IV

ADDITIONAL ANNUAL SURVEY REQUIREMENTS FOR THE FOREMOST CARGO HOLD OF SHIPS SUBJECT TO SOLAS XII/9.1

1 General

1.1 In the case of Bulk Carrier over 5 years of age, the Annual Survey is to include, in addition to the requirements of the Annual Surveys prescribed in chapter 3, an examination of the following items:

1.2 Extent of Survey

1.2.1 For bulk carriers of 5 - 15 years of age:

a) An Overall Survey of the foremost cargo hold, including Close-up Survey of sufficient extent, minimum 25% of frames, is to be carried out to establish the condition of:

- Shell frames including their upper and lower end attachments, adjacent shell plating, and transverse bulkheads.
- Suspect areas identified at previous surveys (see 1.2.9 of BCS- R Z10.2).

b) Where considered necessary by the surveyor as a result of the Overall and Close-up Survey as described in a) above, the survey is to be extended to include a Close-up Survey of all of the shell frames and adjacent shell plating of the cargo hold.

1.2.2 For bulk carriers exceeding 15 years of age:

a) An Overall Survey of the foremost cargo hold, including Close-up Survey is to be carried out to establish the condition of:

- All shell frames including their upper and lower end attachments, adjacent shell plating, and transverse bulkheads.
- Suspect areas identified at previous surveys (see 1.2.9 of BCS- R Z10.2).

1.3 Extent of Thickness Measurement

1.3.1 Thickness measurement is to be carried out to an extent sufficient to determine both general and local corrosion levels at areas subject to Close-up Survey, as described in 1.2.1 a) and 1.2.2. a) above.

The minimum requirement for thickness measurements are suspect areas identified at previous surveys (see 1.2.9 of BCS- R Z10.2).

Where Substantial Corrosion as defined in chapter 1.2.9 is found, the extent of thickness measurements should be increased with the requirements of Table VIII.

1.3.2 The thickness measurement may be dispensed with provided the surveyor is satisfied by the Close-up Survey, that there is no structural diminution and the Protective Coating where fitted remains effective.

1.4 Special Consideration

1.4.1 Where the protective coating in the foremost cargo hold, as defined by BCS- R Z.9 is found to be in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.

Explanatory note:

For existing bulk carriers, where owners may elect to coat or recoat cargo holds as noted above, consideration may be given to the extent of the close-up and thickness measurement surveys. Prior to the coating of cargo holds of existing ships, scantlings should be ascertained in the presence of a surveyor.

ANNEX V

GUIDELINES FOR THE GAUGING OF SIDE SHELL FRAMES AND BRACKETS IN SINGLE SIDE SKIN BULK CARRIERS REQUIRED TO COMPLY WITH UR S31

1. General

Gauging is necessary to determine the general condition of the structure and to define the extent of possible steel renewals or other measures for the webs and flanges of side shell frames and brackets for verification of the compliance with BCS- R S31.

2. Zones of Side Shell Frames and Brackets

For the purpose of steel renewal, sand blasting and coating, four zones A, B, C and D are defined, as shown in Figure 1.

Zones A & B are considered to be the most critical zones.

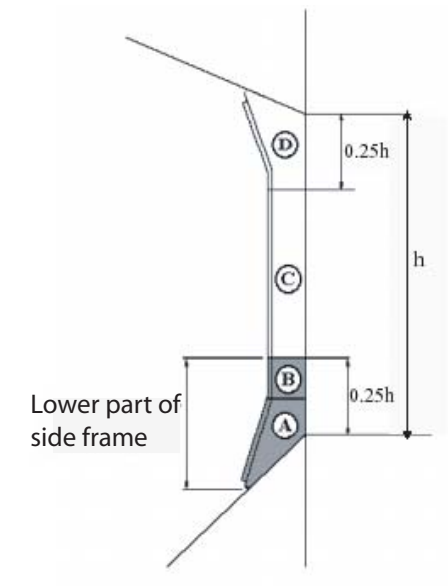


Figure 1 Zones of Side Shell Frames and Brackets

3. Pitting and grooving

Pits can grow in a variety of shapes, some of which would need to be ground before assessment.

Pitting corrosion may be found under coating blisters, which must be removed before inspection.

To measure the remaining thickness of pits or grooving the normal ultrasonic transducer (generally 10mm diameter) will not suffice. A miniature transducer (3 to 5 mm diameter) must be used. Alternatively the gauging firm must use a pit gauge to measure the depth of the pits and grooving and calculate the remaining thickness.

3.1 Assessment based upon Area

This is the method specified in BCS- R S31.2.5 and is based upon the intensity determined from Figure 2 below.

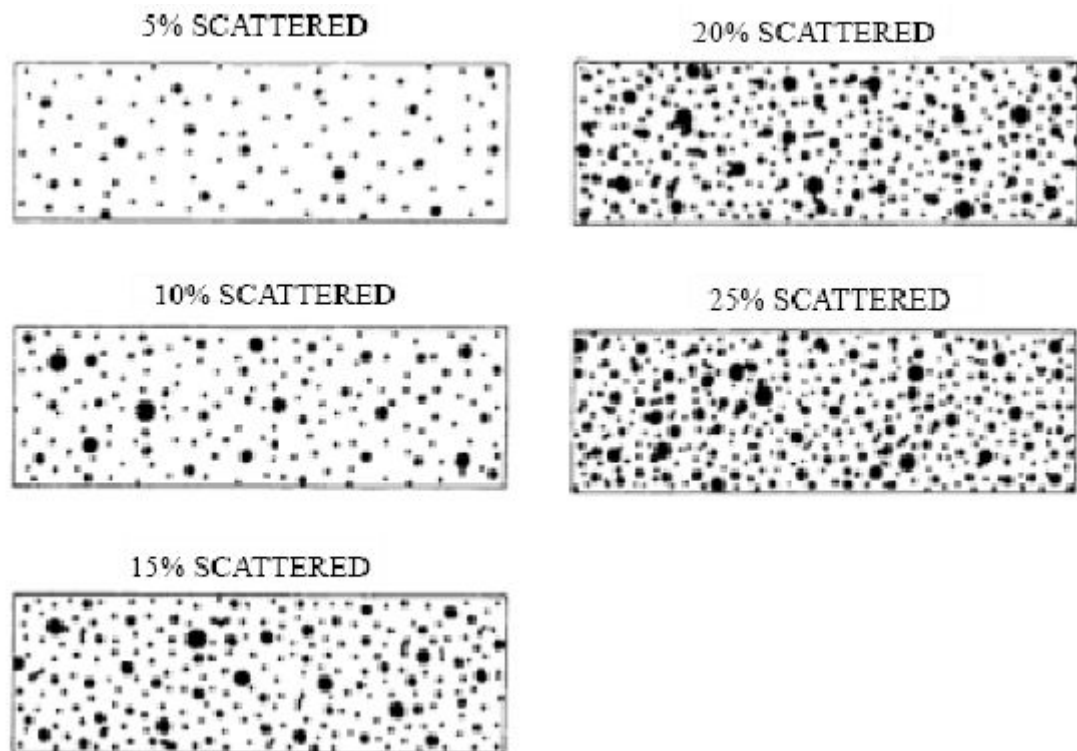


Figure 2 Pitting intensity diagrams (from 5% to 25% intensity)

If pitting intensity is higher than 15% in an area (see Figure 2), then thickness measurements are to be taken to check the extent of the pitting corrosion. The 15% is based upon pitting or grooving on only one side of the plate.

In cases where pitting is evident as defined above (exceeding 15 %) then an area of 300mm diameter or more (or, where this is impracticable on the frame flange or the side shell, hopper tank plating or topside tank plating attached to the side frame, an equivalent rectangular area), at the most pitted part, is to be cleaned to bare metal, and the thickness measured in way of the five deepest pits within the cleaned area. The least thickness measured in way of any of these pits is to be taken as the thickness to be recorded.

The minimum acceptable remaining thickness in any pit or groove is equal to:

- 75% of the as built thickness, for pitting or grooving in the cargo hold side frame webs and flanges.
- 70% of the as built thickness, for pitting or grooving in the side shell, hopper tank and topside tank plating attached to the cargo hold side frame, over a width up to 30mm from each side of it.

4. Gauging methodology

Numbers of side frames to be measured are equivalent to those of Special Survey or Intermediate Survey corresponding to the ship's age. Representative thickness measurements are to be taken for each zone as specified below.

Special consideration to the extent of the thickness measurements may be given by BCS, if the structural members show no thickness diminution with respect to the as built thicknesses and the coating is found in "as-new" condition (i.e., without breakdown or rusting).

Where gauging readings close to the criteria are found, the number of hold frames to be measured is to be increased.

If renewal or other measures according to BCS- R S31 are to be applied on individual frames in a hold, then all frames in that hold are to be gauged.

There is a variety of construction methods used for side shell frames in bulk carriers. Some have faceplates (T sections) on the side shell frames, some have flanged plates and some have bulb plates. The use of faceplates and flanged sections is considered similar for gauging purposes in that both the web and faceplate or web and flange plate are to be gauged. If bulb plate has been used, then web of the bulb plate is to be gauged in the normal manner and the sectional modulus has to be specially considered if required.

4.1 Gaugings for Zones A, B & D

Web plating

The gauging pattern for Zones A, B & D are to be a five point pattern. See Figure 3. The 5 point pattern is to be over the depth of the web and the same area vertically. The gauging report is to reflect the average reading.

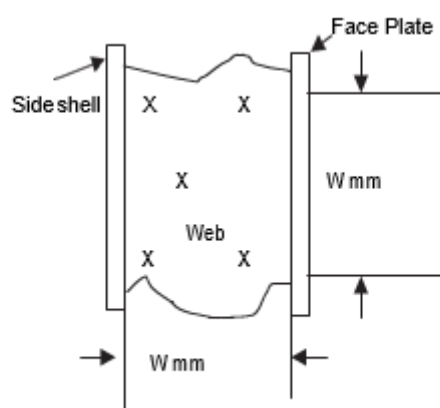


Figure 3 Typical 5 point pattern on the web plate

4.2 Gaugings for Zone C

Web plating

Depending upon the condition of the web in way of Zone C, the web may be measured by taking 3 readings over the length of Zone C and averaging them. The average reading is to be compared with the allowable thickness. If the web plating has general corrosion then this pattern should be expanded to a five point pattern as noted above.

4.3 Gaugings for section a) and b) (flanges and side shell plating)

Where the lower bracket length or depth does not meet the requirements in BCS- R S12(Rev.3), gaugings are to be taken at sections a) and b) to calculate the actual section modulus required in BCS- R S31.3.4. See Figure 4. At least 2 readings on the flange/faceplate are to be taken in way of each section. At least one reading of the attached shell plating is to be taken on each side of the frame (i.e. fore and aft) in way of section a) and section b).

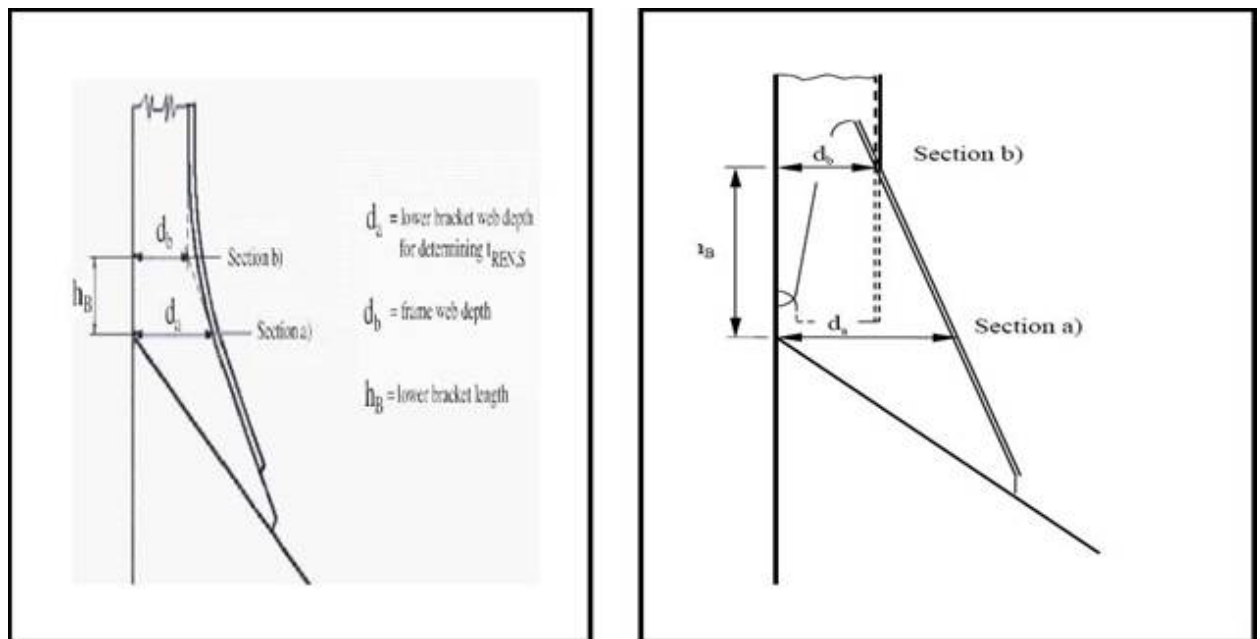


Figure 4 Sections a) and b)

5 Report on Thickness Measurement of Cargo Hold Frames

See form TM7-BC S31 (sheet 11 bis).

ANNEX VI

ANNEX VIA

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:
Classification Society:
Class ID:
Date of build of the ship:
Owner:
Thickness measurement firm:

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 BCS- R Z10.2.

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

1.2 Documentation

All documents used in the development of the survey programme are to be available onboard during the survey as required by section 6.

2 Arrangement of cargo holds, tanks and spaces

This section of the survey programme is to 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 prevention system

This section of the survey programme is to indicate any changes relating to (and is to update) the information on the use of the holds and tanks of the ship, the extent of coatings and the corrosion prevention system provided in the Survey Planning Questionnaire.

4 Conditions for survey

This section of the survey programme is to 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 is to indicate any changes relating to (and is to 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 is to 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 is to identify and list the spaces that should undergo an overall survey for this ship in accordance with 2.3.1.

7.2 Close-up survey

This section of the survey programme is to identify and list the hull structures that are to undergo a close-up survey for this ship in accordance with 2.3.2.

8 Identification of tanks for tank testing

This section of the survey programme is to identify and list the cargo holds and tanks that are to undergo tank testing for this ship in accordance with 2.5.

9 Identification of areas and sections for thickness measurements

This section of the survey programme is to identify and list the areas and sections where thickness measurements are to be taken in accordance with 2.2.4.4 and 2.4.1.

10 Minimum thickness of hull structures

This section of the survey programme is to specify the minimum thickness for hull structures of this ship that are subject to survey, (indicate either (a) or preferably (b), if such information is available):

- (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			
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)			
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			
<i>Hatch Covers</i>			
Plating			
Stiffeners			
<i>Hatch Coamings</i>			
Plating			
Stiffeners			

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

For vessels built under BCS Common Structural Rules, the renewal thickness of the hull structure elements is indicated in the appropriate drawings.

11 Thickness Measurement Firm

This section of the survey programme is to identify changes, if any, relating to the information on the thickness measurement firm provided in the Survey Planning Questionnaire.

12 Damage experience related to the ship

This section of the survey programme is to, using the tables provided below, provide details of the hull damages for at least the last three years in way of the cargo holds, ballast tanks and void spaces within the cargo length area. These damages are subject to survey.

Hull damages sorted by location for this ship

Cargo hold, tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

**Hull damages for sister or similar ships (if available) in the case of
design related damage**

Cargo hold, tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

13 Areas identified with substantial corrosion from previous surveys

This section of the survey programme is to identify and list the areas of substantial corrosion from previous surveys.

14 Critical structural areas and suspect areas

This section of the survey programme is to identify and list the critical structural areas and the suspect areas, when such information is available.

15 Other relevant comments and information

This section of the survey programme is to provide any other comments and information relevant to the survey.

Appendices

Appendix 1 - List of plans

Paragraph 5.1.3 requires that main structural plans of cargo holds and ballast tanks (scantling drawings), including information regarding use of high tensile steel (HTS) are to be available. This Appendix of the survey programme is to identify and list the main structural plans which form part of the survey programme.

Appendix 2 - Survey Planning Questionnaire

The Survey Planning Questionnaire (annex VIB), which has been submitted by the owner, is to be appended to the survey programme.

Appendix 3 - Other documentation

This part of the survey programme is to identify and list any other documentation that forms part of the plan.

Prepared by the owner in co-operation with BCS for compliance with 5.1.3:

Date:.....(name and signature of authorized owner's representative)

Date:.....(name and signature of authorized representative of BCS)

ANNEX VIB

SURVEY PLANNING QUESTIONNAIRE

1 The following information will enable the owner in co-operation with BCS to develop a Survey Programme complying with the requirements of BCS- R Z10.2. 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 BCS- R Z10.2.

Particulars

Ship's name:

IMO number:

Flag State:

Port of registry:

Owner:

Classification Society:

Class ID:

Gross tonnage:

Deadweight (metric tonnes):

Date of build:

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

2 The owner is to 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	Permanent Means of Access	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 plating						
	Tank top						
TOPSIDE TANKS	Underdeck structure						
	Side shell & structure						
	Sloping plate & structure						
	Webs & bulkheads						
HOPPER TANKS	Hopper sloping plate & structure						
	Side shell & structure						
	Bottom structure						
	Webs & bulkheads						
	Double bottom structure						
	Upper stool internal structure						
	Lower stool internal structure						

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 is to 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 bottom tanks					
Upper stools					
Lower stools					
Fore peak					
Aft peak					
Miscellaneous other spaces:					

Note: Indicate tanks which are used for oil/ballast

- 1) HC=hard coating; SC=soft coating;
SH=semi-hard coating; 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 3 years)
- 4) N=no findings recorded; Y=findings recorded,
description of findings is to 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, 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 firm:

BCS- R Z10.3 Hull Surveys of Chemical Tankers

CONTENTS

1. General

- 1.1 Application
- 1.2 Definitions
- 1.3 Repairs
- 1.4 Thickness measurements and close-up surveys
- 1.5 Remote Inspection Techniques (RIT)

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- 2.2 Scope
 - 2.2.1 General
 - 2.2.2 Dry Dock Survey
 - 2.2.3 Tank Protection
- 2.3 Extent of Overall and Close-up Survey
- 2.4 Extent of Thickness Measurement
- 2.5 Extent of Tank Testing
- 2.6 Chemical Tankers over 10 years of Age

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 - 3.2.2 Examination of the Hull
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 - 4.2.2 Chemical Tankers 5 - 10 years of Age
 - 4.2.3 Chemical Tankers 10 - 15 years of Age
 - 4.2.4 Chemical Tankers over 15 years of Age

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- 5.2 Conditions for Survey
- 5.3 Access to Structures
- 5.4 Equipment for Survey
- 5.5 Rescue and emergency response equipment
- 5.6 Survey at Sea or at Anchorage
- 5.7 Survey Planning Meeting

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- 6.2 Survey Report File
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- 6.4 Review of Documentation On Board

-
- 7. Procedures for Thickness Measurements**
 - 7.1 General
 - 7.2 Certification of Thickness Measurement Firm
 - 7.3 Reporting
 - 8. Reporting and Evaluation of Survey**
 - 8.1 Evaluation of Survey Report
 - 8.2 Reporting

ENCLOSURES

Table I.1: Minimum requirements for Close-up Survey at Special Survey of Single Skin Chemical Tankers

I.2: Minimum requirements for Close-up Survey at Special Survey of Double Skin Chemical Tankers

Table II: Minimum requirements for thickness measurements at Special Survey of Chemical Tankers

Table III: Minimum requirements for tank testing at Special Survey of Chemical Tankers

Table IV: Requirements for extent of thickness measurements at those areas of substantial corrosion

Table V: Procedures for certification of Firms Engaged in Thickness Gauging of Hull Structures

Table VI: Survey Reporting Principles

Table VII: Executive Hull Summary

Annex I: Guidelines for Technical Assessment in conjunction with planning for Enhanced Surveys of Chemical Tankers Special Survey - Hull

Annex II: Recommended Procedures for Thickness Measurements of Chemical Tankers

Annex IIIA: Survey Programme

Appendix 1 List of Plans
Appendix 2 Survey Planning Questionnaire
Appendix 3 Other Documentation

Annex IIIB: Survey Planning Questionnaire

Annex IIIC: Owner's Inspection Report

Notes:

1. This requirement is applied for surveys commenced on or after 1 July 2020.

1. GENERAL

1.1 Application

1.1.1 The requirements apply to all self-propelled Chemical Tankers with integral tanks i.e. vessels with IMO certificate of fitness for the carriage of dangerous chemicals in bulk. If a chemical tanker is constructed with both integral and independent tanks, these requirements are applicable only to that portion of the cargo length containing integral tanks. Combined gas carriers/chemical tankers with independent tanks within the hull, are to be surveyed as gas carriers.

1.1.2 The requirements apply to surveys of hull structure and piping systems in way of cargo tanks, pump rooms, cofferdams, pipe tunnels, void spaces within the cargo area and all Ballast Tanks. The requirements are additional to the classification requirements applicable to the remainder of the ship. The requirements are not applicable for independent tanks on deck. Refer to BCS- R Z7.

1.1.3 The requirements contain the minimum extent of examination, thickness measurements and tank testing. The survey is to be extended when Substantial Corrosion and/or structural defects are found and include additional Close-up Survey when necessary.

1.2 Definitions

1.2.1 Chemical Tanker

A Chemical Tanker is a ship constructed or adapted and used for the carriage in bulk of any liquid product listed in Chapter 17 of the International Code For The Construction And Equipment Of Ships Carrying Dangerous Chemicals In Bulk, IBC Code.

1.2.2 Ballast Tank

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

1.2.2 bis A Combined Cargo/Ballast Tank is a tank which is used for the carriage of cargo or ballast water as a routine part of the vessel's operation and will be treated as a Ballast Tank. Cargo tanks in which water ballast might be carried only in exceptional cases per MARPOL I/18.3 are to be treated as cargo tanks.

1.2.3 Overall Survey

An 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.

1.2.4 Close-up Survey

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

1.2.5 Transverse Section

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

1.2.6 Representative Tank

Representative Tanks are those which are expected to reflect the condition of other tanks of similar type and service and with similar corrosion prevention systems. When selecting Representative Tanks account is to be taken of the service and repair history onboard and identifiable Critical Structural Areas and/or Suspect Areas.

1.2.7 Suspect Area

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

1.2.8 Critical Structural Area

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

1.2.9 Substantial Corrosion

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

1.2.10 Corrosion Prevention System

A Corrosion Prevention System is normally considered a full hard protective coating.

Hard Protective Coating is usually to be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specifications.

1.2.11 Coating condition

Coating condition is defined as follows:

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

Reference is made to BCS- G 87 "Guidelines for Coating Maintenance & Repairs for Ballast Tanks and Combined Cargo/Ballast Tanks on Oil Tankers".

1.2.12 Cargo Area

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

1.2.13 Special consideration

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

1.2.14 Prompt and Thorough Repair

A Prompt and Thorough repair is a permanent repair completed at the time of survey to the satisfaction of the Surveyor, therein removing the need for the imposition of any associated condition of classification.

1.2.15 Remote Inspection Techniques(RIT)

Remote Inspection Technique is a means of survey that enables examination of any part of the structure without the need for direct physical access of the surveyor(refer to BCS- G 42).

1.3 Repairs

1.3.1 Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Surveyor, **will** affect the vessel's structural, watertight or weathertight integrity, is to be **promptly and thoroughly** (see 1.2.14) repaired. Areas to be considered include:

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

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

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

1.3.3 Where the damage found on structure mentioned in Para. 1.3.1 is isolated and of a localised nature which does not affect the ship's structural integrity, consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weather tight integrity and impose a condition of class in accordance with BCS- PR 35, with a specific time limit.

1.4 Thickness measurements and close-up surveys

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

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

1.5 Remote Inspection Techniques (RIT)

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

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

1.5.3 When using a RIT as an alternative to close-up survey, if not carried out by BCS itself, it is to be conducted by a firm approved as a service supplier according to BCS- R Z17 and is to be witnessed by an attending surveyor of BCS.

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

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

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

2. SPECIAL SURVEY¹

2.1 Schedule

2.1.1 Special Surveys are to be carried out at 5 years intervals to renew the Classification Certificate.

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

2.1.3 For surveys completed within 3 months before the expiry date of the Special Survey, the next period of class will start from the expiry date of the Special Survey. For surveys completed more than 3 months before the expiry date of the Special Survey, the period of class will start from the survey completion date. In cases where the vessel has been laid up or has been out of service for a considerable period because of a major repair or modification and the owner elects to only carry out the overdue surveys, the next period of class will start from the expiry date of the special survey. If the owner elects to carry out the next due special survey, the period of class will start from the survey completion date.

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

2.1.5 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

2.2 Scope

2.2.1 General

2.2.1.1 The Special Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to ensure that the hull and related piping, as required in 2.2.1.3, is in a satisfactory condition and is fit for its intended purpose for the new period of class of 5 years to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

2.2.1.2 All cargo tanks, Ballast Tanks, including double bottom tanks, pump rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing as required in 2.4 and 2.5, to ensure that the structural integrity remains effective. The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

2.2.1.3 Cargo piping on deck and cargo and ballast piping within the above tanks and spaces are to be examined and operationally tested to working pressure to attending Surveyor's satisfaction to ensure that tightness and condition remain satisfactory. Special attention is to be given to any ballast piping in cargo tanks and cargo piping in ballast tanks and void

¹ Some Societies use the term "Special Periodical Survey" others use the term "Class Renewal Survey" instead of the term "Special Survey".

spaces, and Surveyors are to be advised on all occasions when this piping, including valves and fittings are open during repair periods and can be examined internally.

2.2.2 Dry Dock Survey

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

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

2.2.3 Tank Protection

2.2.3.1 Where provided, the condition of the corrosion prevention system of cargo tanks is to be examined.

A Ballast Tank is to be examined at subsequent annual intervals where:

- a. a **hard** protective coating has not been applied from the time of construction, or
- b. a soft or semi-hard coating has been applied, or
- c. substantial corrosion is found within the tank, or
- d. the **hard** protective coating is found to be in less than GOOD condition and the **hard** protective coating is not repaired to the satisfaction of the Surveyor.

Thickness measurements are to be carried out as deemed necessary by the surveyor.

2.3 Extent of Overall and Close-up Survey

2.3.1 An Overall Survey of all tanks and spaces is to be carried out at each Special Survey.

2.3.2 The minimum requirements for Close-up Surveys at Special Survey are given in Table I. The survey of stainless steel tanks may be carried out as an overall survey supplemented by Close-up Survey as deemed necessary by the surveyor.

2.3.3 The Surveyor may extend the Close-up Survey as deemed necessary taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:

- a) In particular, tanks having structural arrangements or details which have suffered defects in similar tanks or on similar ships according to available information.
- b) In tanks which have structures approved with reduced scantlings due to an approved corrosion control system.

2.3.4 For areas in tanks where hard protective coatings are found to be in a GOOD condition as defined in 1.2.11, the extent of Close-up Surveys according to Table I may be specially considered.

2.4 Extent of Thickness Measurement

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

2.4.2 Provisions for extended measurements for areas with Substantial Corrosion are given in Table IV, and as may be additionally specified in the Survey Programme as required in 5.1. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous Special Surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

2.4.3 The Surveyor may further extend the thickness measurements as deemed necessary.

2.4.4 For areas in tanks where hard protective coatings are found to be in a GOOD condition as defined in 1.2.11, the extent of thickness measurements according to Table II may be specially considered.

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

2.4.6 In cases where two or three sections are to be measured, at least one is to include a Ballast Tank within 0.5L amidships.

2.5 Extent of Tank Testing

2.5.1 The minimum requirements for ballast tank testing at Special Survey are given in 2.5.3 and Table III. The minimum requirements for cargo tank testing at Special Survey are given in 2.5.4 and Table III. Cargo tank testing carried out by the vessel's crew under the direction of the Master may be accepted by the surveyor provided the following conditions are complied with:

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

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

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

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

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

2.6 Chemical Tankers over 10 Years of Age

2.6.1 Selected steel cargo pipes outside cargo tanks and ballast pipes passing through cargo tanks are to be:

- Thickness measured at random or selected pipe lengths to be opened for internal inspection;
- Pressure tested to the maximum working pressure.

Special attention is to be given to cargo/slop discharge piping through Ballast Tanks and void spaces.

3. ANNUAL SURVEY

3.1 Schedule

3.1.1 Annual Surveys are to be held within 3 months before or after anniversary date from

4. INTERMEDIATE SURVEY

4.1 Schedule

4.1.1 The Intermediate Survey is to be held at or between either the 2nd or 3rd Annual Survey.

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

4.1.3 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

4.2 Scope

4.2.1 General

4.2.1.1 The survey extent is dependent on the age of the vessel as specified in 4.2.2 to 4.2.4.

4.2.1.2 For weather decks, an examination as far as applicable of cargo, bunker, ballast, steam and vent piping systems as well as vent masts and headers is to be carried out. If upon examination there is any doubt as to the condition of the piping, the piping may be required to be pressure tested, thickness measured or both.

4.2.2 Chemical Tankers between 5 and 10 Years of Age

The following is to apply:

4.2.2.1 For ballast tanks, an Overall Survey of Representative Tanks selected by the Surveyor is to be carried out. If such inspections reveal no visible structural defects, the examination may be limited to a verification that the hard protective coating remains in GOOD condition.

4.2.2.2 A Ballast Tank is to be examined at subsequent annual intervals where:

- a. a hard protective coating has not been applied from the time of construction, or
- b. a soft or semi-hard coating has been applied, or
- c. substantial corrosion is found within the tank, or
- d. the hard protective coating is found to be in less than GOOD condition and the hard protective coating is not repaired to the satisfaction of the Surveyor.

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

4.2.3 Chemical Tankers between 10 and 15 years of Age

The following is to apply:

4.2.3.1 The requirements of the Intermediate Survey are to be to the same extent as the previous Special Survey as required in 2 and 5.1. However, pressure testing of cargo and ballast tanks is not required unless deemed necessary by the attending Surveyor.

4.2.3.2 In application of 4.2.3.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.4.

4.2.3.3 In application of 4.2.3.1, an under water survey may be considered in lieu of the requirements of 2.2.2.

4.2.4 Chemical Tankers over 15 years of Age

The following is to apply:

4.2.4.1 The requirements of the Intermediate Survey are to be to the same extent as the previous Special Survey as required in 2 and 5.1. However, pressure testing of cargo and ballast tanks is not required unless deemed necessary by the attending Surveyor.

4.2.4.2 In application of 4.2.4.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.4.

4.2.4.3 In application of 4.2.4.1, a survey in dry dock is to be part of the intermediate survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo tanks and water ballast tanks are to be carried out in accordance with the applicable requirements for intermediate surveys, if not already performed.

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

5. PREPARATION FOR SURVEY

5.1 Survey Programme

5.1.1 The Owner in co-operation with BCS is to work out a specific Survey Programme prior to the commencement of any part of:

- the Special Survey;
- the Intermediate Survey for chemical tankers over 10 years of age.

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

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

The Survey Programme is to be in a written format based on the information in annex IIIA.

5.1.1.1 Prior to the development of the survey programme, the survey planning questionnaire is to be completed by the owner based on the information set out in annex IIIB, and forwarded to BCS.

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

- .1 Survey status and basic ship information;
- .2 Documentation on-board, as described in 6.2 and 6.3;
- .3 Main structural plans of cargo and ballast tanks (scantling drawings), including information regarding use of high tensile steels (HTS), clad steel and stainless steel;
- .4 Executive Hull Summary;
- .5 Relevant previous damage and repair history;
- .6 Relevant previous survey and inspection reports from both BCS and the owner;
- .7 Information regarding the use of the ship's tanks, typical cargoes and other relevant data;
- .8 details of the inert gas plant and tank cleaning procedures;
- .9 information and other relevant data regarding conversion or modification of the ship's cargo and ballast tanks since the time of construction;
- .10 description and history of the coating and corrosion protection system (previous class notations), if any;
- .11 inspections by the Owner's personnel during the last 3 years with reference to structural deterioration in general, leakages in tank boundaries and piping and

condition of the coating and corrosion protection system if any. Guidance for reporting is shown in Annex IIIC;

- .12 information regarding the relevant maintenance level during operation including port state control reports of inspection containing hull related deficiencies, Safety Management System non-conformities relating to hull maintenance, including the associated corrective action(s); and
- .13 any other information that will help identify suspect areas and critical structural areas.

5.1.3 The submitted Survey Programme is to account for and comply, as a minimum, with the requirements of Tables I, II, 2.5 and 2.6 for close-up survey, thickness measurement, tank testing and pipe 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), clad steel and stainless steel;
- .3 Plan of tanks;
- .4 List of tanks with information on use, corrosion prevention and condition of coating;
- .5 Conditions for survey (e.g., information regarding tank cleaning, gas freeing, ventilation, lighting, etc.);
- .6 Provisions and methods for access to structures;
- .7 Equipment for surveys;
- .8 Nomination of tanks and areas for close-up survey (per 2.3);
- .9 Nomination of sections for thickness measurement (per 2.4);
- .10 Nomination of tanks for tank testing (per 2.5); and the pipes that are to undergo pipe testing as per 2.6;
- .11 Identification of the thickness measurement firm;
- .12 Damage experience related to the ship in question;
- .13 Critical structural areas and suspect areas, where relevant.

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

5.1.5 Use may also be made of the Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Chemical Tankers Special Survey - Hull, contained in Annex I. These guidelines are a recommended tool which may be invoked at the discretion of BCS, 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 is to 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 are to be agreed between the owner and BCS are to be in accordance with BCS- PR 37.

5.2.1.2 Details of the means of access are to 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 is to not proceed.

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

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

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

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

5.3 Access to Structures

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

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

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

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

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

5.4 Equipment for Survey

5.4.1 Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required.

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

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

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

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

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

5.5 Rescue and emergency response equipment

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

5.6 Survey at Sea or at Anchorage

5.6.1 Survey at sea or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel onboard. Necessary precautions and procedures for carrying out the survey are to be in accordance with 5.1, 5.2, 5.3 and 5.4.

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

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

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

- .1 only rough duty, inflatable rafts or boats, having satisfactory residual buoyancy and stability even if one chamber is ruptured, should be used;
- .2 the boat or raft should be tethered to the access ladder and an additional person should be stationed down the access ladder with a clear view of the boat or raft;
- .3 appropriate lifejackets should be available for all participants;

- .4 the surface of water in the tank should be calm (under all foreseeable conditions the expected rise of water within the tank should not exceed 0.25 m) and the water level stationary. On no account should the level of the water be rising while the boat or raft is in use;
- .5 the tank or space must contain clean ballast water only. Even a thin sheen of cargo on the water is not acceptable;
- .6 at no time should the water level be allowed to be within 1 m of the deepest under deck web face flat so that the survey team is not isolated from a direct escape route to the tank hatch. Filling to levels above the deck transverse should only be contemplated if a deck access manhole is fitted and open in the bay being examined, so that an escape route for the survey party is available at all times. Other effective means of escape to the deck may be considered;
- .7 if the tanks (or spaces) are connected by a common venting system, or inert gas system, the tank in which the boat or raft should be used should be isolated to prevent a transfer of gas from other tanks (or spaces).

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

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

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

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

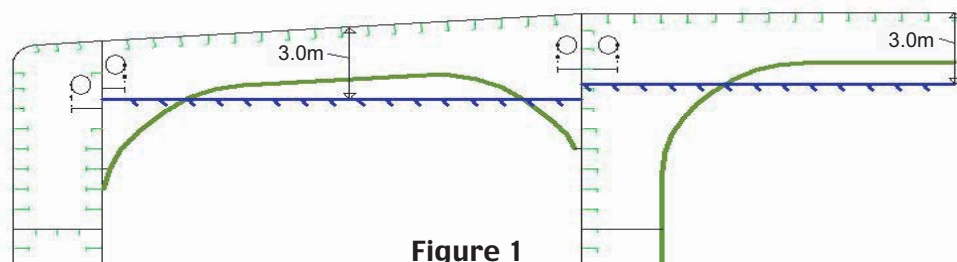


Figure 1

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

Reference is made to BCS- G 39 - Guidelines for the use of Boats or Rafts for Close-up surveys.

5.7 Survey Planning Meeting

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

5.7.2 Prior to the commencement of any part of the Special and Intermediate Survey a survey planning meeting is to be held between the attending Surveyor(s), the Owner's Representative in attendance and the TM firm representative, where involved, and the master of the ship or an appropriately qualified representative appointed by the master or firm for the purpose of ascertaining that all the arrangements envisaged in the survey programme are in place, so as to ensure the safe and efficient conduct of the survey work to be carried out. See also 7.1.2.

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

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

6. DOCUMENTATION ON BOARD

6.1 General

6.1.1 The owner is to obtain, supply and maintain on board documentation as specified in 6.2 and 6.3, which is to be readily available for the Surveyor.

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

6.2 Survey Report File

6.2.1 A Survey Report File is to be a part of the documentation on board consisting of

- Reports of structural surveys;
- Executive Hull Summary;
- Thickness measurement reports.

6.2.2 The Survey Report File is to be available also in the Owner's and BCS's management offices.

6.3 Supporting Documents

6.3.1 The following additional documentation is to be available onboard:

- Survey Programme as required by 5.1 until such time as the Special Survey or Intermediate Survey, as applicable, has been completed;
- Main structural plans of cargo and ballast tanks;
- Previous repair history;
- Cargo and ballast history;
- Extent of use of inert gas plant and tank cleaning procedures;
- Inspections by ship's personnel with reference to
 - structural deterioration in general
 - leakage in bulkheads and piping
 - condition of corrosion prevention system, if any;
- Any other information that will help identify Critical Structural Areas and/or Suspect Areas requiring inspection.

6.4 Review of Documentation On Board

6.4.1 Prior to survey, the Surveyor is to examine the completeness of the documentation onboard, 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 BCS itself, are to be witnessed by a Surveyor of BCS. The Surveyor is to be on board to the extent necessary to control the process.

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

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

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

7.2 Certification of Thickness Measurement Firm

7.2.1 The thickness measurements are to be carried out by a qualified firm certified by BCS according to principles stated in Table V.

7.3 Reporting

7.3.1 A thickness measurement report is to be prepared. The report is to give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report is to give the date when the measurements were carried out, type of measurement equipment, names of personnel and their qualifications and has to be signed by the operator. The thickness measurement report is to follow the principles as specified in the Recommended Procedures for Thickness Measurements of Chemical Tankers, contained in Annex II.

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

8. REPORTING AND EVALUATION OF SURVEY

8.1 Evaluation of Survey Report

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

8.2 Reporting

8.2.1 Principles for survey reporting are shown in Table VI.

8.2.2 When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items examined and / or tested (pressure testing, thickness measurements etc.) and an indication of whether the item has been credited, are to be made available to the next attending Surveyor(s), prior to continuing or completing the survey.

8.2.3 An Executive Hull Summary of the survey and results is to be issued to the Owner as shown in Table VII and placed on board the vessel for reference at future surveys. The Executive Hull Summary is to be endorsed by BCS's head office or regional managerial office.

TABLE I.1

**MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT
SPECIAL SURVEY OF SINGLE SKIN CHEMICAL TANKERS**

Special Survey No.1 age < 5		Special Survey No.2 5 < age < 10		Special Survey No.3 10 < age < 15		Special Survey No.4 and Subsequent: age > 15
A	ONE WEB FRAME RING - in a ballast wing tank	A	ALL WEB FRAME RINGS - in a ballast wing tank or double bottom ballast tank (see Note I)	A	ALL WEB FRAME RINGS - in all ballast tanks	As special survey No.3
B	ONE DECK TRANSVERSE - in a cargo tank or on deck	B	ONE DECK TRANSVERSE - in each remaining ballast tank or on deck	A	ALL WEB FRAME RINGS - in a cargo wing tank	Additional transverse areas as deemed necessary by BCS
		B	ONE DECK TRANSVERSE - in a cargo wing tank or on deck			
D	ONE TRANSVERSE BULKHEAD - lower part in a ballast tank	B	ONE DECK TRANSVERSE - in two cargo centre tanks or on deck	A	ONE WEB FRAME RING - in each remaining cargo tank	
D	ONE TRANSVERSE BULKHEAD - lower part in a cargo wing tank	C	BOTH TRANSVERSE BULKHEADS - in a ballast wing tank	C	ALL TRANSVERSE BULKHEADS - in all cargo tanks	
D	ONE TRANSVERSE BULKHEAD - lower part in a cargo centre tank (see Note II)	D	ONE TRANSVERSE BULKHEAD - lower part in each remaining ballast tank	C	ALL TRANSVERSE BULKHEADS - in all ballast tanks	
		D	ONE TRANSVERSE BULKHEAD - lower part in two cargo centre tanks (see Note II)			
		D	ONE TRANSVERSE BULKHEAD - lower part in a cargo wing tank			

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

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

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

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

TABLE I.2

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

Special Survey No.1 age < 5		Special Survey No.2 5 < age < 10		Special Survey No.3 10 < age < 15		Special Survey No.4 and Subsequent: age > 15
(1)	ONE WEB FRAME RING - in a ballast double hull tank (see Note I)	(1)	ALL WEB FRAME RINGS - in a ballast wing tank or ballast double hull tank (see Note I)	(1)	ALL WEB FRAME RINGS - in all ballast tanks	As special survey No.3
(2)	ONE DECK TRANSVERSE - in a cargo tank or on deck	(6)	THE KNUCKLE AREA AND THE UPPER PART (3 metres approx) of one web frame in each remaining ballast tank	(7)	ALL WEB FRAME RINGS - in a cargo wing tank	Additional transverse areas as deemed necessary by BCS
(4)	ONE TRANSVERSE BULKHEAD - in a ballast tank (see Note I)			(7)	ONE WEB FRAME RING - in each remaining cargo tank	
(5)	ONE TRANSVERSE BULKHEAD - in a cargo wing tank	(2)	ONE DECK TRANSVERSE - in two cargo tanks	(3)	ALL TRANSVERSE BULKHEADS - in all cargo tanks	
(5)	ONE TRANSVERSE BULKHEAD - in a cargo centre tank (see Note II)	(4)	ONE TRANSVERSE BULKHEAD - in each ballast tank (see Note I)	(4)	ALL TRANSVERSE BULKHEADS - in all ballast tanks	
		(5)	ONE TRANSVERSE BULKHEAD - in two cargo centre tanks (see Note II)			
		(5)	ONE TRANSVERSE BULKHEAD - in a cargo wing tank			

(1), (2), (3), (4), (5), (6) and (7) are areas to be subjected to close-up surveys and thickness measurements (see Figures 2.1 - 2.3).

(1): Web frame in a ballast tank means vertical web in side tank, hopper web in hopper tank, floor in double bottom tank and deck transverse in double deck tank (where fitted), including adjacent structural members. In fore and aft peak tanks web frame means a complete transverse web frame ring including adjacent structural members.

(2): Deck transverse, including adjacent deck structural members (or external structure on deck in way of the tank, where applicable).

(3): Transverse bulkhead complete in cargo tanks, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower and upper stools, where fitted.

(4): Transverse bulkhead complete in ballast tanks, including girder system and adjacent structural members, such as longitudinal bulkheads, girders in double bottom tanks, inner bottom plating, hopper side, connecting brackets.

(5): Transverse bulkhead lower part in cargo tank, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower stool, where fitted.

(6): The *knuckle area* and the upper part (3 metres approximately), including adjacent structural members. *Knuckle area* is the area of the web frame around the connections of the slope hopper plating to the inner hull bulkhead and the inner bottom plating, up to 2 metres from the corners both on the bulkhead and the double bottom.

(7): Web frame in a cargo tank means deck transverse, longitudinal bulkhead structural elements and cross ties, where fitted, including adjacent structural members.

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

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

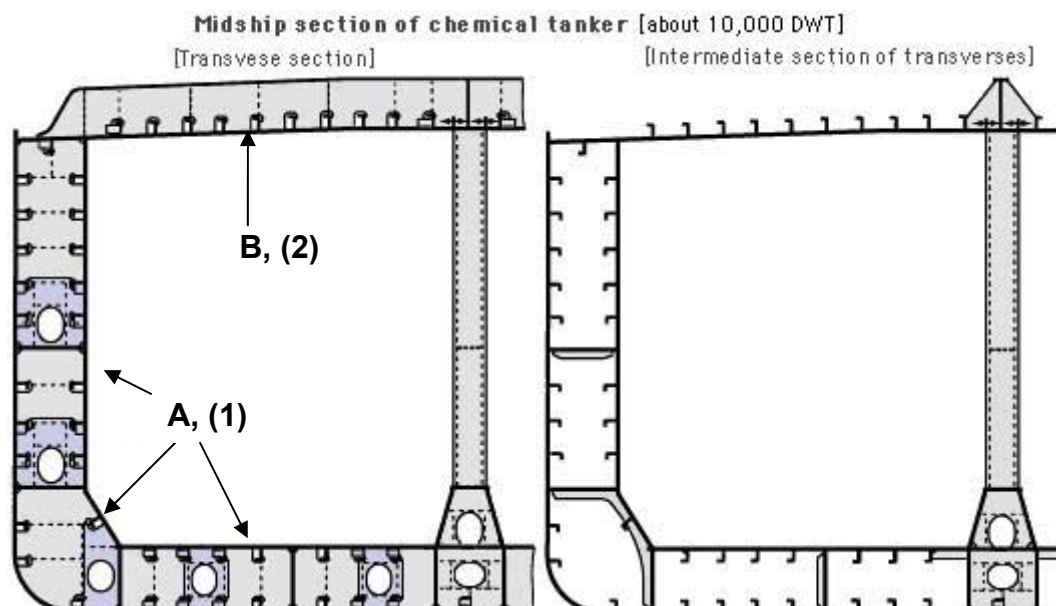


Fig. 2.1 Representative transverse section of chemical tanker. Areas A & B and 1 and 2

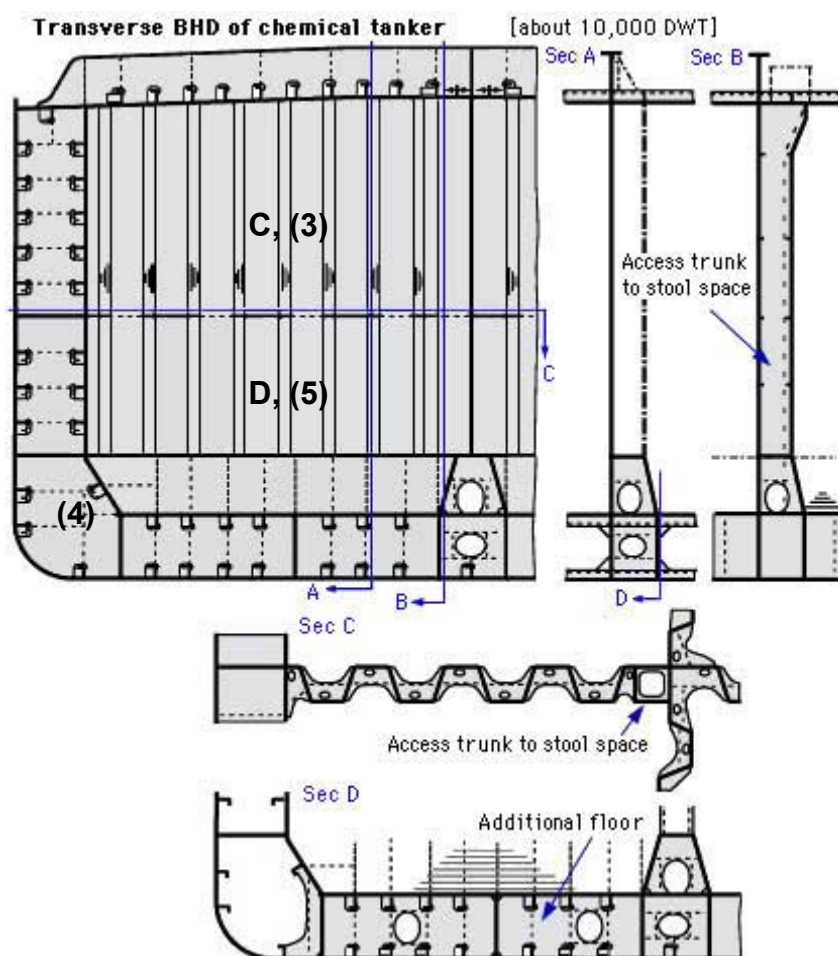


Fig. 2.2 Representative transverse section of chemical tanker. Areas C & D and 3, 4 and 5

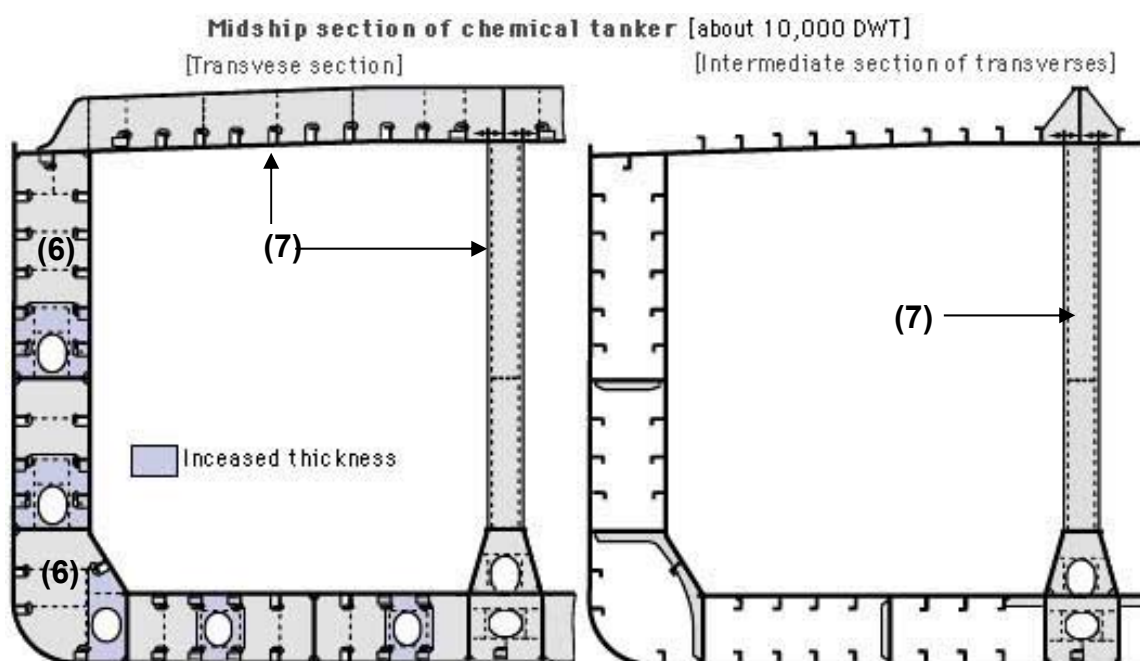


Fig. 2.3 Representative transverse section of chemical tanker. Areas 6 and 7

TABLE II

**MINIMUM REQUIREMENTS FOR THICKNESS MEASUREMENTS AT
SPECIAL SURVEY OF CHEMICAL TANKERS**

Special Survey No.1 age < 5	Special Survey No.2 5 < age ≤ 10	Special Survey No.3 10 < age ≤ 15	Special Survey No.4 and Subsequent age > 15
1. Suspect areas	1. Suspect areas	1. Suspect areas	1. Suspect areas
2. One section of deck plating for the full beam of the ship within the cargo area (in way of a ballast tank, if any, or a cargo tank used primarily for water ballast)	2. Within the cargo area: .1 Each deck plate .2 One transverse section	2. Within the cargo area: .1 Each deck plate .2 Two transverse sections ⁽¹⁾ .3 All wind and water strakes	2. Within the cargo area: .1 Each deck plate .2 Three transverse sections ⁽¹⁾ .3 Each bottom plate
	3. Selected wind and water strakes outside the cargo area	3. Selected wind and water strakes outside the cargo area	3. All wind and water strakes, full length
4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I.1 or I.2, as applicable.	4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I.1 or I.2, as applicable.	4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I.1 or I.2, as applicable.	4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I.1 or I.2, as applicable.
(1): at least one section is to include a ballast tank within 0.5L amidships.			

TABLE III

**MINIMUM REQUIREMENTS FOR TANK TESTING
AT SPECIAL SURVEY OF CHEMICAL TANKERS**

Special Survey No.1 age ≤ 5	Special Survey No.2 and Subsequent age > 5
All ballast tank boundaries	All ballast tank boundaries
Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, pump rooms or cofferdams	All cargo tank bulkheads

TABLE IV/Sheet 1

**REQUIREMENTS FOR EXTENT OF THICKNESS
MEASUREMENTS AT THOSE AREAS OF SUBSTANTIAL CORROSION.
SPECIAL SURVEY OF CHEMICAL TANKERS WITHIN
THE CARGO AREA LENGTH.**

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

TABLE IV/Sheet 2

**REQUIREMENTS FOR EXTENT OF THICKNESS
MEASUREMENTS AT THOSE AREAS OF SUBSTANTIAL CORROSION.
SPECIAL SURVEY OF CHEMICAL TANKERS WITHIN
THE CARGO AREA LENGTH.**

DECK STRUCTURE		
Structural member	Extent of measurement	Pattern of measurement
Deck plating	Two transverse bands across tank	Minimum of three measurements per plate per band
Deck longitudinals	Every third longitudinal in each of two bands with a minimum of one longitudinal	Three measurements in line vertically on webs and two measurements on flange (if fitted)
Deck girders and brackets	At fore and aft transverse bulkhead, bracket toes and in centre of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across flange. 5-point pattern on girder/bulkhead brackets
Deck transverse webs	Minimum of two webs, with measurements at both ends and middle of span	5-point pattern over one square metre area. Single measurements on flange
Vertical web and transverse bulkhead in wing ballast tank for double hull design (two metres from deck)	Minimum of two webs, and both transverse bulkheads	5-point pattern over one square metre area
Panel stiffening	Where applicable	Single measurements

TABLE IV/Sheet 3

**REQUIREMENTS FOR EXTENT OF THICKNESS
MEASUREMENTS AT THOSE AREAS OF SUBSTANTIAL CORROSION.
SPECIAL SURVEY OF CHEMICAL TANKERS WITHIN
THE CARGO AREA LENGTH.**

SIDE SHELL AND LONGITUDINAL BULKHEADS		
Structural member	Extent of measurement	Pattern of measurement
Side shell and longitudinal bulkhead plating: <ul style="list-style-type: none"> - Deckhead and bottom strakes, and strakes in way of horizontal girders - All other strakes 	<ul style="list-style-type: none"> - Plating between each pair of longitudinals in a minimum of three bays (along the tank) - Plating between every third pair of longitudinals in same three bays 	Single measurement
Side shell and longitudinal bulkhead longitudinals on: <ul style="list-style-type: none"> - Deckhead and bottom strakes - All other strakes 	<ul style="list-style-type: none"> - Each longitudinal in same three bays - Every third longitudinal in same three bays 	3 measurements across web and 1 measurement on flange
Longitudinals - brackets	Minimum of three at top, middle and bottom of tank in same three bays	5-point pattern over area of bracket
Vertical web and transverse bulkheads of double side tanks (excluding deck area): <ul style="list-style-type: none"> - Strakes in way of horizontal girders - Other strakes 	<ul style="list-style-type: none"> - Minimum of two webs and both transverse bulkheads - Minimum of two webs and both transverse bulkheads 	<ul style="list-style-type: none"> - 5-point pattern over approx. two square metre area - Two measurements between each pair of vertical stiffeners
Web frames and cross ties for other tanks than double side tanks	Three webs with minimum of three locations on each web, including in way of cross tie connections and lower end bracket	5-point pattern over approximately two square metre area of webs, plus single measurements on flanges of web frame and cross ties
Horizontal girders	Plating on each girder in a minimum of three bays	Two measurements between each pair of longitudinal girder stiffeners
Panel stiffening	Where applicable	Single measurements

TABLE IV/Sheet 4

**REQUIREMENTS FOR EXTENT OF THICKNESS
MEASUREMENTS AT THOSE AREAS OF SUBSTANTIAL CORROSION.
SPECIAL SURVEY OF CHEMICAL TANKERS WITHIN
THE CARGO AREA LENGTH.**

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

TABLE V

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

1. Application

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

2. Procedures for Certification

(1) Submission of Documents:

Following documents are to be submitted to BCS for approval:

- a) Outline of firms, e.g. organisation and management structure.
- b) Experience of the firms on thickness measurement inter alia of hull structures of the vessels.
- c) Technicians' careers, i.e. experience of technicians as thickness measurement operators, technical knowledge of hull structure etc. Operators, are to be qualified according to a recognized industrial NDT Standard.
- d) Equipment used for thickness measurement such as ultra-sonic testing machines and its maintenance/calibration procedures.
- e) A guide for thickness measurement operators.
- f) Training programmes of technicians for thickness measurement.
- g) Measurement record format in accordance with the Recommended Procedures for Thickness Measurements of Chemical Tankers, contained in Annex II.

(2) Auditing of the firms:

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

(3) Certification is conditional on an onboard demonstration at thickness measurements as well as satisfactory reporting.

3. Certification

(1) Upon satisfactory results of both the audit of the firm in 2(2) and the demonstration tests in 2(3) above, BCS will issue a Certificate of Approval as well as a notice to the effect that the thickness measurement operation system of the firm has been certified by BCS.

(2) Renewal/endorsement of the Certificate is to be made at intervals not exceeding 3 years by verification that original conditions are maintained.

4. Information of any alteration to the Certified Thickness Measurement Operation System

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

5. Cancellation of Approval

Approval may be cancelled in the following cases:

- (1) Where the measurements were improperly carried out or the results were improperly reported.
- (2) Where the Society's surveyor found any deficiencies in the approved thickness measurement operation systems of the firm.
- (3) Where the firm failed to inform of any alteration in 4 above to BCS.

TABLE VI

SURVEY REPORTING PRINCIPLES

As a principle, for chemical tankers subject to ESP, the surveyor is to include the following content in his report for survey of hull structure and piping systems, as relevant for the survey.

1. General

1.1 A survey report is to be generated in the following cases:

- In connection with commencement, continuation and / or completion of periodical hull surveys, i.e. annual, intermediate and special surveys, as relevant
- When structural damages / defects have been found
- When repairs, renewals or modifications have been carried out
- When condition of class has been imposed or deleted

1.2 The purpose of reporting is to provide:

- Evidence that prescribed surveys have been carried out in accordance with applicable classification rules
- Documentation of surveys carried out with findings, repairs carried out and condition of class imposed or deleted
- Survey records, including actions taken, which shall form an auditable documentary trail. Survey reports are to be kept in the survey report file required to be on board
- Information for planning of future surveys
- Information which may be used as input for maintenance of classification rules and instructions

1.3 When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items surveyed, relevant findings and an indication of whether the item has been credited, is to be made available to the next attending surveyor, prior to continuing or completing the survey. Thickness measurement and tank testing carried out is also to be listed for the next surveyor.

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 tank, where a close-up survey has been carried out, together with information of the means of access used.

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

*Note: As a minimum, the identification of location of close-up survey and thickness measurement is to include a confirmation with description of individual structural members corresponding to the extent of requirements stipulated in BCS- R Z10.3 based on type of periodical survey and the ship's age.
Where only partial survey is required, i.e. one web frame ring / one deck transverse, the identification is to include location within each tank by reference to frame numbers.*

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

2.5 Identification of tanks subject to tank testing.

2.6 Identification of cargo piping on deck and cargo and ballast piping within cargo and ballast tanks, pump rooms, pipe tunnels and void spaces, where:

- Examination including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been carried out
- 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).

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

- Identification of findings, such as:
 - Corrosion with description of location, type and extent
 - Areas with substantial corrosion
 - Cracks / fractures with description of location and extent
 - Buckling with description of location and extent
 - Indents with description of location and extent
- Identification of compartments where no structural damages / defects are found

The report may be supplemented by sketches / photos.

3.3 Thickness measurement report is to be verified and signed by the surveyor controlling the measurements on board.

4. Actions taken with respect to findings

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

4.2 Repairs carried out are to be reported with identification of:

- Compartment
- Structural member
- Repair method (i.e. renewal or modification) including:
 - Steel grades and scantlings (if different from the original),
 - Sketches/photos, as appropriate
- Repair extent
- NDT / Tests

4.3 For repairs not completed at the time of survey, condition of class is to be imposed with a specific time limit for the repairs. In order to provide correct and proper information to the surveyor attending for survey of the repairs, condition of class is to be sufficiently detailed with identification of each item to be repaired. For identification of extensive repairs, reference may be given to the survey report.

TABLE VII (i)

IACS UNIFIED REQUIREMENTS FOR ENHANCED SURVEYS

EXECUTIVE HULL SUMMARY

Issued upon Completion of Special Survey

GENERAL PARTICULARS

SHIP'S NAME:

CLASS IDENTIFY NUMBER:

IMO IDENTIFY NUMBER:

PORT OF REGISTRY:

NATIONAL FLAG:

DEADWEIGHT (M. TONNES):

GROSS TONNAGE:

NATIONAL:

ITC (69):

DATE OF BUILD:

CLASSIFICATION NOTATION:

DATE OF MAJOR CONVERSION:

TYPE OF CONVERSION:

- a) The survey reports and documents listed below have been reviewed by the undersigned and found to be satisfactory
- b) A summary of the survey is attached herewith on sheet 2
- c) The hull special survey has been completed in accordance with the Regulations on [date]

Executive Summary Report completed by:	Name Signature	Title
OFFICE	DATE	
Executive Summary Report verified by:	Name Signature	Title
OFFICE	DATE	

Attached reports and documents:

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)

TABLE VII (ii)

EXECUTIVE HULL SUMMARY

- | | | | |
|----|-------------------------------------|---------------------------|---|
| A) | General Particulars: | - | Ref. Table VII (i) |
| B) | Report Review: | - | Where and how survey was done |
| C) | Close-up Survey: | - | Extent (Which tanks) |
| D) | Cargo & Ballast
Piping System: | - | Examined |
| | | - | Operationally tested |
| E) | Thickness
measurements: | - | Reference to Thickness Measurement report |
| | | - | Summary of where measured |
| | | - | Separate form indicating the tanks/areas with
Substantial Corrosion, and corresponding |
| | | | * Thickness diminution |
| | | | * Corrosion pattern |
| F) | Tank Protection: | Separate form indicating: | |
| | | - | Location of coating |
| | | - | Condition of coating (if applicable) |
| G) | Repairs: | - | Identification of tanks/areas |
| H) | Condition of Class/Recommendations: | | |
| I) | Memoranda: | - | Acceptable defects |
| | | - | Any points of attention for future surveys, e.g. for
Suspect Areas. |
| | | - | Extended Annual/Intermediate survey due to coating
breakdown |
| J) | Conclusion: | - | Statement on evaluation/verification of survey report |

TABLE ~~IX~~VII (iii)

EXTRACT OF THICKNESS MEASUREMENTS

Reference is made to the thickness measurements report:

1) Position of substantially corroded Tanks/Areas or Areas with deep pitting	Thickness diminution [%]	2) Corrosion pattern	Remarks: e.g. Ref. attached sketches

Remarks:

- 1) Substantial corrosion, i.e. 75 – 100% of acceptable margins wasted
- 2) P = Pitting
C = Corrosion in General
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 1/3 or more of actual plate thickness is to be noted.

TABLE ~~IX~~VII (iv)
TANK PROTECTION

1) Tank Nos.	2) Tank protection	3) Coating condition	Remarks

Remarks:

1) All segregated ballast tanks and combined cargo/ballast tanks to be listed.

2) C = Coating NP = No Protection

3) Coating condition according to the following standard

GOOD condition with only minor spot rusting.

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

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

If coating condition **less than "GOOD"** is given, extended annual surveys are to be introduced. This is to be noted in part I) of the Executive Hull Summary.

ANNEX I

GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH PLANNING FOR ENHANCED SURVEYS OF CHEMICAL TANKERS SPECIAL SURVEY - HULL

Contents:

1. INTRODUCTION

2. PURPOSE AND PRINCIPLES

- 2.1 Purpose
- 2.2 Minimum Requirements
- 2.3 Timing
- 2.4 Aspects to be Considered

3. TECHNICAL ASSESSMENT

- 3.1 General
- 3.2 Methods
 - 3.2.1 Design Details
 - 3.2.2 Corrosion
 - 3.2.3 Locations for Close-up Survey and Thickness Measurement

REFERENCES

- 1. BCS- R Z10.3, "Hull Surveys of Chemical Tankers."
- 2. TSCF, "Guidelines for the Inspection and Maintenance of Double Hull Tanker Structures, 1995."
- 3. TSCF, "Guidance Manual for Tanker Structures, 1997."

1 INTRODUCTION

These guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of enhanced special surveys of chemical tankers. As indicated in section 5.1.5 of BCS- R Z10.3, "Hull Surveys of Chemical Tankers," (Ref. 1), the guidelines are a recommended tool which may be invoked at the discretion of BCS, 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 and tanks for thickness measurement, close-up survey and tank testing. Critical Structural Areas are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships (if

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

2.2 Minimum Requirements

However, these guidelines may not be used to reduce the requirements pertaining to thickness measurement, close-up survey and tank testing contained in Tables I, II and III, respectively, of BCS- R Z10.3; which are, in all cases, to be complied with as a minimum.

2.3 Timing

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

2.4 Aspects to be Considered

Technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of tanks and areas for survey:

- Design features such as stress levels on various structural elements, design details and extent of use of high tensile steel.
- Former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available.
- Information with respect to types of cargo carried, use of different tanks for cargo/ballast, protection of tanks and condition of coating, if any.

Technical assessments of the relative risks of susceptibility to damage or deterioration of various structural elements and areas are to be judged and decided on the basis of recognised principles and practices, such as may be found in publications of the Tanker Structure Cooperative Forum (TSCF), (Refs. 2 and 3).

3 TECHNICAL ASSESSMENT

3.1 General

There are three basic types of possible failure which may be the subject of technical assessment in connection with planning of surveys; corrosion, cracks and buckling. Contact damages are not normally covered by the survey plan since indents are usually noted in memoranda and assumed to be dealt with as a normal routine by Surveyors.

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

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

The design is to be considered with respect to structural details which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue.

Corrosion is related to the ageing process, and is closely connected with the quality of corrosion protection at newbuilding, and subsequent maintenance during the service life. Corrosion may also lead to cracking and/or buckling.

3.2 Methods

3.2.1 Design Details

Damage experience related to the ship in question and similar ships, where available, is the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings are to be included.

Typical damage experience to be considered will consist of:

- Number, extent, location and frequency of cracks;
- Location of buckles.

This information may be found in the survey reports and/or the Owner's files, including the results of the Owner's own inspections. The defects are to be analyzed, noted and marked on sketches.

In addition, general experience is to be utilized. For example, reference is to be made to the two TSCF's publications mentioned in Ref.2 and Ref.3, which contain a catalogue of typical damages and proposed repair methods for various tanker structural details.

Such figures are to be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage. An example is shown in Figure 2. In particular, Chapter 3 of Ref.2 deals with various aspects specific to double hull tankers, such as stress concentration locations, misalignment during construction, corrosion trends, fatigue considerations and areas requiring special attention, which are to be considered in working out the survey planning.

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

The use of high tensile steel (HTS) is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favourable, e.g. side structures.

In this respect, stress calculations of typical and important components and details, in accordance with the latest Rules or other relevant methods, may prove useful and are to be considered. The selected areas of the structure identified during this process are to be recorded and marked on the structural drawings to be included in the Survey Programme.

3.2.2 Corrosion

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

- Usage of Tanks and Spaces
- Condition of Coatings
- Cleaning Procedures
- Previous Corrosion Damage
- Ballast use and time for Cargo Tanks
- Corrosion Risk Scheme (See Ref. 3, Table 2.1)
- Location of Heated Tanks

Ref. 3 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

The evaluation of corrosion risks is to be based on information in Ref. 3, together with relevant information on the anticipated condition of the ship as derived from the information collected in order to prepare the Survey Programme and the age of the ship. The various tanks and spaces are to be listed with the corrosion risks nominated accordingly.

Special attention is to be given to the areas where the double hull tanker is particularly exposed to corrosion. To do this end, the specific aspects addressing corrosion in double hull tankers indicated in 3.4 (Corrosion trends) of Ref.2 are to be taken into account.

3.2.3 Locations for Close-up Survey and Thickness Measurement

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

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

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

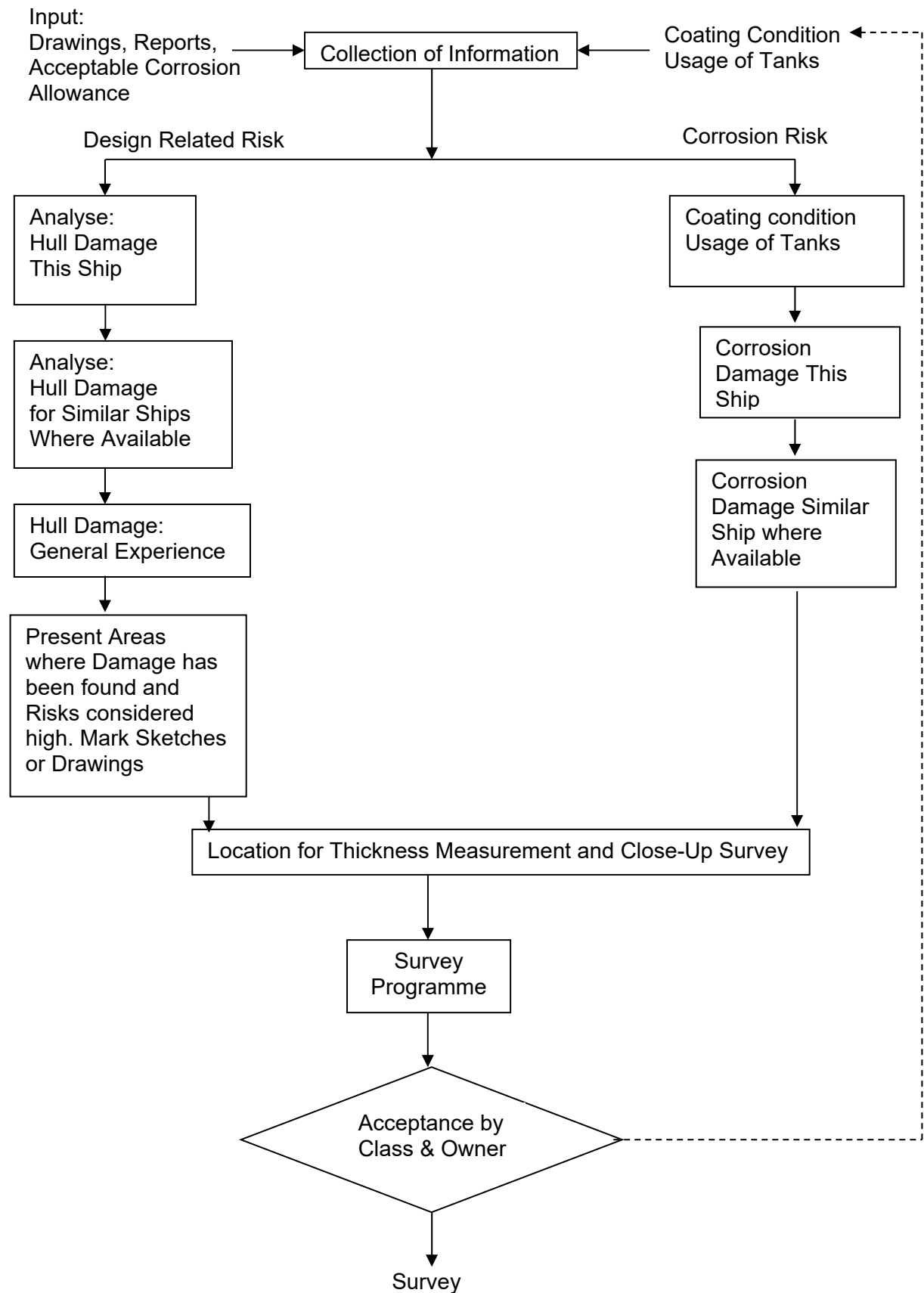


Figure 1: Technical Assessment and the Survey Planning Process

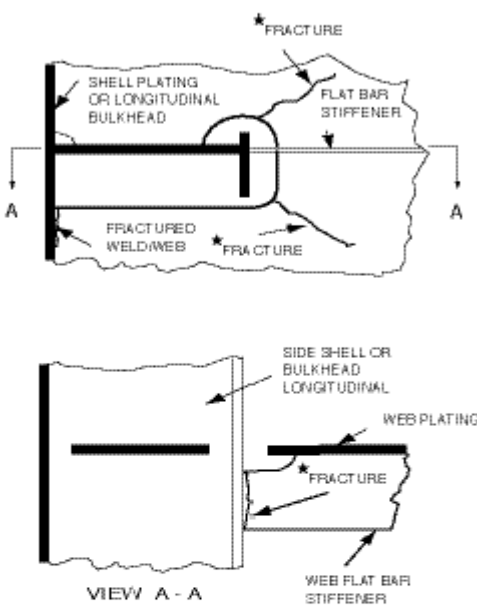
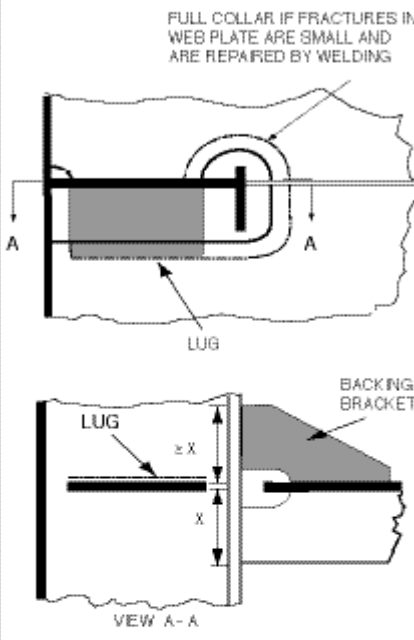
LOCATION: Connection of longitudinals to transverse webs EXAMPLE No. 1 : Web and flat bar fractures at cut-outs for longitudinal stiffener connections		
TYPICAL DAMAGE		PROPOSED REPAIR
 <p>NOTE *ONE OR MORE FRACTURES MAY OCCUR</p>		<p>FULL COLLAR IF FRACTURES IN WEB PLATE ARE SMALL AND ARE REPAIRED BY WELDING</p>  <p>WEB AND FLAT BAR CROPPED AND PART HENEVED OR ALTERNATIVELY WELDED</p>
<p>FACTORS CONTRIBUTING TO DAMAGE</p> <ol style="list-style-type: none"> 1. Asymmetrical connection of flat bar stiffener resulting in high peak stresses at the heel of the stiffener under fatigue loading. 2. Insufficient area of connection of longitudinal to web plate. 3. Defective weld at return around the plate thickness. 4. High localised corrosion at areas of stress concentration such as flat bar stiffener connections, corners of cut-out for the longitudinal and connection of web to shell at cut-outs. 5. High stress in the web of the transverse. 6. Dynamic sea way load/ship motions. 		
FIGURE 1	TANKER STRUCTURE CO-OPERATIVE FORUM SUBJECT: CATALOGUE OF STRUCTURAL DETAILS	FIGURE 1

Figure 2: Typical Damage and Repair Example (Reproduced from Ref. 2)

ANNEX II

RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS OF CHEMICAL TANKERS*

*

Note 1: Annex II is recommendatory

Note 2: For Single Hull Chemical Tankers, please refer to Annex II of BCS- R Z10.1

Note 3: For Double Hull Chemical Tankers, please refer to Annex II of BCS- R Z10.4

ANNEX III

ANNEX IIIA

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:

Classification Society:

Class ID:

Date of build of the ship:

Owner:

Thickness measurement firm:

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 area, cargo tanks, ballast tanks, including fore and aft peak tanks, required by BCS- R Z10.3.

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

1.2 Documentation

All documents used in the development of the survey programme are to be available onboard during the survey as required by section 6.

2 Arrangement of tanks and spaces

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

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

This section of the survey programme is to indicate any changes relating to (and is to update) the information on the use of the 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 is to 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 is to indicate any changes relating to (and is to 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 is to 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 is to identify and list the spaces that are to undergo an overall survey for the ship in accordance with 2.3.1.

7.2 Close-up survey

This section of the survey programme is to identify and list the hull structures that are to undergo a close-up survey for the ship in accordance with 2.3.2.

8 Identification of tanks for tank testing and pipes for pipe testing

This section of the survey programme is to identify and list the tanks that are to undergo tank testing for the ship in accordance with 2.5 and the pipes that are to undergo pipe testing in accordance with 2.6.

9 Identification of areas and sections for thickness measurements

This section of the survey programme is to identify and list the areas and sections where thickness measurements are to be taken in accordance with 2.4.1.

10 Minimum thickness of hull structures

This section of the survey programme is to specify the minimum thickness for hull structures of the ship that are subject to BCS- R Z10.3 (indicate either (a) or preferably (b), if such information is available):

- (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			
Bottom			
Plating			
Longitudinals			
Longitudinal girders			
Ship side			
Plating			
Longitudinals			
Longitudinal girders			
Longitudinal bulkhead			
Plating			
Longitudinals			
Longitudinal girders			
Inner bottom			
Plating			
Longitudinals			
Longitudinal girders			
Transverse bulkheads			
Plating			
Stiffeners			

Transverse web frames, floors and stringers and diaphragms			
Plating			
Flanges			
Stiffeners			

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

11 Thickness measurement firm

This section of the survey programme is to identify changes, if any, relating to the information on the thickness measurement firm provided in the Survey Planning Questionnaire.

12 Damage experience related to the ship

This section of the survey programme is to, using the tables provided below, provide details of the hull damages for at least the last three years in way of the cargo and ballast tanks and void spaces within the cargo area. These damages are subject to survey.

Hull damages sorted by location for the ship

Tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

**Hull damages for sister or similar ships (if available) in the case of
design related damage**

Tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

13 Areas identified with substantial corrosion from previous surveys

This section of the survey programme is to identify and list the areas of substantial corrosion from previous surveys.

14 Critical structural areas and suspect areas

This section of the survey programme is to identify and list the critical structural areas and the suspect areas, if such information is available.

15 Other relevant comments and information

This section of the survey programme is to provide any other comments and information relevant to the survey.

Appendices

Appendix 1 - List of plans

Paragraph 5.1.3.2 requires that main structural plans of cargo and ballast tanks (scantling drawings), including information regarding use of high tensile steel (HTS), clad steel and stainless steel to be available. This appendix of the survey programme is to identify and list the main structural plans which form part of the survey programme.

Appendix 2 - Survey Planning Questionnaire

The Survey Planning Questionnaire (annex IIIB), which has been submitted by the owner, is to be appended to the survey programme.

Appendix 3 - Other documentation

This part of the survey programme is to identify and list any other documentation that forms part of the Plan.

Prepared by the owner in co-operation with BCS for compliance with 5.1.3.

Date:..... (name and signature of authorized owner's representative)

Date:..... (name and signature of authorized representative of BCS)

ANNEX IIIB

SURVEY PLANNING QUESTIONNAIRE

The following information will enable the owner in co-operation with BCS to develop a survey programme complying with the requirements of BCS- R Z10.3. It is essential that the owner provides, when completing the present questionnaire, up-to-date information. The present questionnaire, when completed, is to provide all information and material required by BCS- R Z10.3.

Particulars

Ship's name:
IMO number:
Flag State:
Port of registry:
Owner:
Classification Society:
Class ID:
Gross tonnage:
Deadweight (metric tonnes):
Date of build:

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

The owner is to 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. normally within reach of hand.

Tank No.	Structure	C(Cargo)/ B(Ballast)	Temporary staging	Rafts	Ladders	Direct access	Other means (please specify)
F.P.	Fore peak						
A.P.	Aft peak						
Wing Tanks	Under deck						
	Side shell						
	Bottom transverse						
	Longitudinal						
	Transverse						
Centre Tanks	Under deck						
	Bottom transverse						
	Transverse						

Tank No.	Corrosion protection (1)	Coating extent (2)	Coating condition (3)	Structural deterioration (4)	Tank damage history (5)
Ballast tanks					
Fore peak					
Aft peak					
Miscellaneous spaces					

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

- 1) HC=hard coating; SC=soft coating;
SH=semi-hard coating; 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 3 years)
- 4) N=no findings recorded; Y=findings recorded,
(Description of findings is to be attached to the questionnaire)
- 5) DR=damage & repair; L=leakages;
CV=conversion
(Description is 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:

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

Name and address of the approved thickness measurement firm:

[illegible]

ANNEX IIIC

OWNER'S INSPECTION REPORT

Structural condition

Ship's name:

For tank No:

Grade of steel:

deck:

side:

bottom:

longitudinal bulkhead:

Elements	Cracks	Buckles	Corrosion	Coating condition	Pitting	Modification/repair	Other
Deck							
Bottom							
Side							
Longitudinal bulkhead							
Transverse bulkhead							

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:

BCS- R Z10.4 Hull Surveys of Double Hull Oil Tankers

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 - 1.1 Application
 - 1.2 Definitions
 - 1.3 Repairs
 - 1.4 Thickness Measurements And Close-Up Surveys
- 2. Special Survey**
 - 2.1 Schedule
 - 2.2 Scope
 - 2.3 Extent of Overall and Close-up Surveys
 - 2.4 Extent of Thickness Measurements
 - 2.5 Extent of Tank Testing
- 3. Annual Survey**
 - 3.1 Schedule
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- 4. Intermediate Survey**
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- 5. Preparation For Survey**
 - 5.1 Survey Programme
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 - 8.2 Acceptance criteria for pitting corrosion of CSR ships
 - 8.3 Acceptance criteria for edge corrosion of CSR ships
 - 8.4 Acceptance criteria for grooving corrosion of CSR ships

-
- 9. Reporting and Evaluation of Survey**
 - 9.1 Evaluation of Survey Report
 - 9.2 Reporting

ENCLOSURES

Table I:	Minimum requirements for Close-up Surveys at Special Survey of Double Hull Oil Tankers
Table II:	Minimum requirements for thickness measurements at Special Survey of Double Hull Oil Tankers
Table III:	Minimum requirements for tank testing at Special Survey of Double Hull Oil Tankers
Table IV:	Requirements for extent of thickness measurements at those areas of substantial corrosion
Table V:	Minimum requirements for overall and close-up survey and thickness measurements at intermediate survey of double hull oil tankers
Table VI:	Owners Inspection Report
Table VII:	Procedures for Certification of Firms Engaged in Thickness Gauging of Hull Structures
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Annex I:	Guidelines for Technical Assessment in conjunction with planning for Enhanced Surveys of Double Hull Oil Tankers Special Survey - Hull
Annex II:	Recommended Procedures for Thickness Measurements of Double Hull Oil Tankers Recommended Procedures for Thickness Measurements of Double Hull Oil Tankers Built Under BCS Common Structural Rules
Annex III:	Criteria for Longitudinal Strength of Hull Girder for Oil Tankers Appendix 1: Calculation criteria of section modulus of midship section of hull girder Appendix II: Diminution limit of minimum longitudinal strength of ships in service Appendix III: Sampling method of thickness measurements for longitudinal strength evaluation and repair methods
Annex IVA:	Survey Programme Appendix 1 List of Plans Appendix 2 Survey Planning Questionnaire Appendix 3 Other Documentation
Annex IVB:	Survey Planning Questionnaire
Annex IVC:	Owner's Inspection Report

Note:

1. This requirement is applied for surveys commenced on or after 1 July 2020.

1. GENERAL

1.1 Application

1.1.1

The requirements apply to all self-propelled Double Hull Oil Tankers.

1.1.2

The requirements apply to surveys of hull structure and piping systems in way of cargo tanks, pump rooms, cofferdams, pipe tunnels, void spaces within the cargo area and all ballast tanks. The requirements are additional to the classification requirements applicable to the remainder of the ship. Refer to BCS- R Z7.

1.1.3

The requirements contain the minimum extent of examination, thickness measurements and tank testing. The survey is to be extended when Substantial Corrosion and/or structural defects are found and include additional Close-up Survey when necessary.

1.2 Definitions

1.2.1 Double Hull Oil Tanker

A Double Hull Oil Tanker is a ship which is constructed primarily for the carriage of oil¹⁾ in bulk, which have the cargo tanks protected by a double hull which extends for the entire length of the cargo area, consisting of double sides and double bottom spaces for the carriage of water ballast or void spaces.

1.2.2 Ballast Tank

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

1.2.2 bis A Combined Cargo/Ballast Tank is a tank which is used for the carriage of cargo or ballast water as a routine part of the vessel's operation and will be treated as a Ballast Tank. Cargo tanks in which water ballast might be carried only in exceptional cases per MARPOL I/18(3) are to be treated as cargo tanks.

1.2.3 Overall Survey

An 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.

1.2.4 Close-up Survey

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

Note: ¹⁾ MARPOL Annex I cargoes
The requirements are also applicable to existing double hull tankers not complying with MARPOL Regulation 13F, but having a U-shaped midship section.

1.2.5 Transverse Section

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

1.2.6 Representative Tank

Representative Tanks are those which are expected to reflect the condition of other tanks of similar type and service and with similar corrosion prevention systems. When selecting Representative Tanks account is to be taken of the service and repair history onboard and identifiable Critical Structural Areas and/or Suspect Areas.

1.2.7 Suspect Area

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

1.2.8 Critical Structural Area

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

1.2.9 Renewal Thickness

Renewal thickness (t_{ren}) is the minimum allowable thickness, in mm, below which renewal of structural members is to be carried out.

1.2.10 Substantial Corrosion

Substantial Corrosion is an extent of corrosion such that assessment of corrosion pattern indicates a wastage in excess of 75% of allowable margins, but within acceptable limits. For vessels built under the IACS Common Structural Rules, substantial corrosion is an extent of corrosion such that the assessment of the corrosion pattern indicates a measured thickness between $t_{ren} + 0.5\text{mm}$ and t_{ren} .

1.2.11 Corrosion Prevention System

A Corrosion Prevention System is normally considered a full hard protective coating.

Hard Protective Coating is usually to be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specifications.

1.2.12 Coating Condition

Coating condition is defined as follows:

- **GOOD** condition with only minor spot rusting,
- **FAIR** condition with local breakdown at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition,

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

Reference is made to BCS- G 87 "Guidelines for Coating Maintenance & Repairs for Ballast Tanks and Combined Cargo / Ballast Tanks on Oil Tankers"

1.2.13 Cargo Area

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

1.2.14 Special consideration

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

1.2.15 Prompt and Thorough Repair

A Prompt and Thorough Repair is a permanent repair completed at the time of survey to the satisfaction of the Surveyor, therein removing the need for the imposition of any associated condition of classification.

1.2.16 Pitting Corrosion

Pitting corrosion is defined as scattered corrosion spots/areas with local material reductions which are greater than the general corrosion in the surrounding area. Pitting intensity is defined in Figure 1.

1.2.17 Edge Corrosion

Edge corrosion is defined as local corrosion at the free edges of plates, stiffeners, primary support members and around openings. An example of edge corrosion is shown in Figure 2.

1.2.18 Grooving Corrosion

Grooving corrosion is typically local material loss adjacent to weld joints along abutting stiffeners and at stiffener or plate butts or seams. An example of groove corrosion is shown in Figure 3.

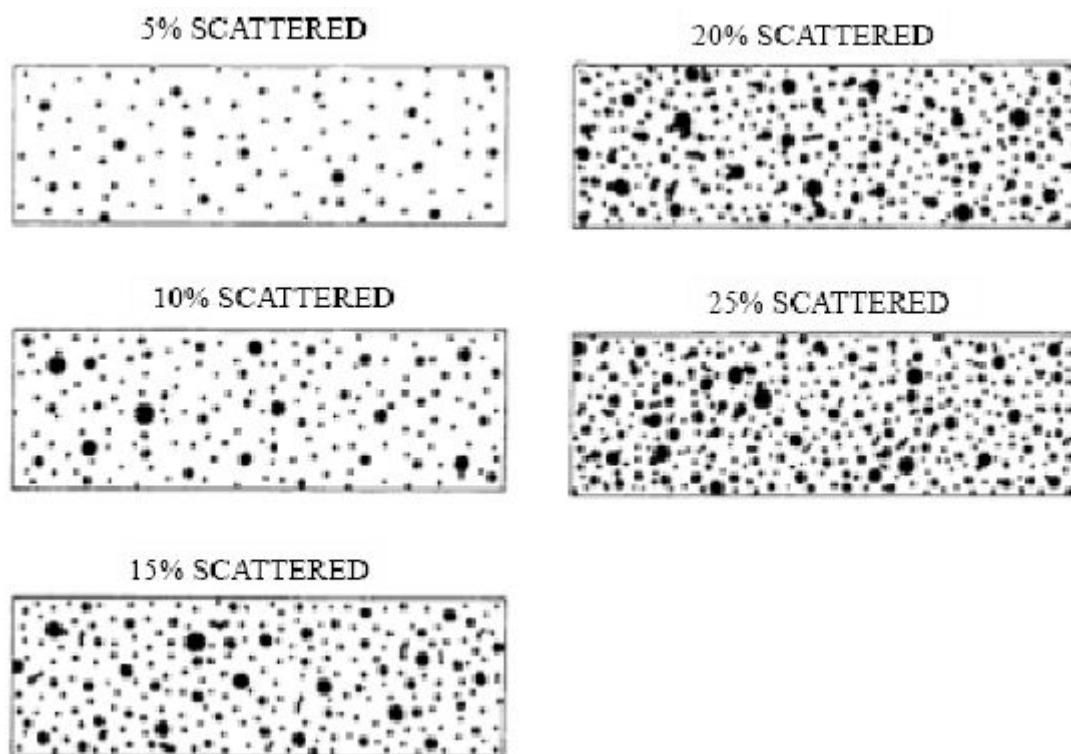


Figure 1 - Pitting intensity diagrams

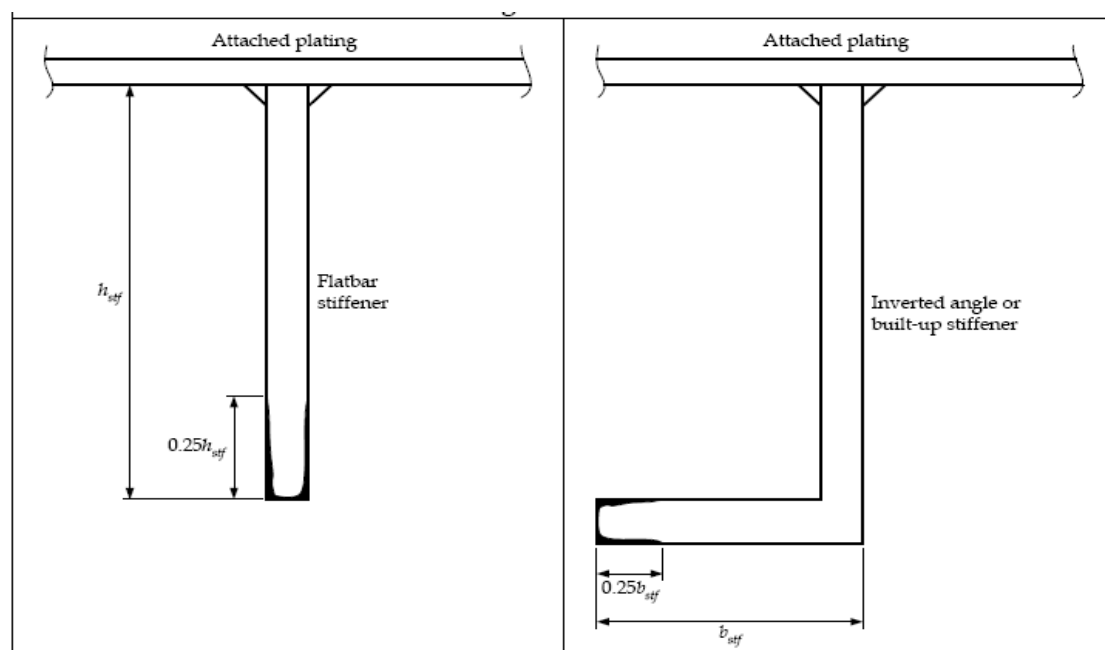


Figure 2 - Edge corrosion

Z10.4

(cont'd)

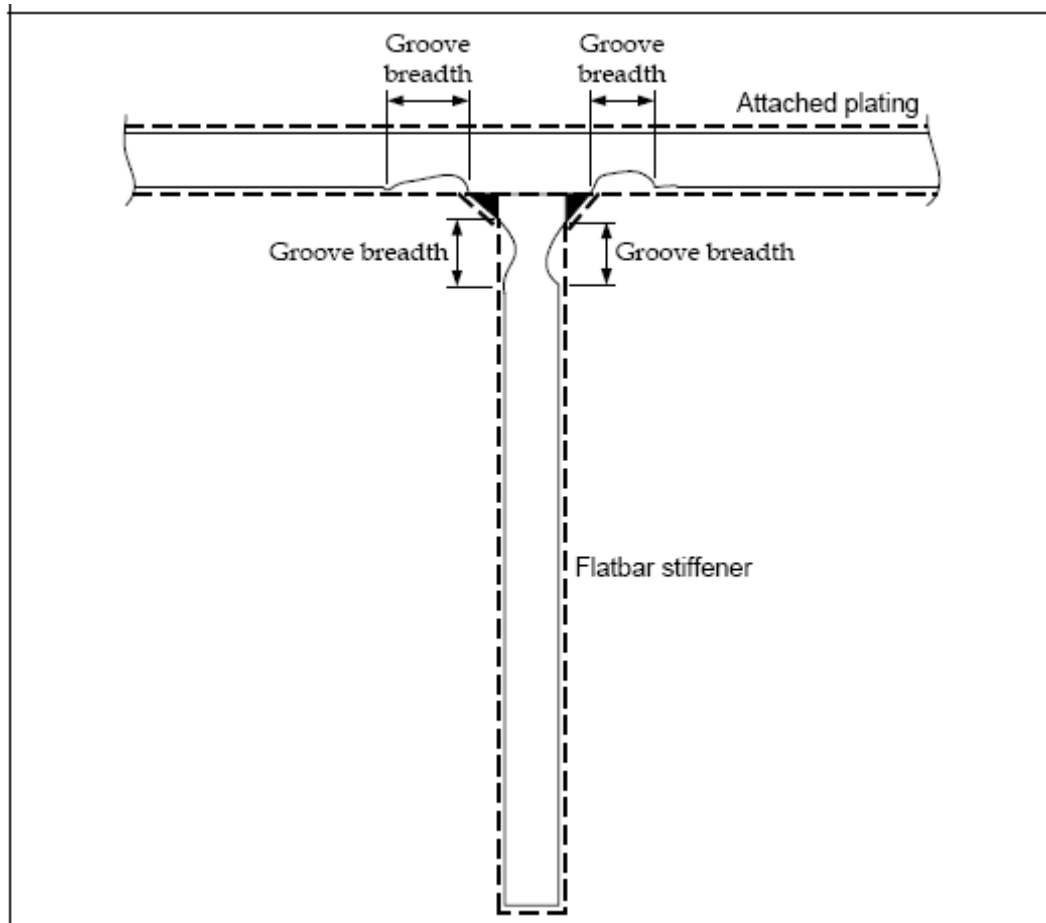


Figure 3 - Grooving corrosion

1.3 Repairs

1.3.1

Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Surveyor, will affect the vessel's structural, watertight or weathertight integrity, is to be promptly and thoroughly (see 1.2.14) repaired. Areas to be considered include:

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

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

1.3.2

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

1.3.3

Where the damage found on structure mentioned in Para. 1.3.1 is isolated and of a localised nature which does not affect the ship's structural integrity, consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weather tight integrity and impose a condition of class in accordance with BCS- PR 35, with a specific time limit.

1.4 Thickness measurements and close-up surveys

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

2. SPECIAL SURVEY⁽²⁾

2.1 Schedule

2.1.1

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

2.1.2

The first Special Survey is to be completed within 5 years from the date of the initial classification survey and thereafter within 5 years from the credited date of the previous Special Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances.

In this case, the next period of class will start from the expiry date of the Special Survey before the extension was granted.

2.1.3

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

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

2.1.4

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

2.1.5

Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

Note: ²⁾ Some Societies use the term "Special Periodical Survey" others use the term "Class Renewal Survey" instead of the term "Special Survey".

2.2 Scope

2.2.1 General

2.2.1.1

The Special Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to ensure that the hull and related piping, as required in 2.2.1.3, is in a satisfactory condition and is fit for its intended purpose for the new period of class of 5 years to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

2.2.1.2

All cargo tanks, Ballast Tanks, including double bottom tanks, pump rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing as required in 2.4 and 2.5, to ensure that the structural integrity remains effective. The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration that may be present.

2.2.1.3

Cargo piping on deck, including Crude Oil Washing (COW) piping, Cargo and Ballast piping within the above tanks and spaces are to be examined and operationally tested to working pressure to attending Surveyor's satisfaction to ensure that tightness and condition remain satisfactory. Special attention is to be given to any ballast piping in cargo tanks and any cargo piping in ballast tanks and void spaces, and Surveyors are to be advised on all occasions when this piping, including valves and fittings are open during repair periods and can be examined internally.

2.2.2 Dry Dock Survey

2.2.2.1

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

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

2.2.3 Tank Protection

2.2.3.1

Where provided, the condition of the corrosion prevention system of cargo tanks is to be examined.

A Ballast Tank is to be examined at subsequent annual intervals where:

- a. a **hard** protective coating has not been applied from the time of construction, or
- b. a soft or semi-hard coating has been applied, or
- c. substantial corrosion is found within the tank, or
- d. the **hard** protective coating is found to be in less than GOOD condition and the **hard** protective coating is not repaired to the satisfaction of the Surveyor.

Thickness measurements are to be carried out as deemed necessary by the surveyor.

2.3 Extent of Overall and Close-up Surveys

2.3.1

An Overall Survey of all tanks and spaces is to be carried out at each Special Survey.

2.3.2

The minimum requirements for Close-up Surveys at Special Survey are given in Table I.

2.3.3

The Surveyor may extend the Close-up Survey as deemed necessary taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:

a) in particular, tanks having structural arrangements or details which have suffered defects in similar tanks or on similar ships according to available information,

b) In tanks which have structures approved with reduced scantlings due to an approved corrosion control system.

2.3.4

For areas in tanks where hard protective coatings are found to be in a GOOD condition as defined in 1.2.11, the extent of Close-up Surveys according to Table I may be specially considered.

2.4 Extent of Thickness Measurements

2.4.1

The minimum requirements for thickness measurements at Special Survey are given in Table II.

2.4.2

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

For vessels built under BCS Common Structural Rules, the identified substantial corrosion areas are required to be examined and additional thickness measurements are to be carried out at annual and intermediate surveys.

2.4.3

The Surveyor may further extend the thickness measurements as deemed necessary.

2.4.4

For areas in tanks where hard protective coating are found to be in a GOOD condition as defined in 1.2.11, the extent of thickness measurements according to Table II may be specially considered.

2.4.5

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

2.4.6

In cases where two or three sections are to be measured, at least one is to include a Ballast Tank within 0.5L amidships.

In case of oil tankers of 130m in length and upwards (as defined in the International Convention on Load Lines in force) and more than 10 years of age, for the evaluation of the ship's longitudinal strength as required in 9.1.1.1, the sampling method of thickness measurements is given in Annex III Appendix 3.

2.5 Extent of Tank Testing

2.5.1

The minimum requirements for ballast tank testing at Special Survey are given in 2.5.3 and Table III.

The minimum requirements for cargo tank testing at Special Survey are given in 2.5.4 and Table III.

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

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

2.5.2

The Surveyor may extend the tank testing as deemed necessary.

2.5.3

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

2.5.4

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

2.5.5

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

3. ANNUAL SURVEY

3.1 Schedule

3.1.1

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

3.2 Scope

3.2.1 General

3.2.1.1

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

3.2.2 Examination of the hull

3.2.2.1

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

3.2.2.2

Examination of watertight penetrations as far as practicable.

3.2.3 Examination of the weather deck

3.2.3.1

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

3.2.3.2

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

3.2.3.3

Examination of flame screens on vents to all bunker tanks.

3.2.3.4

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

3.2.4 Examination of cargo pump rooms and pipe tunnels if fitted.

3.2.4.1

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

3.2.4.2

Examination of the condition of all piping systems.

3.2.5 Examination of Ballast Tanks

3.2.5.1

Examination of Ballast Tanks where required as a consequence of the results of the Special Survey (see 2.2.3) and Intermediate Survey (see 4.2.2.1 and 4.2.2.2) is to be carried out. When considered necessary by the Surveyor, or when extensive corrosion exists, thickness measurements are to be carried out and if the results of these thickness measurements indicate that Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with Table IV. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

For vessels built under BCS Common Structural Rules, the identified substantial corrosion areas are required to be examined and additional thickness measurements are to be carried out.

4. INTERMEDIATE SURVEY

4.1 Schedule

4.1.1

The Intermediate Survey is to be held at or between either the 2nd or 3rd Annual Survey.

4.1.2

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

4.1.3

Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

4.2 Scope

4.2.1 General

4.2.1.1

The survey extent is dependent on the age of the vessel as specified in 4.2.2 to 4.2.4 and shown in Table V.

4.2.1.2

For weather decks, an examination as far as applicable of cargo, crude oil washing, bunker, ballast, steam and vent piping systems as well as vent masts and headers is to be carried out. If upon examination there is any doubt as to the condition of the piping, the piping may be required to be pressure-tested, thickness measured or both.

4.2.1.3

For vessels built under BCS Common Structural Rules, the identified substantial corrosion areas are required to be examined and additional thickness measurements are to be carried out.

4.2.2 Double Hull Oil Tankers between 5 and 10 years of age. The following is to apply:

4.2.2.1

For tanks used for salt-water ballast, an Overall Survey of Representative Tanks selected by the Surveyor is to be carried out.

If such inspections reveal no visible structural defects, the examination may be limited to a verification that the hard protective coating remains in GOOD condition.

4.2.2.2

A Ballast Tank is to be examined at subsequent annual intervals where:

- a. a hard protective coating has not been applied from the time of construction, or
- b. a soft or semi-hard coating has been applied, or
- c. substantial corrosion is found within the tank, or
- d. the hard protective coating is found to be in less than GOOD condition and the hard protective coating is not repaired to the satisfaction of the Surveyor.

4.2.2.3

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

4.2.3 Double Hull Oil Tankers between 10 and 15 years of age. The following is to apply:

4.2.3.1

The requirements of the Intermediate Survey are to be to the same extent as the previous Special Survey as required in 2 and 5.1. However, pressure testing of cargo and ballast tanks *and the requirements for longitudinal strength evaluation of Hull Girder as required in 8.1.1.1* are not required unless deemed necessary by the attending Surveyor.

4.2.3.2

In application of 4.2.3.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.4.

4.2.3.3

In application of 4.2.3.1, an under water survey may be considered in lieu of the requirements of 2.2.2.

4.2.4 Double Hull Oil Tankers over 15 years of age. The following is to apply:

4.2.4.1

The requirements of the Intermediate Survey are to be to the same extent as the previous Special Survey as required in 2 and 5.1. However, pressure testing of cargo and ballast tanks *and the requirements for longitudinal strength evaluation of Hull Girder as required in 8.1.1.1* are not required unless deemed necessary by the attending Surveyor.

4.2.4.2

In application of 4.2.4.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.4.

4.2.4.3

In application of 4.2.4.1, a survey in dry dock is to be part of the intermediate survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo tanks and water ballast tanks are to be carried out in accordance with the applicable requirements for intermediate surveys, if not already carried out.

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

5. PREPARATION FOR SURVEY

5.1 Survey Programme

5.1.1

The Owner in co-operation with BCS is to work out a specific Survey Programme prior to the commencement of any part of:

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

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

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

The Survey Programme is to be in a written format based on the information in annex IVA. The survey is not to commence until the survey programme has been agreed.

5.1.1.1 Prior to the development of the survey programme, the survey planning questionnaire is to be completed by the owner based on the information set out in annex IVB, and forwarded to BCS.

5.1.2

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

- .1 survey status and basic ship information;
- .2 documentation on board, as described in 6.2 and 6.3;
- .3 main structural plans of cargo and ballast tanks (scantlings drawings), including information regarding use of high-tensile steels (HTS);
- .4 Executive Hull Summary;
- .5 relevant previous damage and repair history;
- .6 relevant previous survey and inspection reports from both the recognized organization and the owner;
- .7 cargo and ballast history for the last 3 years, including carriage of cargo under heated conditions;
- .8 details of the inert gas plant and tank cleaning procedures;
- .9 information and other relevant data regarding conversion or modification of the ship's cargo and ballast tanks since the time of construction;

-
- .10 description and history of the coating and corrosion protection system (previous class notations), if any;
 - .11 inspections by the Owner's personnel during the last 3 years with reference to structural deterioration in general, leakages in tank boundaries and piping and condition of the coating and corrosion protection system if any. Guidance for reporting is shown in Annex IVC;
 - .12 information regarding the relevant maintenance level during operation including port state control reports of inspection containing hull related deficiencies, Safety Management System non-conformities relating to hull maintenance, including the associated corrective action(s); and
 - .13 any other information that will help identify suspect areas and critical structural areas

5.1.3

The submitted Survey Programme is to account for and comply, as a minimum, with the requirements of Tables I, II and 2.5 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 tanks;
- .4 list of tanks with information on use, corrosion prevention and condition of coating;
- .5 conditions for survey (e.g., information regarding tank cleaning, gas freeing, ventilation, lighting, etc.);
- .6 provisions and methods for access to structures;
- .7 equipment for surveys;
- .8 nomination of tanks and areas for close-up survey (per 2.3);
- .9 nominations of sections for thickness measurement (per 2.4);
- .10 nomination of tanks for tank testing (per 2.5);
- .11 identification of the thickness measurement firm;
- .12 damage experience related to the ship in question;
- .13 critical structural areas and suspect areas, where relevant.

5.1.4

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

5.1.5

Use may also be made of the Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Double Hull Oil Tankers Special Survey - Hull, contained in Annex I. These guidelines are a recommended tool which may be invoked at the discretion of BCS, 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 is to 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 are to be agreed between the owner and BCS are to be in accordance with BCS- PR 37.

5.2.1.2 Details of the means of access are to 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 is to not proceed.

5.2.2

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

5.2.3

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

5.2.4

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

5.2.5

Where Soft or Semi-hard Coatings have been applied, safe access is to be provided for the surveyor to verify the effectiveness of the coating and to carry out an assessment of the

conditions of internal structures which may include spot removal of the coating. When safe access cannot be provided, the soft or semi-hard coating is to be removed.

5.3 Access to structures

5.3.1

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

5.3.2

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

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

5.4 Equipment for survey

5.4.1

Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required.

5.4.2

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

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

5.4.3

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

5.4.4

Adequate and safe lighting is to be provided for the safe and efficient conduct of the survey.

5.4.5

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

5.5 Rescue and emergency response equipment

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

5.6 Survey at sea or at anchorage

5.6.1

Survey at sea or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel onboard. Necessary precautions and procedures for carrying out the survey are to be in accordance with 5.1, 5.2, 5.3 and 5.4.

5.6.2

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

5.6.3

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

5.6.4

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

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

5.6.5

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

5.6.6

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

- .1 when the coating of the under deck structure is in GOOD condition and there is no evidence of wastage; or
- .2 if a permanent means of access is provided in each bay to allow safe entry and exit. This means:
 - i. access direct from the deck via a vertical ladder and a small platform fitted approximately 2 m below the deck in each bay; or
 - ii. access to deck from a longitudinal permanent platform having ladders to deck in each end of the tank. The platform shall, for the full length of the tank, be arranged in level with, or above, the maximum water level needed for rafting of under deck structure. For this purpose, the ullage corresponding to the maximum water level is to be assumed not more than 3m from the deck plate measured at the midspan of deck transverses and in the middle length of the tank (See Figure 4).

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

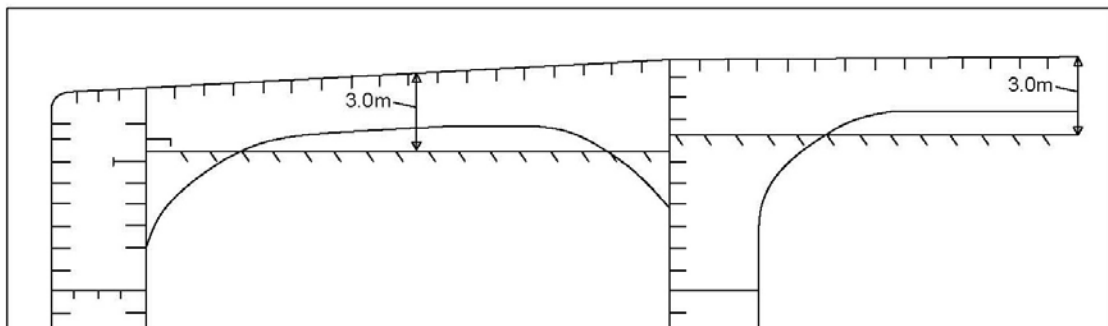


Figure 4 Maximum water level in a tank

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

Reference is made to BCS- G 39 - Guidelines for the use of Boats or Rafts for Close-up surveys.

5.7 Survey Planning Meeting

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

5.7.2 Prior to the commencement of any part of the Special and Intermediate Survey a survey planning meeting is to be held between the attending Surveyor(s), the Owner's Representative in attendance, the TM firm representative, where involved, and the master of the ship or an appropriately qualified representative appointed by the master or Company for the purpose of ascertaining 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. See also 7.1.2.

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

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

6. DOCUMENTATION ON BOARD

6.1 General

6.1.1

The owner is to obtain, supply and maintain on board documentation as specified in 6.2 and 6.3, which is to be readily available for the Surveyor.

6.1.2

The documentation is to be kept on board for the lifetime of the ship.

6.1.3

For tankers and bulk carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10, the Owner is to arrange the updating of the Ship Construction File (SCF) throughout the ship's life whenever a modification of the documentation included in the SCF has taken place. Documented procedures for updating the SCF are to be included within the Safety Management System.

6.2 Survey report file

6.2.1

A Survey Report File is to be a part of the documentation on board consisting of:

- reports of structural surveys;
- Executive Hull Summary;
- thickness measurement reports.

6.2.2

The Survey Report File is to be available also in the Owner's and BCS's management offices.

6.3 Supporting documents

6.3.1

The following additional documentation is to be available onboard:

- Survey Programme as required by 5.1 until such time as the Special Survey or Intermediate Survey, as applicable, has been completed;
- main structural plans of cargo and ballast tanks (for CSR ships these plans are to include for each structural element both the as-built and renewal thickness. Any thickness for voluntary addition is also to be clearly indicated on the plans. The Midship Section plan to be supplied on board the ship is to include the minimum allowable hull girder sectional properties for the tank transverse section in all cargo tanks);
- previous repair history;
- cargo and ballast history;
- extent of use of inert gas plant and tank cleaning procedures;

-
- inspections by ship's personnel with reference to
 - structural deterioration in general;
 - leakage in bulkheads and piping;
 - condition of coating or corrosion prevention system, if any.
 - any other information that will help identify Critical Structural Areas and/or Suspect Areas requiring inspection;

6.3.2

For tankers and bulk carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10, the Ship Construction File (SCF), limited to the items to be retained on board, is to be available on board.

6.4 Review of documentation on board

6.4.1

Prior to survey, the Surveyor is to examine the completeness of the documentation onboard, and its contents as a basis for the survey.

6.4.2

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

6.4.2.1 For the SCF stored on board ship, the surveyor is to examine the information on board ship.

In cases where any major event, including, but not limited to, substantial repair and conversion, or any modification to the ship structures, the surveyor is to also verify that the updated information is kept on board the ship.

If the updating of the SCF onboard is not completed at the time of survey, the Surveyor records it and requires confirmation at the next periodical survey.

6.4.2.2 For the SCF stored on shore archive, the surveyor is to examine the list of information included on shore archive.

In cases where any major event, including, but not limited to, substantial repair and conversion, or any modification to the ship structures, the surveyor is to also verify that the updated information is stored on shore archive by examining the list of information included on shore archive or kept on board the ship.

In addition, the surveyor is to confirm that the service contract with of the Archive Center is valid.

If the updating of the SCF Supplement ashore is not completed at the time of survey, the Surveyor records it and requires confirmation at the next periodical survey.

6.4.3

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

7. PROCEDURES FOR THICKNESS MEASUREMENT

7.1 General

7.1.1

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

7.1.2

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

7.1.3

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

7.1.4

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

7.2 Certification of thickness measurement firm

7.2.1

The thickness measurement is to be carried out by a qualified firm certified by BCS according to principles stated in Table VII.

7.3 Number and locations of measurements

7.3.1 Application

The item 7.3 only applies to vessels built under the BCS Common Structural Rules¹. For vessels not built under BCS Common Structural Rules, the requirements for number and locations of measurements are according to the Rules of BCS and/or specific BCS- URs depending on ship's age and structural elements concerned.

7.3.2 Number of measurements

Considering the extent of thickness measurements according to the different structural elements of the ship and surveys (special, intermediate and annual), the locations of the points to be measured are given for the most important items of the structure.

7.3.3 Locations of measurements

Table 1 provides explanations and/or interpretations for the application of those requirements indicated in the Rules, which refer to both systematic thickness measurements related to the calculation of global hull girder strength and specific measurements connected to close-up surveys.

Fig 5 to Fig 8 are provided to facilitate the explanations and/or interpretations given in Table 1, to show typical arrangements of double hull oil tankers.

¹ BCS Common Structural Rules mean BCS Common Structural Rules for Double Hull Oil Tankers (BCS CSR for Oil Tankers) or BCS Common Structural Rules for Bulk Carriers and Oil Tankers (BCS CSR BC&OT).

Table 1: Interpretations of rule requirements for the locations and number of points to be measured

Item	Interpretation	Figure reference
Selected plates	«Selected» means at least a single point on one out of three plates, to be chosen on representative areas of average corrosion.	
Deck, bottom plates and wind-and-water strakes	At least two points on each plate to be taken either at each 1/4 extremity of plate or at representative areas of average corrosion.	
Transverse section	<p>Measurements to be taken on all longitudinal members such as plating, longitudinals and girders at the deck, side, bottom, longitudinal bulkheads, inner bottom and hopper. One point to be taken on each plate. Both web and flange to be measured on longitudinals, if applicable.</p> <p>For tankers older than 10 years of age:</p> <p>within 0.1D (where D is the ship's moulded depth) of the deck and bottom at each transverse section to be measured, every longitudinal and girder is to be measured on the web and face plate, and every plate is to be measured at one point between longitudinals.</p>	Fig 5
Transverse rings (#) in cargo and ballast tanks	<p>At least two points on each plate in a staggered pattern and two points on the corresponding flange where applicable.</p> <p>Minimum 4 points on the first plate below deck.</p> <p>Additional points in way of curved parts. At least one</p>	Fig 6

Item	Interpretation	Figure reference
	point on each of two stiffeners between stringers / longitudinal girders.	
Transverse bulkheads in cargo tanks	<p>At least two points on each plate. Minimum 4 points on the first plate below main deck.</p> <p>At least one point on every third stiffener to be taken between each stringer.</p> <p>At least two points on each plate of stringers and girders, and two points on the corresponding flange. Additional points in way of curved part.</p> <p>Two points of each diaphragm plate of stools if fitted.</p>	Fig 7
Transverse bulkheads in ballast tanks	<p>At least 4 points on plates between stringers / longitudinal girders, or per plate if stringers / girders not fitted.</p> <p>At least two points on each plate of stringers and girders, and two points on the corresponding flange. Additional points in way of curved part.</p> <p>At least one point on two stiffeners between each stringer / longitudinal girder.</p>	Fig 8
Adjacent structural members	On adjacent structural members one point per plate and one point on every third stiffener / longitudinal.	

(#°) Transverse rings means all transverse material appearing in a cross-section of the ship's hull, in way of a double bottom floor, vertical web and deck transverse (definition from CSR)

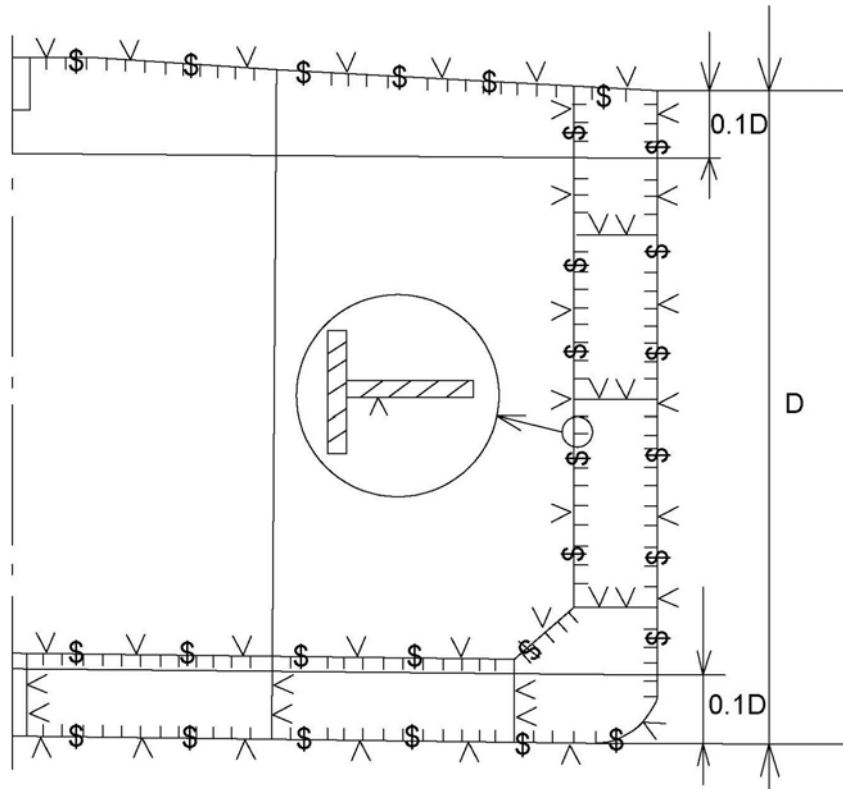


Figure 5 - Transverse section

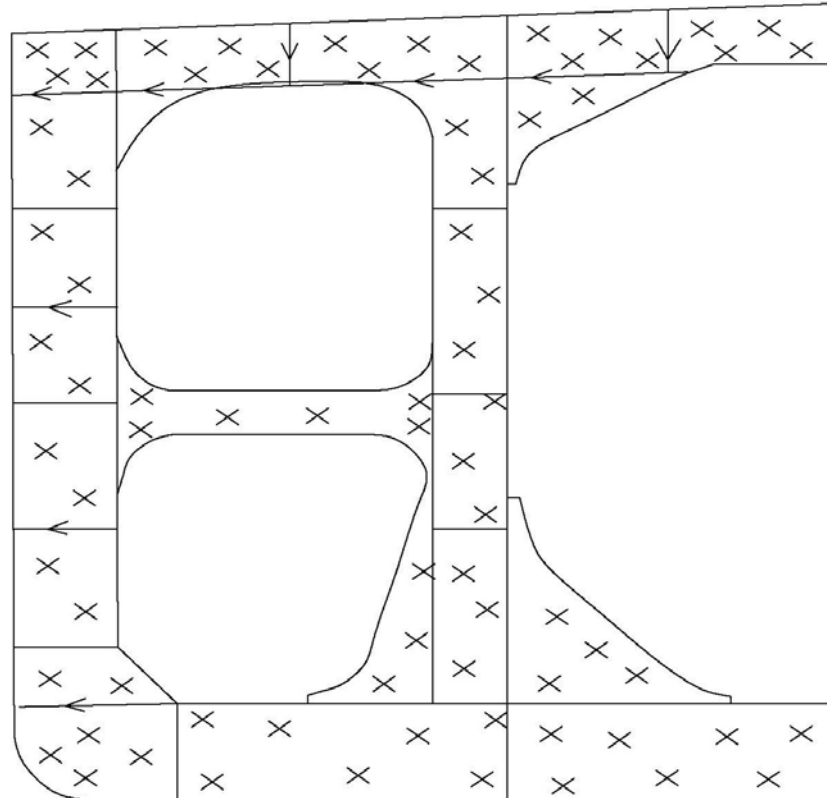


Figure 6 - Transverse rings in cargo and ballast tanks

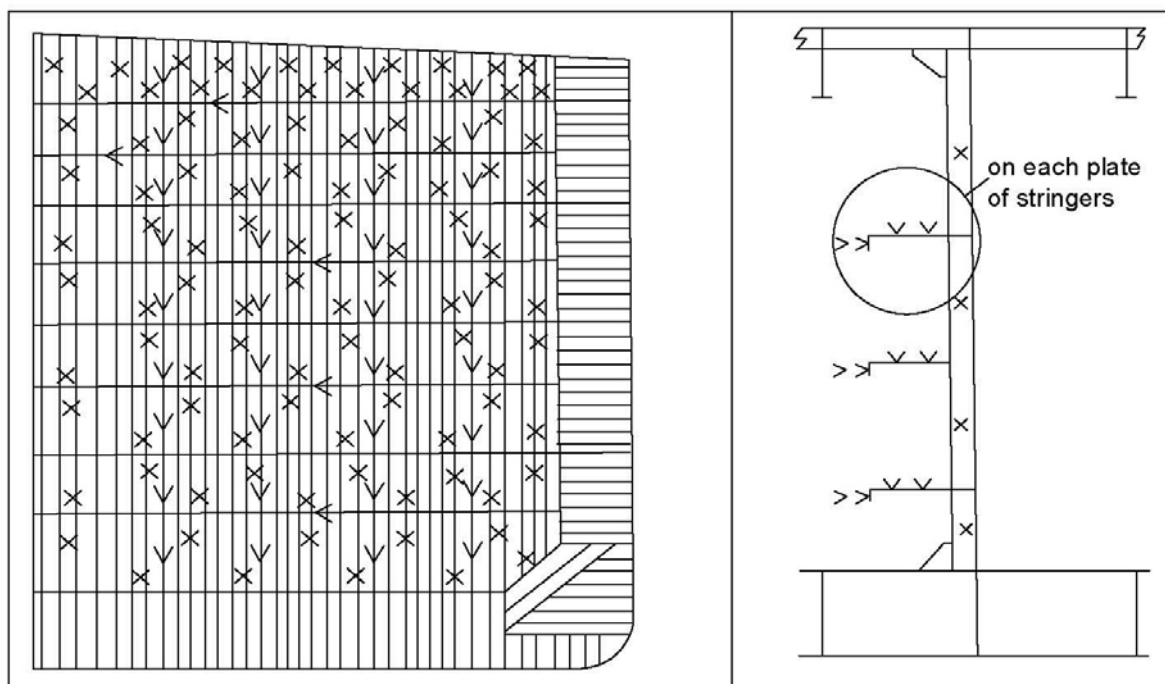


Figure 7 - Transverse bulkheads in cargo tanks

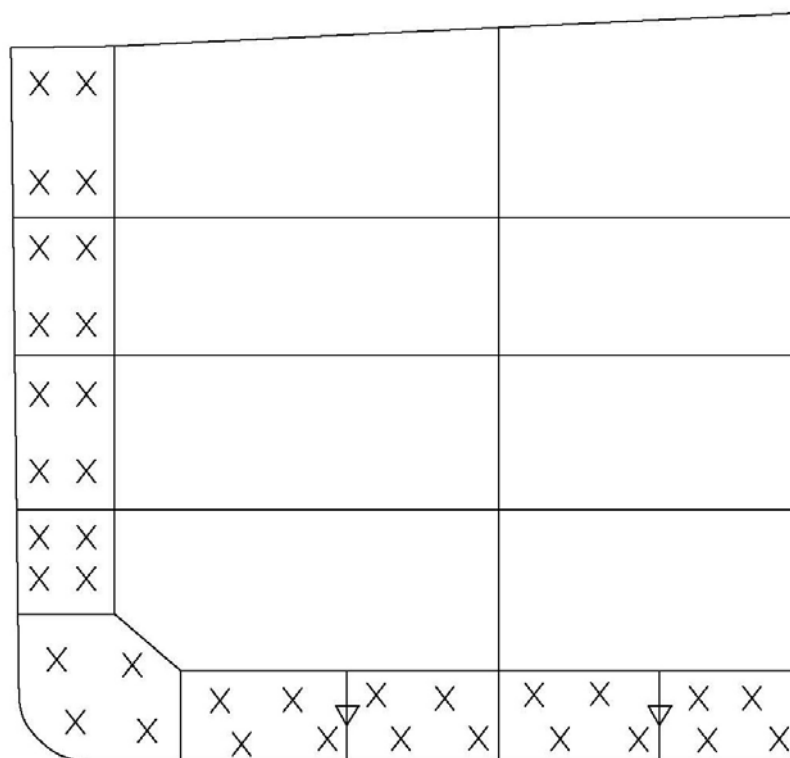


Figure 8 - Transverse bulkheads in ballast tanks

7.4 Reporting

7.4.1

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

The thickness measurement report is to follow the principles as specified in the Recommended Procedures for Thickness Measurement of Double Hull Oil Tankers, contained in Annex II.

7.4.2

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

8. ACCEPTANCE CRITERIA

8.1 General

8.1.1 For vessels built under BCS Common Structural Rules, the Acceptance Criteria is according to BCS Common Structural Rules¹ and as specified in 8.2, 8.3 and 8.4.

8.1.2 For vessels not built under BCS Common Structural Rules, the Acceptance Criteria are according to the Rules of BCS and/or specific BCS- Rs depending on ship's age and structural elements concerned.

8.2 Acceptance criteria for pitting corrosion of CSR ships

8.2.1 For plates with pitting intensity less than 20%, see Figure 1, the measured thickness, t_m , of any individual measurement is to meet the lesser of the following criteria:

$$t_m \geq 0.7 (t_{as-built} - t_{vol add}) \text{ mm}$$

$$t_m \geq t_{ren} - 1 \text{ mm}$$

Where:

$t_{as-built}$ as-built thickness of the member, in mm

$t_{vol add}$ voluntary thickness addition; thickness, in mm, voluntarily added as the Owner's extra margin for corrosion wastage in addition to t_c

t_{ren} renewal criteria for general corrosion as defined in BCS Common Structural Rules²

8.2.2 The average thickness across any cross section in the plating is not to be less than the renewal criteria for general corrosion given in BCSCCommon Structural Rules².

8.3 Acceptance criteria for edge corrosion of CSR ships

8.3.1 Provided that the overall corroded height of the edge corrosion of the flange, or web in the case of flat bar stiffeners, is less than 25%, see Figure 2, of the stiffener flange breadth or web height, as applicable, the measured thickness, t_m , is to meet the lesser of the following criteria:

$$t_m \geq 0.7 (t_{as-built} - t_{vol add}) \text{ mm}$$

$$t_m \geq t_{ren} - 1 \text{ mm}$$

Where:

$t_{as-built}$ as-built thickness of the member, in mm

$t_{vol add}$ voluntary thickness addition; thickness, in mm, voluntarily added as the Owner's extra margin for corrosion wastage in addition to t_c

¹ Section 12 of IACS CSR for Oil Tankers, or Ch. 13, Part 1 of IACS CSR BC&OT

² 1.4.2.1 of Section 12 of IACS CSR for Oil Tankers, or 2.1.1 of Sec. 2, Ch. 13, Part 1 of IACS CSR BC&OT

t_{ren} renewal criteria for general corrosion as defined in IACS Common Structural Rules¹

8.3.2 The average measured thickness across the breadth or height of the stiffener is not to be less than that defined in IACS CSR².

8.3.3 Plate edges at openings for manholes, lightening holes etc. may be below the minimum thickness given in IACS CSR² provided that:

- a) the maximum extent of the reduced plate thickness, below the minimum given in IACS CSR², from the opening edge is not more than 20% of the smallest dimension of the opening and does not exceed 100mm.
- b) rough or uneven edges may be cropped-back provided that the maximum dimension of the opening is not increased by more than 10% and the remaining thickness of the new edge is not less than $t_{ren} - 1$ mm.

8.4 Acceptance criteria for grooving corrosion of CSR ships

8.4.1 Where the groove breadth is a maximum of 15% of the web height, but not more than 30mm, see Figure 3, the measured thickness, t_m , in the grooved area is to meet the lesser of the following criteria:

$$t_m \geq 0.75 (t_{as-built} - t_{vol add}) \text{ mm}$$

$$t_m \geq t_{ren} - 0.5 \text{ mm}$$

but is not to be less than

$$t_m = 6 \text{ mm}$$

Where:

$t_{as-built}$ as-built thickness of the member, in mm

$t_{vol add}$ voluntary thickness addition; thickness, in mm, voluntarily added as the Owner's extra margin for corrosion wastage in addition to t_c

t_{ren} renewal criteria for general corrosion as defined in BCS CSR¹

8.4.2 Structural members with areas of grooving greater than those in 8.4.1 are to be assessed based on the criteria for general corrosion as defined in BCS CSR² using the average measured thickness across the plating/stiffener.

¹ 1.4.2.1 of Section 12 of BCS CSR for Oil Tankers, or 2.1.1 of Sec. 2, Ch. 13, Part 1 of BCS CSR BC&OT ² 1.4.2 of Section 12 of BCS CSR for Oil Tankers, or 2.1 of Sec. 2, Ch. 13, Part 1 of BCS CSR BC&OT

9 REPORTING AND EVALUATION OF SURVEY

9.1 Evaluation of survey report

9.1.1

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

9.1.1.1 In case of oil tankers of 130 m in length and upwards (as defined in the International Convention on Load Lines in force), the ship's longitudinal strength is to be evaluated by using the thickness of structural members measured, renewed and reinforced, as appropriate, during the special survey carried out after the ship reached 10 years of age in accordance with the criteria for longitudinal strength of the ship's hull girder for oil tankers specified in Annex III.

9.1.1.2 The final result of evaluation of the ship's longitudinal strength required in 9.1.1.1, after renewal or reinforcement work of structural members, if carried out as a result of initial evaluation, is to be reported as a part of the Executive Hull Summary.

9.2 Reporting

9.2.1

Principles for survey reporting are shown in Table VIII.

9.2.2

When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items examined and / or tested (pressure testing, thickness measurements etc.) and an indication of whether the item has been credited, are to be made available to the next attending Surveyor(s), prior to continuing or completing the survey.

9.2.3

An Executive Hull Summary of the survey and results is to be issued to the Owner as shown in Table IX and placed on board the vessel for reference at future surveys. The Executive Hull Summary is to be endorsed by BCS's head office or regional managerial office.

TABLE I

**Minimum Requirements for Close-Up Survey
at Special Survey of Double Hull Oil Tankers**

Special Survey No.1 age ≤ 5	Special Survey No.2 5 < age ≤ 10	Special Survey No.3 10 < age ≤ 15	Special Survey No.4 and Subsequent age > 15
One web frame (1), in a ballast tank (see Note 1)	All web frames (1), in a ballast tank (see Note 1) The <i>knuckle area</i> and the upper part (5 metres approximately) of one web frame in each remaining ballast tank (6)	All web frames (1), in all ballast tanks	As for Special Survey for age from 10 to 15 years Additional transverse areas as deemed necessary by BCS
One deck transverse, in a cargo oil tank (2)	One deck transverse, in two cargo oil tanks (2)	All web frames (7), including deck transverse and cross ties, if fitted, in a cargo oil tank One web frame (7), including deck transverse and cross ties, if fitted, in each remaining cargo oil tank	
One transverse bulkhead (4), in a ballast tank (see Note 1)	One transverse bulkhead (4), in each ballast tank (see Note 1)	All transverse bulkheads, in all cargo oil (3) and ballast (4) tanks	
One transverse bulkhead (5), in a cargo oil centre tank	One transverse bulkhead (5), in two cargo oil centre tanks		
One transverse bulkhead (5), in a cargo oil wing tank (see Note 2)	One transverse bulkhead (5), in a cargo oil wing tank (see Note 2)		
<p>(1), (2), (3), (4), (5), (6) and (7) are areas to be subjected to close-up surveys and thickness measurements (see Figure 9 and Figure 10)</p> <p>(1): Web frame in a ballast tank means vertical web in side tank, hopper web in hopper tank, floor in double bottom tank and deck transverse in double deck tank (where fitted), including adjacent structural members. In fore and aft peak tanks web frame means a complete transverse web frame ring including adjacent structural members</p> <p>(2): Deck transverse, including adjacent deck structural members (or external structure on deck in way of the tank, where applicable)</p> <p>(3): Transverse bulkhead complete in cargo tanks, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower and upper stools, where fitted</p> <p>(4): Transverse bulkhead complete in ballast tanks, including girder system and adjacent structural members, such as longitudinal bulkheads, girders in double bottom tanks, inner bottom plating, hopper side, connecting brackets</p> <p>(5): Transverse bulkhead lower part in cargo tank, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower stool, where fitted</p> <p>(6): The <i>knuckle area</i> and the upper part (5 metres approximately), including adjacent structural members. <i>Knuckle area</i> is the area of the web frame around the connections of the slope hopper plating to the inner hull bulkhead and the inner bottom plating, up to 2 metres from the corners both on the bulkhead and the double bottom</p> <p>(7): Web frame in a cargo oil tank means deck transverse, longitudinal bulkhead structural elements and cross ties, where fitted, including adjacent structural members</p> <p>Note 1: Ballast tank: Apart from the fore and aft peak tanks, the term "ballast tank" has the following meaning:</p> <p>.1 all ballast compartments (hopper tank, side tank and double-deck tank, if separate from double-bottom tank) located on one side, i.e. portside or starboard side, and additionally double-bottom tank on portside plus starboard side, when the longitudinal central girder is not watertight and, therefore, the double-bottom tank is a unique compartment from portside to starboard side; or</p> <p>.2 all ballast compartments (double-bottom tank, hopper tank, side tank and double-deck tank) located on one side, i.e. portside or starboard side, when the longitudinal central girder is watertight and, therefore, the portside double-bottom tank separate from the starboard-side double-bottom tank."</p> <p>Note 2: Where no centre cargo tanks are fitted (as in case of centre longitudinal bulkhead), transverse bulkheads in wing tanks are to be surveyed</p>			

TABLE II

**Minimum Requirements for Thickness Measurements
at Special Survey of Double Hull Oil Tankers**

Special Survey No.1 age ≤ 5	Special Survey No.2 5 < age ≤ 10	Special Survey No.3 10 < age ≤ 15	Special Survey No.4 and Subsequent age > 15
1. Suspect areas	1. Suspect areas	1. Suspect areas	1. Suspect areas
2. One section of deck plating for the full beam of the ship within the cargo area	2. Within the cargo area: .1 Each deck plate .2 One transverse section	2. Within the cargo area: .1 Each deck plate .2 Two transverse sections (1) .3 All wind and water strakes	2. Within the cargo area: .1 Each deck plate .2 Three transverse sections (1) .3 Each bottom plate
	3. Selected wind and water strakes outside the cargo area	3. Selected wind and water strakes outside the cargo area	3. All wind and water strakes, full length
4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I.	4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I.	4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I.	4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I.
(1): at least one section is to include a ballast tank within 0.5L amidships.			

TABLE III

**Minimum Requirements for Tank Testing at Special Survey
of Double Hull Oil Tankers**

Age of ship (in years at time of special survey due date)	
Special Survey No.1 age ≤ 5	Special Survey No.2 and Subsequent age > 5
All ballast tank boundaries	All ballast tank boundaries
Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, pump rooms or cofferdams	All cargo tank bulkheads

TABLE IV / Sheet 1

Requirements for extent of Thickness Measurements at those areas of substantial corrosion - Special Survey of Double Hull Oil Tankers within the Cargo Area Length

BOTTOM, INNER BOTTOM AND HOPPER STRUCTURE		
Structural member	Extent of measurement	Pattern of measurement
Bottom, inner bottom and hopper structure plating	Minimum of three bays across double bottom tank, including aft bay Measurements around and under all suction bell mouths	5-point pattern for each panel between longitudinals and floors
Bottom, inner bottom and hopper structure longitudinals	Minimum of three longitudinals in each bay where bottom plating measured	Three measurements in line across the flange and three measurements on vertical web
Bottom girders, including the watertight ones	At fore and aft watertight floors and in centre of tanks	Vertical line of single measurements on girder plating with one measurement between each panel stiffener, or a minimum of three measurements
Bottom floors, including the watertight ones	Three floors in the bays where bottom plating measured, with measurements at both ends and middle	5-point pattern over two square metre area
Hopper structure web frame ring	Three floors in bays where bottom plating measured	5-point pattern over one square metre of plating. Single measurements on flange
Hopper structure transverse watertight bulkhead or swash bulkhead	- lower 1/3 of bulkhead	- 5-point pattern over one square metre of plating
	- upper 2/3 of bulkhead	- 5-point pattern over two square metre of plating
	- stiffeners (minimum of three)	- For web, 5-point pattern over span (two measurements across web at each end and one at centre of span). For flange, single measurements at each end and centre of span
Panel stiffening	Where applicable	Single measurements

TABLE IV / Sheet 2

Requirements for extent of Thickness Measurements at those areas of substantial corrosion - Special Survey of Double Hull Oil Tankers within the Cargo Area Length

DECK STRUCTURE		
Structural member	Extent of measurement	Pattern of measurement
Deck plating	Two transverse bands across tank	Minimum of three measurements per plate per band
Deck longitudinals	Every third longitudinal in each of two bands with a minimum of one longitudinal	Three measurements in line vertically on webs and two measurements on flange (if fitted)
Deck girders and brackets (usually in cargo tanks only)	At fore and aft transverse bulkhead, bracket toes and in centre of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across flange. 5-point pattern on girder/bulkhead brackets
Deck transverse webs	Minimum of two webs, with measurements at both ends and middle of span	5-point pattern over one square metre area. Single measurements on flange
Vertical web and transverse bulkhead in wing ballast tank (two metres from deck)	Minimum of two webs, and both transverse bulkheads	5-point pattern over one square metre area
Panel stiffening	Where applicable	Single measurements

TABLE IV / Sheet 3

**Requirements for extent of Thickness Measurements at those areas of
substantial corrosion - Special Survey of Double Hull Oil
Tankers within the Cargo Area Length**

STRUCTURE IN WING BALLAST TANKS		
Structural member	Extent of measurement	Pattern of measurement
Side shell and longitudinal bulkhead plating: <ul style="list-style-type: none"> - Upper strake and strakes in way of horizontal girders - All other strakes 	<ul style="list-style-type: none"> - Plating between each pair of longitudinals in a minimum of three bays (along the tank) - Plating between every third pair of longitudinals in same three bays 	<ul style="list-style-type: none"> - Single measurement - Single measurement
Side shell and longitudinal bulkhead longitudinals on: <ul style="list-style-type: none"> - Upper strake - All other strakes 	<ul style="list-style-type: none"> - Each longitudinal in same three bays - Every third longitudinal in same three bays 	<ul style="list-style-type: none"> - 3 measurements across web and 1 measurement on flange - 3 measurements across web and 1 measurement on flange
Longitudinals - brackets	Minimum of three at top, middle and bottom of tank in same three bays	5-point pattern over area of bracket
Vertical web and transverse bulkheads (excluding deckhead area): <ul style="list-style-type: none"> - Strakes in way of horizontal girders - Other strakes 	<ul style="list-style-type: none"> - Minimum of two webs and both transverse bulkheads - Minimum of two webs and both transverse bulkheads 	<ul style="list-style-type: none"> - 5-point pattern over approx. two square metre area - Two measurements between each pair of vertical stiffeners
Horizontal girders	Plating on each girder in a minimum of three bays	Two measurements between each pair of longitudinal girder stiffeners
Panel stiffening	Where applicable	Single measurements

TABLE IV / Sheet 4

**Requirements for extent of Thickness Measurements at those areas of
substantial corrosion - Special Survey of Double Hull Oil
Tankers within the Cargo Area Length**

LONGITUDINAL BULKHEADS IN CARGO TANKS		
Structural Member	Extent of Measurement	Pattern of Measurement
Deckhead and bottom strakes, and strakes in way of the horizontal stringers of transverse bulkheads	Plating between each pair of longitudinals in a minimum of three bays	Single measurement
All other strakes	Plating between every third pair of longitudinals in same three bays	Single measurement
Longitudinals on deckhead and bottom strakes	Each longitudinal in same three bays	Three measurements across web and one measurement on flange
All other longitudinals	Every third longitudinal in same three bays	Three measurements across web and one measurement on flange
Longitudinals - brackets	Minimum of three at top, middle and bottom of tank in same three bays	5-point pattern over area of bracket
Web frames and cross ties	Three webs with minimum of three locations on each web, including in way of cross tie connections	5-point pattern over approximately two square metre area of webs, plus single measurements on flanges of web frame and cross ties
Lower end brackets (opposite side of web frame)	Minimum of three brackets	5-point pattern over approximately two square metre area of brackets, plus single measurements on bracket flanges

TABLE IV / Sheet 5

**Requirements for extent of Thickness Measurements at those areas of
substantial corrosion - Special Survey of Double Hull Oil
Tankers within the Cargo Area Length**

TRANSVERSE WATERTIGHT AND SWASH BULKHEADS IN CARGO TANKS		
Structural member	Extent of measurement	Pattern of measurement
Upper and lower stool, where fitted	<ul style="list-style-type: none"> - Transverse band within 25mm of welded connection to inner bottom/deck plating - Transverse band within 25mm of welded connection to shelf plate 	5-point pattern between stiffeners over one metre length
Deckhead and bottom strakes, and strakes in way of horizontal stringers	Plating between pair of stiffeners at three locations: approximately 1/4, 1/2 and 3/4 width of tank	5-point pattern between stiffeners over one metre length
All other strakes	Plating between pair of stiffeners at middle location	Single measurement
Strakes in corrugated bulkheads	Plating of each change of scantling at centre of panel and at flange of fabricated connection	5-point pattern over about one square metre of plating
Stiffeners	Minimum of three typical stiffeners	For web, 5-point pattern over span between bracket connections (two measurements across web at each bracket connection and one at centre of span). For flange, single measurements at each bracket toe and at centre of span
Brackets	Minimum of three at top, middle and bottom of tank	5-point pattern over area of bracket
Horizontal stringers	All stringers with measurements at both ends and middle	5-point pattern over one square metre area, plus single measurements near bracket toes and on flanges

TABLE V

Minimum Requirements for Overall and Close-Up Survey and Thickness Measurements at Intermediate Survey of Double Hull Oil Tankers

Age of ship at time of intermediate survey due date		
5 < age ≤ 10	10 < age ≤ 15	age > 15
Overall survey of Representative ballast tanks selected by the attending surveyor (see 4.2.2)	The requirements of the previous Special Survey (see 4.2.3)	The requirements of the previous Special Survey (see 4.2.4)
Suspect areas identified at previous surveys are to be examined (see 4.2.2)		

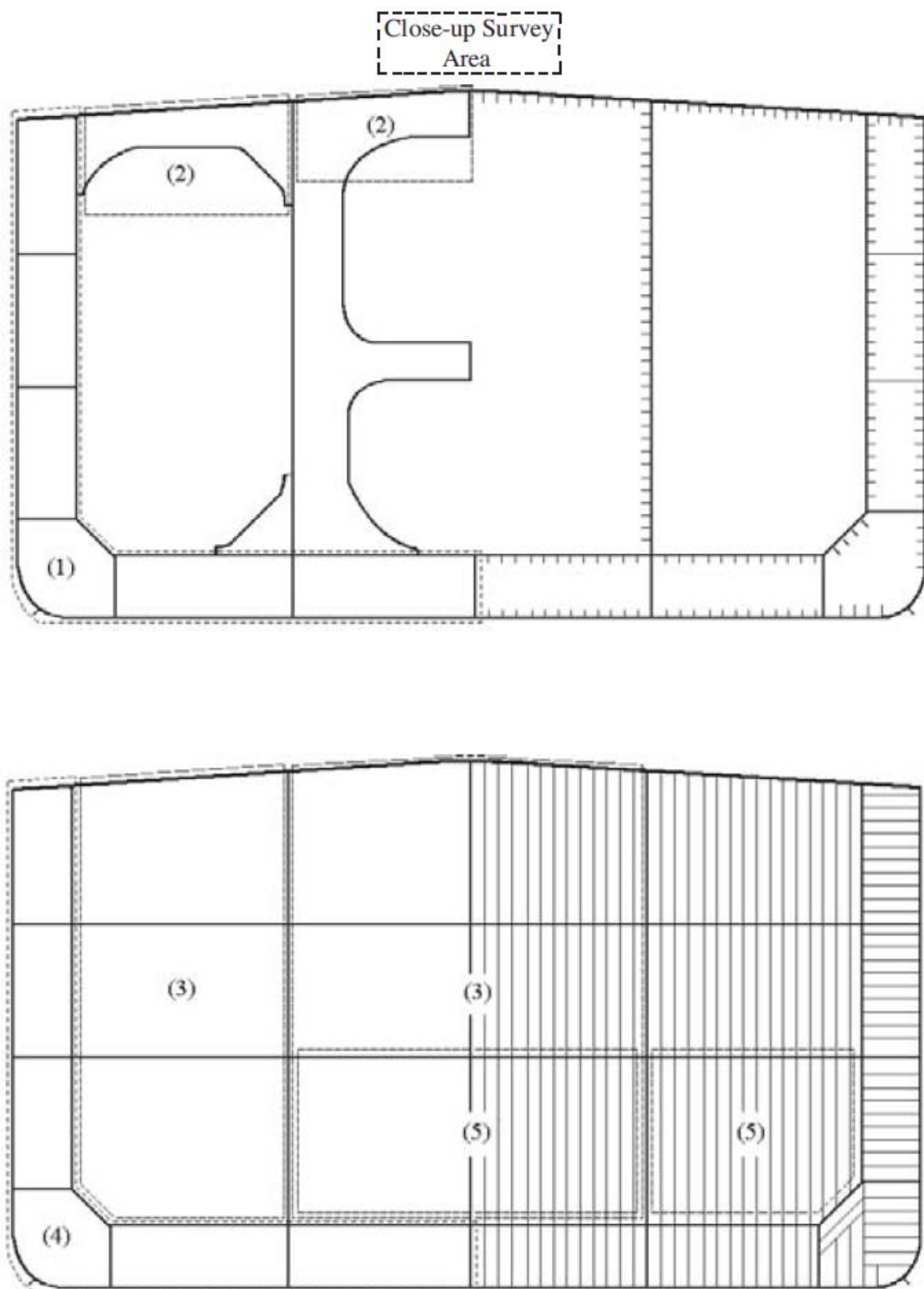


Figure 9 - Close-up Survey Requirements for Double Hull Oil Tankers Areas (1) to (5)

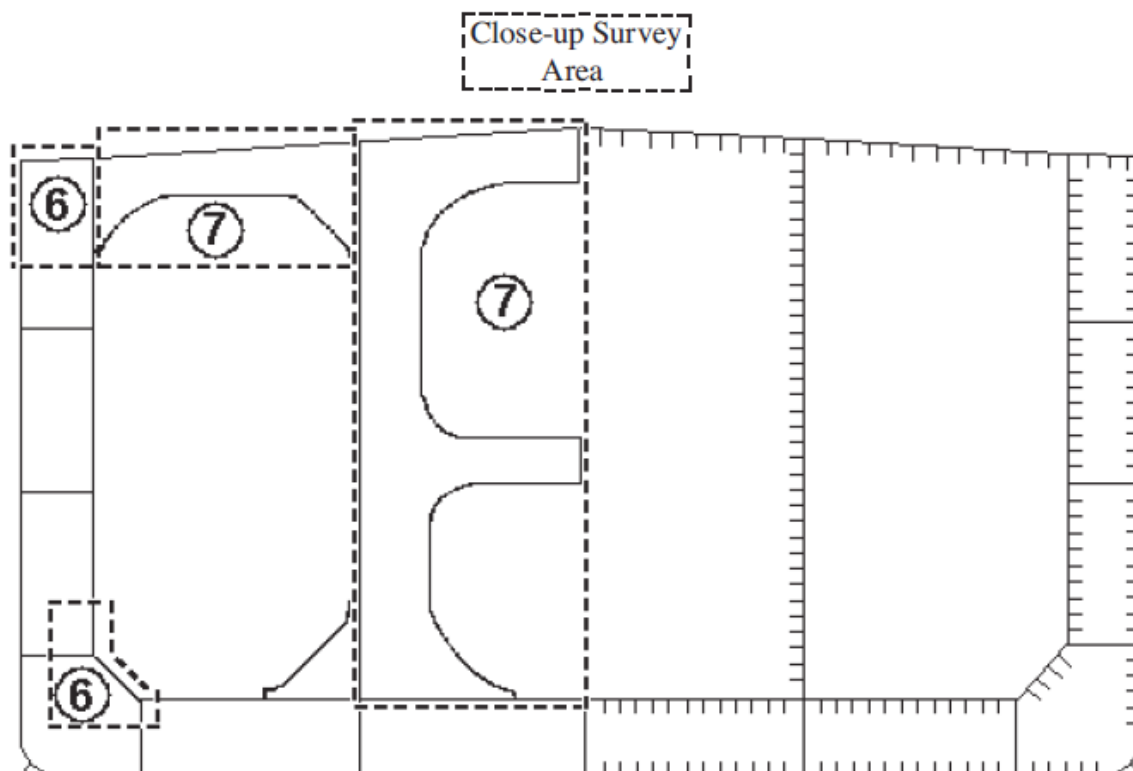


Figure 10 - Close-up Survey Requirements for Double Hull Oil Tankers Areas (6) and (7)

TABLE VI

Note: Table VI is retitled Annex IVC.

TABLE VII

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

1. Application

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

2. Procedures for Certification

(1) Submission of Documents:

Following documents are to be submitted to BCS for approval;

- a) Outline of firms, e.g. organization and management structure.
- b) Experience of the firms on thickness measurement inter alia of hull structures of the vessels.
- c) Technicians' careers, i.e. experience of technicians as thickness measurement operators, technical knowledge of hull structure etc. Operators, are to be qualified according to a recognized industrial NDT Standard.
- d) Equipment used for thickness measurement such as ultra-sonic testing machines and its maintenance/calibration procedures.
- e) A guide for thickness measurement operators.
- f) Training programmes of technicians for thickness measurement.
- g) Measurement record format in accordance with the Recommended Procedures for Thickness Measurements of Double Hull Oil Tankers contained in Annex II.

(2) Auditing of the firms:

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

(3) Certification is conditional on an onboard demonstration at thickness measurements as well as satisfactory reporting.

3. Certification

(1) Upon satisfactory results of both the audit of the firm in 2(2) and the demonstration tests in 2(3) above, BCS will issue a Certificate of Approval as well as a notice to the effect that the thickness measurement operation system of the firm has been certified by BCS.

(2) Renewal/endorsement of the Certificate is to be made at intervals not exceeding 3 years by verification that original conditions are maintained.

4. Information of any alteration to the Certified Thickness Measurement Operation System

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

5. Cancellation of Approval

Approval may be cancelled in the following cases:

- (1) Where the measurements were improperly carried out or the results were improperly reported.
- (2) Where BCS's surveyor found any deficiencies in the approved thickness measurement operation systems of the firm.
- (3) Where the firm failed to inform of any alteration in 4 above to BCS.

TABLE VIII

SURVEY REPORTING PRINCIPLES

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

1. General

1.1 A survey report is to be generated in the following cases:

- In connection with commencement, continuation and / or completion of periodical hull surveys, i.e. annual, intermediate and special surveys, as relevant
- When structural damages / defects have been found
- When repairs, renewals or modifications have been carried out
- When condition of class has been imposed or deleted

1.2 The purpose of reporting is to provide:

- Evidence that prescribed surveys have been carried out in accordance with applicable classification rules
- Documentation of surveys carried out with findings, repairs carried out and condition of class imposed or deleted
- Survey records, including actions taken, which shall form an auditable documentary trail. Survey reports are to be kept in the survey report file required to be on board
- Information for planning of future surveys
- Information which may be used as input for maintenance of classification rules and instructions

1.3 When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items surveyed, relevant findings and an indication of whether the item has been credited, is to be made available to the next attending surveyor, prior to continuing or completing the survey. Thickness measurement and tank testing carried out is also to be listed for the next surveyor.

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 tank, where a close-up survey has been carried out, together with information of the means of access used.

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

Note: As a minimum, the identification of location of close-up survey and thickness measurement is to include a confirmation with description of individual structural members corresponding to the extent of requirements stipulated in BCS- R Z10.4 based on type of periodical survey and the ship's age.

Where only partial survey is required, i.e. one web frame ring / one deck transverse, the identification is to include location within each tank by reference to frame numbers.

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

2.5 Identification of tanks subject to tank testing.

2.6 Identification of cargo piping on deck, including crude oil washing (COW) piping, and cargo and ballast piping within cargo and ballast tanks, pump rooms, pipe tunnels and void spaces, where:

- Examination including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been carried out
- 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).

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

- Identification of findings, such as:
 - Corrosion with description of location, type and extent
 - Areas with substantial corrosion
 - Cracks / fractures with description of location and extent
 - Buckling with description of location and extent
 - Indents with description of location and extent
- Identification of compartments where no structural damages / defects are found

The report may be supplemented by sketches / photos.

3.3 Thickness measurement report is to be verified and signed by the surveyor controlling the measurements on board.

3.4 Evaluation result of longitudinal strength of the hull girder of oil tankers of 130 m in length and upwards and over 10 years of age. The following data is to be included, as relevant:

- Measured and as-built transverse sectional areas of deck and bottom flanges
- Diminution of transverse sectional areas of deck and bottom flanges
- Details of renewals or reinforcements carried out, as relevant (as per 4.2)

4. Actions taken with respect to findings

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

4.2 Repairs carried out are to be reported with identification of:

- Compartment
- Structural member
- Repair method (i.e. renewal or modification) including:
 - Steel grades and scantlings (if different from the original)
 - Sketches/photos, as appropriate
- Repair extent
- NDT / Tests

4.3 For repairs not completed at the time of survey, condition of class is to be imposed with a specific time limit for the repairs. In order to provide correct and proper information to the surveyor attending for survey of the repairs, condition of class is to be sufficiently detailed with identification of each item to be repaired. For identification of extensive repairs, reference may be given to the survey report.

TABLE IX (i)

**IACS UNIFIED REQUIREMENTS FOR ENHANCED SURVEYS
EXECUTIVE HULL SUMMARY**

Issued upon Completion of Special Survey

GENERAL PARTICULARS

SHIP'S NAME:

CLASS IDENTIFY NUMBER:

IMO IDENTIFY NUMBER:

PORT OF REGISTRY:

NATIONAL FLAG:

DEADWEIGHT (M. TONNES):

GROSS TONNAGE:

NATIONAL:

ITC (69):

DATE OF BUILD:

CLASSIFICATION NOTATION:

DATE OF MAJOR CONVERSION:

TYPE OF CONVERSION:

-
- a) The survey reports and documents listed below have been reviewed by the undersigned and found to be satisfactory
- b) A summary of the survey is attached herewith on sheet 2
- c) The hull special survey has been completed in accordance with the Regulations on [date]

Executive Summary Report completed by:	Name Signature	Title
OFFICE	DATE	
Executive Summary Report verified by:	Name Signature	Title
OFFICE	DATE	

Attached reports and documents:

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)

TABLE IX (ii)

EXECUTIVE HULL SUMMARY

- | | | | |
|----|---|---------------------------|--|
| A) | General Particulars: | - | Ref. Table IX (i) |
| B) | Report Review: | - | Where and how survey was done |
| C) | Close-up Survey: | - | Extent (Which tanks) |
| D) | Cargo & Ballast Piping System: | - | Examined |
| | | - | Operationally tested |
| E) | Thickness measurements: | - | Reference to Thickness Measurement report |
| | | - | Summary of where measured |
| | | - | Separate form indicating the tanks/areas with Substantial Corrosion, and corresponding |
| | | * | Thickness diminution |
| | | * | Corrosion pattern |
| F) | Tank Protection: | Separate form indicating: | |
| | | - | Location of coating |
| | | - | Condition of coating (if applicable) |
| G) | Repairs: | - | Identification of tanks/areas |
| H) | Condition of Class/Recommendations: | | |
| I) | Memoranda: | - | Acceptable defects |
| | | - | Any points of attention for future surveys, e.g. for Suspect Areas. |
| | | - | Extended Annual/Intermediate survey due to coating breakdown |
| J) | Evaluation results of the ship's longitudinal strength (for oil tankers of 130 m in length and upwards and of over 10 years of age) | | |
| K) | Conclusion: | - | Statement on evaluation/verification of survey report |

TABLE IX (iii) A – non CSR vessels

EXTRACT OF THICKNESS MEASUREMENT

Reference is made to the thickness measurements report:

1) Position of substantially corroded Tanks/Areas or Areas with deep pitting	Thickness diminution[%]	2) Corrosion pattern	Remarks: e.g. Ref. attached sketches

Remarks

- 1) Substantial corrosion, i.e. 75 – 100% of acceptable margins wasted.
- 2) P = Pitting
C = Corrosion in General
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 1/3 or more of actual plate thickness is to be noted.

TABLE IX (iii) B – CSR vessels

EXTRACT OF THICKNESS MEASUREMENTS

Reference is made to the thickness measurements report:

1) Position of substantially corroded Tanks/Areas or Areas with deep pitting	$t_m - t_{ren}$ (mm)	2) Corrosion pattern	Remarks: e.g. Ref. Attached sketches

Remarks

- 1) Substantial corrosion, an extent of corrosion such that the assessment of the corrosion pattern indicates a measured thickness between $t_{ren} + 0.5\text{mm}$ and t_{ren} .
- 2) P = Pitting
C = Corrosion in General
Areas with deep pitting assessed according to 8.2 are to be recorded in this column.

TABLE IX (iv)
TANK PROTECTION

1) Tank Nos.	2) Tank protection	3) Coating condition	Remarks

Remarks:

1)

All segregated ballast tanks and combined cargo/ballast tanks to be listed.

2)

C = Coating NP = No Protection

3)

Coating condition according to the following standard

GOOD

condition with only minor spot rusting.

FAIR

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

POOR

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

If coating condition **less than "GOOD"** is given, extended annual surveys are to be introduced. This is to be noted in part I) of the Executive Hull Summary.

TABLE IX (v)

**Evaluation result of longitudinal strength of the hull girder of
oil tankers of 130 m in length and upwards and of over 10 years of age
(Of sections 1, 2 and 3 below, only one applicable section is to be completed)**

1 This section applies to ships regardless of the date of construction: Transverse sectional areas of deck flange (deck plating and deck longitudinals) and bottom flange (bottom shell plating and bottom longitudinals) of the ship's hull girder have been calculated by using the thickness measured, renewed or reinforced, as appropriate, during the special survey most recently conducted after the ship reached 10 years of age, and found that the diminution of the transverse sectional area does not exceed 10% of the as-built area, as shown in the following table:

Table 1 Transverse sectional area of hull girder flange				
		Measured	As-built	Diminution
Transverse Section 1	Deck flange	cm ²	cm ²	cm ² (%)
	Bottom flange	cm ²	cm ²	cm ² (%)
Transverse Section 2	Deck flange	cm ²	cm ²	cm ² (%)
	Bottom flange	cm ²	cm ²	cm ² (%)
Transverse Section 3	Deck flange	cm ²	cm ²	cm ² (%)
	Bottom flange	cm ²	cm ²	cm ² (%)

2 This section applies to ships constructed on or after 1 July 2002: Section moduli of transverse section of the ship's hull girder have been calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the special survey most recently conducted after the ship reached 10 years of age in accordance with the provisions of paragraph 2.2.1.1 of Annex III, and are found to be within their diminution limits determined by BCS*, as shown in the following table:

Table 2 Transverse section modulus of hull girder				
		Z _{act} (cm ³) *1	Z _{req} (cm ³) *2	Remarks
Transverse Section 1	Upper deck			
	Bottom			
Transverse Section 2	Upper deck			
	Bottom			
Transverse Section 3	Upper deck			
	Bottom			

* The actual transverse section modulus of the hull girder of oil tankers calculated under paragraph 2.2.1.1 of Annex III to BCS- R Z10.4 is not to be less than 90% of the required section modulus for new buildings specified in BCS- R S7* or S11, whichever is the greater.

* C = 1.0 c_n is to be used for the purpose of this calculation.

Notes

- *1 Z_{act} means the actual section moduli of the transverse section of the ship's hull girder calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the special survey, in accordance with the provisions of paragraph 2.2.1.1 of Annex III.
- *2 Z_{req} means diminution limit of the longitudinal bending strength of ships, as calculated in accordance with the provisions of paragraph 2.2.1.1 of Annex III.

The calculation sheets for Z_{act} are to be attached to this report.

3 This section applies to ships constructed before 1 July 2002: Section moduli of transverse section of the ship's hull girder have been calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the special survey most recently conducted after the ship reached 10 years of age in accordance with the provisions of paragraph 2.2.1.2 of Annex III, and found to meet the criteria required by BCS and that Z_{act} is not less than Z_{mc} (defined in *2 below) as specified in appendix 2 to Annex III, as shown in the following table:

Describe the criteria for acceptance of the minimum section moduli of the ship's hull girder for ships in service required by BCS.

Table 3 Transverse section modulus of hull girder				
		$Z_{act} \text{ (cm}^3\text{)}^{*1}$	$Z_{req} \text{ (cm}^3\text{)}^{*2}$	Remarks
Transverse Section 1	Upper deck			
	Bottom			
Transverse Section 2	Upper deck			
	Bottom			
Transverse Section 3	Upper deck			
	Bottom			

Notes:

- *1 As defined in note *1 of Table 2.
- *2 Z_{mc} means the diminution limit of minimum section modulus calculated in accordance with provisions of paragraph 2.2.1.2 of Annex III.

ANNEX I

GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH PLANNING FOR ENHANCED SURVEYS OF DOUBLE HULL OIL TANKERS SPECIAL SURVEY - HULL

Contents:

- 1. INTRODUCTION
- 2. PURPOSE AND PRINCIPLES
 - 2.1 Purpose
 - 2.2 Minimum Requirements
 - 2.3 Timing
 - 2.4 Aspects to be Considered
- 3. TECHNICAL ASSESSMENT
 - 3.1 General
 - 3.2 Methods
 - 3.2.1 Design Details
 - 3.2.2 Corrosion
 - 3.2.3 Locations for Close-up Survey and Thickness Measurement

REFERENCES

- 1. BCS- R Z10.4, "Hull Surveys of Double Hull Oil Tankers."
- 2. TSCF, "Guidelines for the Inspection and Maintenance of Double Hull Tanker Structures, 1995."
- 3. TSCF, "Guidance Manual for Tanker Structures, 1997."

1. INTRODUCTION

These guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of enhanced special surveys of double hull oil tankers. As indicated in 5.1.5 of BCS- R Z10.4, "Hull Surveys of Double Hull Oil Tankers," (Ref. 1), the guidelines are a recommended tool which may be invoked at the discretion of BCS, 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 and tanks for thickness measurement, close-up survey and tank testing.

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

2.2 Minimum Requirements

However, these guidelines may not be used to reduce the requirements pertaining to thickness measurement, close-up survey and tank testing contained in Tables I, II and III, respectively, of BCS- R Z10.4; 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 are to be worked out by the Owner or operator in cooperation with BCS well in advance of the commencement of the Special Survey, i.e., prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

2.4 Aspects to be Considered

Technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of tanks and areas for survey:

- * Design features such as stress levels on various structural elements, design details and extent of use of high tensile steel.
- * Former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available.
- * Information with respect to types of cargo carried, use of different tanks for cargo/ballast, protection of tanks and condition of coating, if any.

Technical assessments of the relative risks of susceptibility to damage or deterioration of various structural elements and areas are to be judged and decided on the basis of recognised principles and practices, such as may be found in publications of the Tanker Structure Cooperative Forum (TSCF), (Refs. 2 and 3).

3. TECHNICAL ASSESSMENT

3.1 General

There are three basic types of possible failure which may be the subject of technical assessment in connection with planning of surveys; corrosion, cracks and buckling. Contact damages are not normally covered by the survey plan since indents are usually noted in memoranda and assumed to be dealt with as a normal routine by Surveyors.

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

The design is to be considered with respect to structural details which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue.

Corrosion is related to the ageing process, and is closely connected with the quality of corrosion protection at newbuilding, and subsequent maintenance during the service life. Corrosion may also lead to cracking and/or buckling.

3.2 Methods

3.2.1 Design Details

Damage experience related to the ship in question and similar ships, where available, is the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings is to be included.

Typical damage experience to be considered will consist of:

- Number, extent, location and frequency of cracks.
- Location of buckles.

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

In addition, general experience is to be utilized. For example, reference is to be made to the two TSCF's publications mentioned in Ref.2 and Ref.3, which contain a catalogue of typical damages and proposed repair methods for various tanker structural details.

Such figures are to be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage. An example is shown in Figure 2. In particular, Chapter 3 of Ref.2 deals with various aspects specific to double hull tankers, such as stress concentration locations, misalignment during construction, corrosion trends, fatigue considerations and areas requiring special attention, which are to be considered in working out the survey planning.

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

The use of high tensile steel (HTS) is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favourable, e.g. side structures.

In this respect, stress calculations of typical and important components and details, in accordance with the latest Rules or other relevant methods, may prove useful and are to be considered.

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

3.2.2 Corrosion

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

- Usage of Tanks and Spaces
- Condition of Coatings
- Cleaning Procedures
- Previous Corrosion Damage
- Ballast use and time for Cargo Tanks
- Corrosion Risk Scheme (See Ref. 3, Table 2.1)
- Location of Heated Tanks

Ref. 3 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

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

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

Special attention is to be given to the areas where the double hull tanker is particularly exposed to corrosion. To do this end, the specific aspects addressing corrosion in double hull tankers indicated in 3.4 (Corrosion trends) of Ref.2 are to be taken into account.

3.2.3 Locations for Close-up Survey and Thickness Measurement

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

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

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

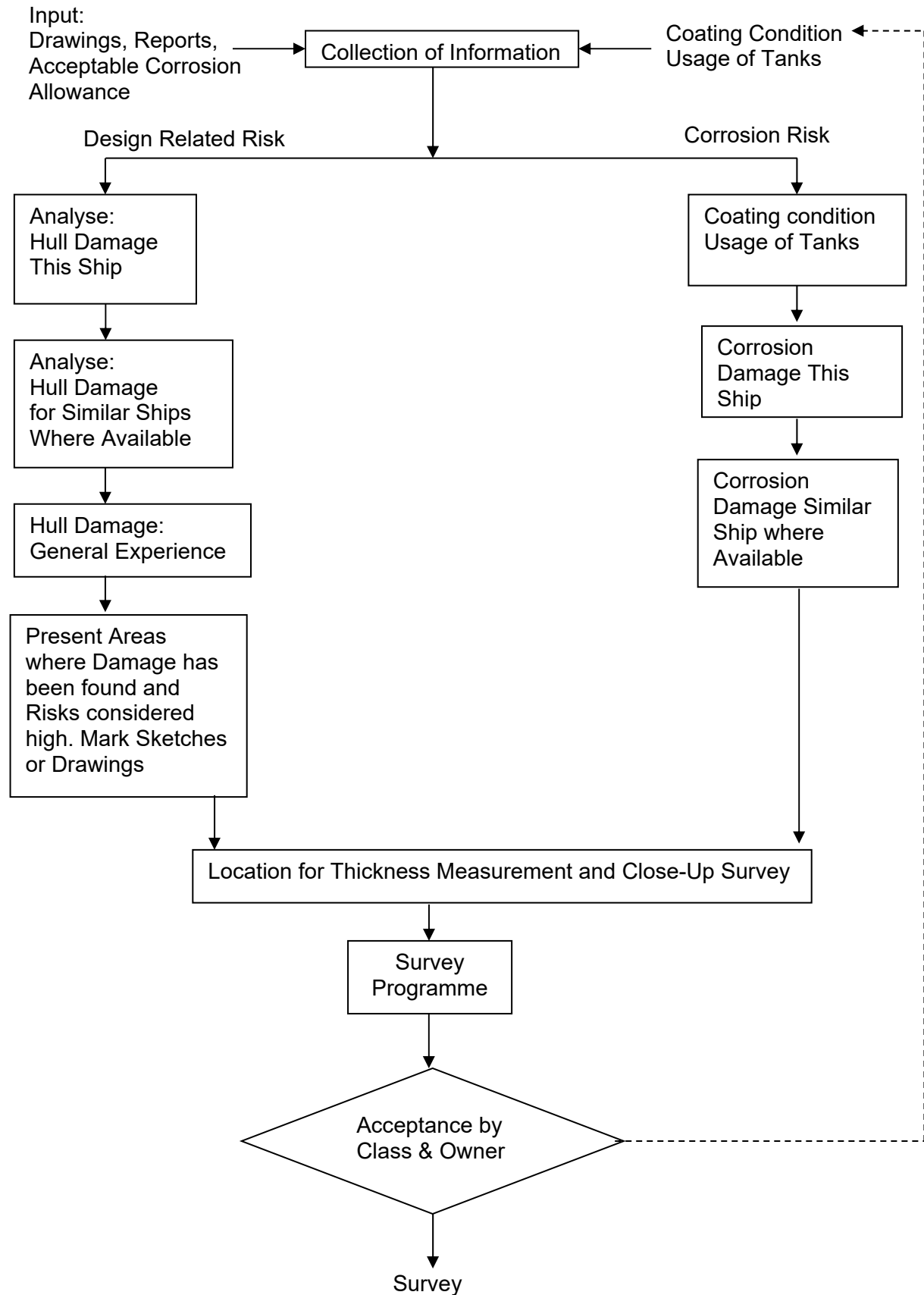


Figure 1: Technical Assessment and the Survey Planning Process

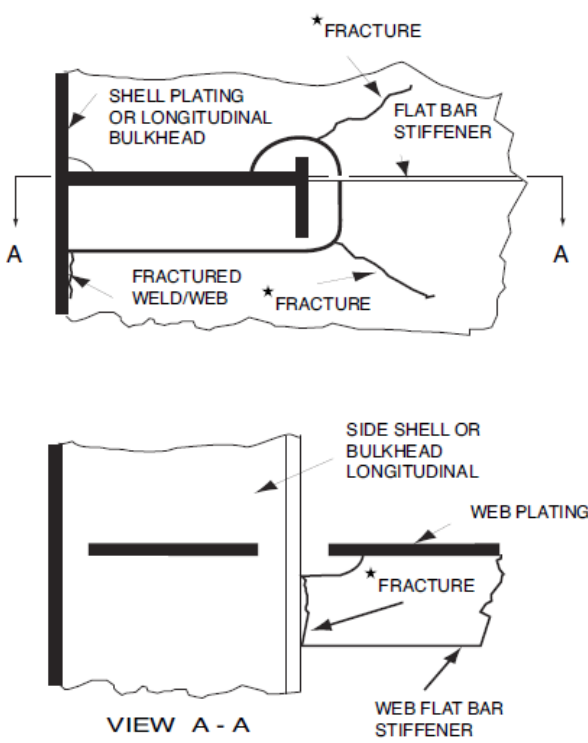
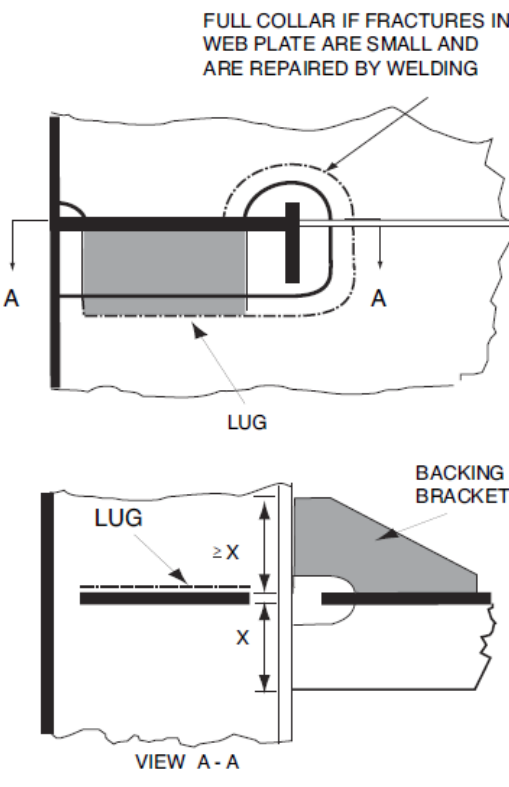
LOCATION: Connection of longitudinals to transverse webs		
EXAMPLE No. 1 : Web and flat bar fractures at cut-outs for longitudinal stiffener connections		
TYPICAL DAMAGE		PROPOSED REPAIR
 <p>NOTE ★ONE OR MORE FRACTURES MAY OCCUR</p>		<p>FULL COLLAR IF FRACTURES IN WEB PLATE ARE SMALL AND ARE REPAIRED BY WELDING</p>  <p>WEB AND FLAT BAR CROPPED AND PART RENEWED OR ALTERNATIVELY WELDED</p>
FACTORS CONTRIBUTING TO DAMAGE <ol style="list-style-type: none"> 1. Asymmetrical connection of flat bar stiffener resulting in high peak stresses at the heel of the stiffener under fatigue loading. 2. Insufficient area of connection of longitudinal to web plate. 3. Defective weld at return around the plate thickness. 4. High localised corrosion at areas of stress concentration such as flat bar stiffener connections, corners of cut-out for the longitudinal and connection of web to shell at cut-outs. 5. High stress in the web of the transverse. 6. Dynamic sea way load/ship motions. 		
FIGURE 1	TANKER STRUCTURE CO-OPERATIVE FORUM	FIGURE 1
	SUBJECT: CATALOGUE OF STRUCTURAL DETAILS	

Figure 2: Typical Damage and Repair Example (Reproduced from Ref. 2)

ANNEX II

RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS OF DOUBLE HULL OIL TANKERS*

*

Note: Annex II is recommendatory.

CONTENTS

Sheet 1

- Sheet 1 - Contents
- Sheet 2 - Instructions
- Sheet 3 - General Particulars

REPORTS

- Sheet 4 - Report TM1-DHT for recording the thickness measurements of all deck plating, all bottom shell plating and side shell plating
- Sheet 5 - Report TM2-DHT (i) for recording the thickness measurement of shell and deck plating at transverse sections - strength deck and sheerstrake plating
- Sheet 6 - Report TM2-DHT (ii) for recording the thickness measurement of shell and deck plating at transverse sections - shell plating
- Sheet 7 - Report TM3-DHT for recording the thickness measurement of longitudinal members at transverse sections (including double hull plating)
- Sheet 8 - Report TM4-DHT for recording the thickness measurement of transverse structural members
- Sheet 9 - Report TM5-DHT for recording the thickness measurement of W.T./O.T. transverse bulkheads
- Sheet 10 - Report TM6-DHT for recording the thickness measurement of miscellaneous structural members

GUIDANCE

- Sheet 11 - Typical transverse section of a double hull oil tanker (up to 150,000 dwt). The diagram includes details of the items to be measured and the report forms to be used.
- Sheet 12 - Typical transverse section of a double hull oil tanker (above 150,000 dwt). The diagram included details of the items to be measured and the report forms to be used.
- Sheet 13 - Transverse section outline. The diagram may be used for those ships where the diagrams on sheet 11 and sheet 12 are not suitable
- Sheet 14 - Transverse section and transverse bulkheads of a double hull oil tanker showing typical areas for thickness measurement in association with close-up survey requirements, areas (1) to (5) as defined in Table I of the BCS- R Z10.4.
- Sheet 15 - Transverse section of a double hull oil tanker showing typical areas for thickness measurement in association with close-up survey requirements, areas (6) to (7) as defined in Table I of the BCS- R Z10.4.

**Recommended Procedures for Thickness Measurements of
Double Hull Oil Tankers**

1. This document is to be used for recording thickness measurements as required by BCS- R Z10.4.
2. Reporting forms TM1-DHT, TM2-DHT, TM3-DHT, TM4-DHT, TM5-DHT and TM6-DHT (sheets 4-10) are to be used for recording thickness measurements and the maximum allowable diminution is to be stated.

The maximum allowable diminution could be stated in an attached document.

3. The remaining sheets 11-15 are guidance diagrams and notes relating to the reporting forms and the procedure for the thickness measurements.

GENERAL PARTICULARS**Sheet 3**

Ship's name:-

IMO Number:-

Class Identification number:-

Port of registry:-

Gross tons:-

Deadweight:-

Date of build:-

Classification society:-

Name of Company performing the thickness measurement:-

Thickness measurement company certified by:-

Certificate No.:-

Certificate valid from.....to.....

Place of measurement:-

First date of measurement:-

Last date of measurement:-

Special survey/intermediate survey due:-*

Details of measurement equipment:-

Qualification of operator:-

Report Number:-

Consisting of.....Sheets

Name of operator:-	Name of surveyor:-
--------------------------	--------------------------

Signature of operator:-	Signature of surveyor:-
-------------------------------	-------------------------------

Firm official stamp:-	Classification Society Official Stamp:-
-----------------------------	--

* Delete as appropriate

TM1-DHT

**Report on THICKNESS MEASUREMENT of ALL DECK PLATING, ALL BOTTOM SHELL PLATING
or SIDE SHELL PLATING***
(* - delete as appropriate)

Sheet 4

Ship's name.....

Class Identity No.

Report No.

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

Operators Signature.....

NOTES – See Reverse

NOTES TO THE REPORT TM1-DHT

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

TM2-DHT (i)

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

Sheet 5

Ship's name.....

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									
STRAKE POSITION	No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S	
		mm	mm	P	S	mm	%	mm	%		mm	mm	P	S	mm	%	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																											
sheer strake																											
TOPSIDE TOTAL																											

Operators Signature.....

NOTES – See Reverse

NOTES TO THE REPORT TM2-DHT (i)

1. This report form is to be used for recording the thickness measurements of:

Strength deck plating and sheerstrake plating transverse sections:

One, two or three sections within the cargo area comprising of the structural items (0), (1) and (2) as shown on the diagrams of typical transverse sections illustrated on sheets 11 and 12 of this document.
2. The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
3. The exact frame station of measurement is to be stated.
4. The single measurements recorded are to represent the average of multiple measurements.
5. The maximum allowable diminution could be stated in an attached document.

TM2-DHT (ii)

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

Sheet 6

Ship's name.....

Class Identity No.

Report No.

SHELL PLATING

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

Operators Signature.....

NOTES – See Reverse

NOTES TO THE REPORT TM2-DHT (ii)

1. This report form is to be used for recording the thickness measurements of:

Shell plating transverse sections:

One, two or three sections within the cargo area comprising of the structural items (3), (4) and (5) and (6) as shown on the diagrams of typical transverse sections illustrated on sheets 11 and 12 of this document.

2. The bottom area comprises keel, bottom and bilge plating.
3. The exact frame station of measurement is to be stated.
4. The single measurements recorded are to represent the average of multiple measurements.
5. The maximum allowable diminution could be stated in an attached document.

TM3-DHT

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

Sheet 7

Ship's name.....

Class Identity No.

Report No.

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES TO THE REPORT TM3-DHT

1. This report is to be used for recording the thickness measurements of:

Longitudinal Members at transverse sections:

One, two or three sections within the cargo area comprising of the appropriate structural items (10) to (29) as shown on the diagrams of typical transverse sections illustrated on sheets 11 and 12 of this document.

2. The exact frame station of measurement is to be stated.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

TM4-DHT

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

Sheet 8

Ship's name.....

Class Identity No.

Report No.

TANK DESCRIPTION:

LOCATION OF STRUCTURE:

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES TO THE REPORT TM4-DHT

1. This report is to be used for recording the thickness measurements of:

 Transverse structural members, comprising of the appropriate structural items (30) to (36) as shown on diagrams of typical transverse sections illustrated on sheets 11 and 12 of this document.
2. Guidance for areas of measurement is indicated on sheet 14 and 15 of this document.

 The single measurements recorded are to represent the average of multiple measurements.
3. The maximum allowable diminution could be stated in an attached document.

TM5-DHT

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

Sheet 9

Ship's name.....

Class Identity No.

Report No.

TANK/HOLD DESCRIPTION:

LOCATION OF STRUCTURE:

FRAME NO.:

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES TO THE REPORT TM5-DHT

1. This report is to be used for recording the thickness measurement of:
W.T./O.T. transverse bulkheads.
2. Guidance for areas of measurement is indicated on sheet 14 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

TM6-DHT

Report on THICKNESS MEASUREMENT OF MISCELLANEOUS STRUCTURAL MEMBERS

Sheet 10

Ship's name.....

Class Identity No.

Report No.

[illegible]

Operators Signature.....

NOTES – See Reverse

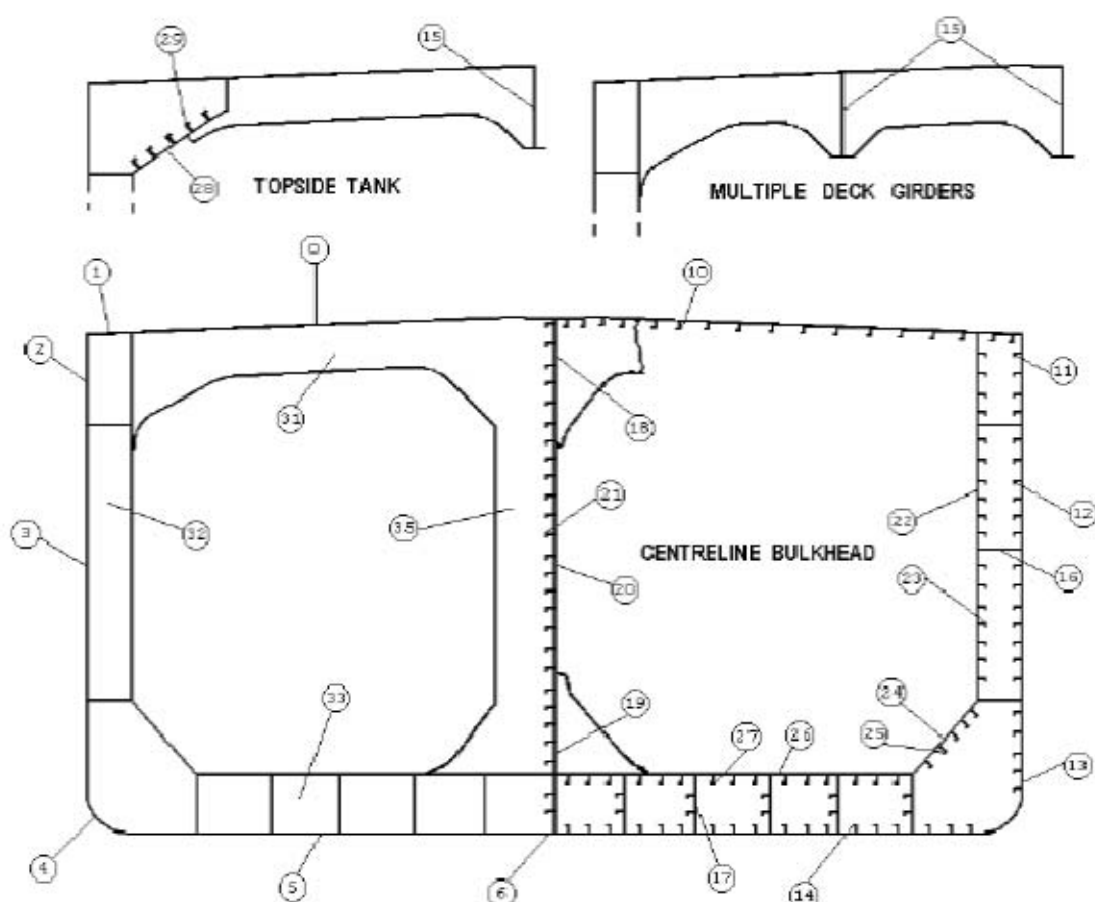
NOTES TO THE REPORT TM6-DHT

1. This report is to be used for recording the thickness measurement of:
Miscellaneous structural members.
2. The single measurements recorded are to represent the average of multiple measurements.
3. The maximum allowable diminution could be stated in an attached document.

Thickness Measurement - Double Hull Oil Tankers

Sheet 11

Typical transverse section of a double hull oil tanker up to 150,000 dwt with indication of longitudinal and transverse members



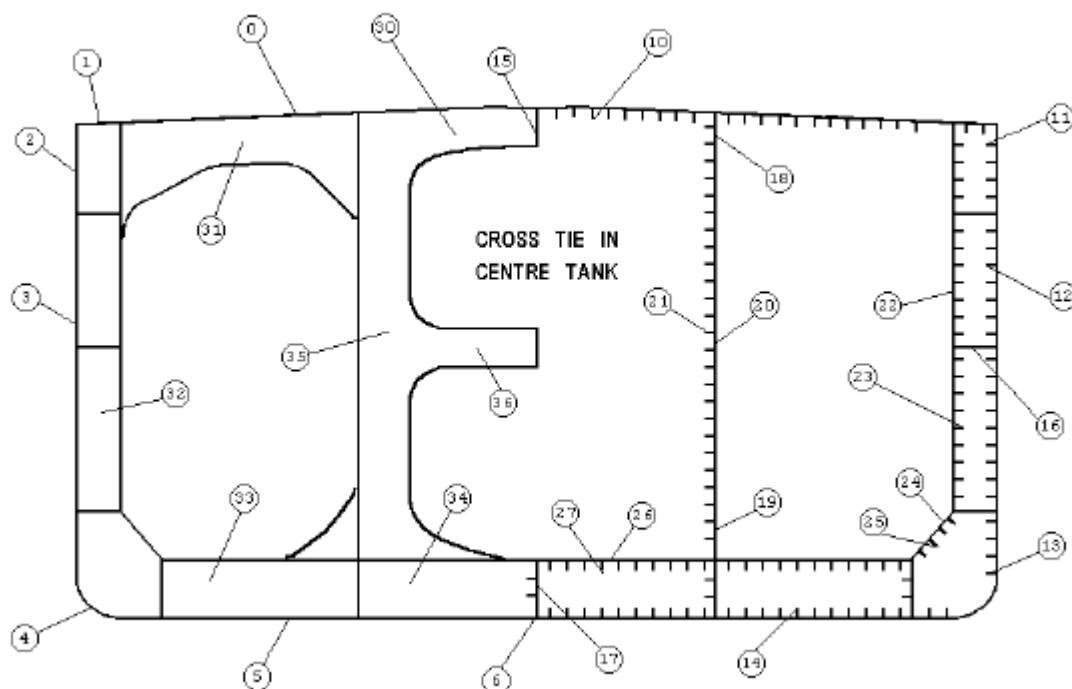
Report on TM2-DHT (i) & (ii)	
0.	Strength deck plating
1.	Stringer plate
2.	Sheerstrake
3.	Side shell plating
4.	Bilge plating
5.	Bottom shell plating
6.	Keel plate

Report on TM3-DHT			
10.	Deck longitudinals	20.	Longitudinal bulkhead plating (remainder)
11.	Sheerstrake longitudinals	21.	Longitudinal bulkhead longitudinals
12.	Side shell longitudinals	22.	Inner side plating
13.	Bilge longitudinals	23.	Inner side longitudinals
14.	Bottom longitudinals	24.	Hopper plating
15.	Deck girders	25.	Hopper longitudinals
16.	Horizontal girders in wing ballast tanks	26.	Inner bottom plating
17.	Bottom girders	27.	Inner bottom longitudinals
18.	Longitudinal bulkhead top strake	28.	Topside tank plating
19.	Longitudinal bulkhead bottom strake	29.	Topside tank longitudinals

Report on TM4-DHT	
30.	Deck transverse - centre tank
31.	Deck transverse - wing tank
32.	Vertical web in wing ballast tank
33.	Double bottom floor - wing tank
34.	Double bottom floor - centre tank
35.	Longitudinal bulkhead vertical web
36.	Cross ties

Thickness Measurement - Double Hull Oil Tankers

Typical transverse section of a double hull oil tanker above 150,000 dwt with indication of longitudinal and transverse members



Report on TM2-DHT (i) & (ii)

- | | |
|----|-----------------------|
| 0. | Strength deck plating |
| 1. | Stringer plate |
| 2. | Sheerstrake |
| 3. | Side shell plating |
| 4. | Bilge plating |
| 5. | Bottom shell plating |
| 6. | Keel plate |

Report on TM3-DHT

- | | | | |
|-----|--|-----|---|
| 10. | Deck longitudinals | 20. | Longitudinal bulkhead plating (remainder) |
| 11. | Sheerstrake longitudinals | 21. | Longitudinal bulkhead longitudinals |
| 12. | Side shell longitudinals | 22. | Inner side plating |
| 13. | Bilge longitudinals | 23. | Inner side longitudinals |
| 14. | Bottom longitudinals | 24. | Hopper plating |
| 15. | Deck girders | 25. | Hopper longitudinals |
| 16. | Horizontal girders in wing ballast tanks | 26. | Inner bottom plating |
| 17. | Bottom girders | 27. | Inner bottom longitudinals |
| 18. | Longitudinal bulkhead top strake | 28. | Topside tank plating |
| 19. | Longitudinal bulkhead bottom strake | 29. | Topside tank longitudinals |

Report on TM4-DHT

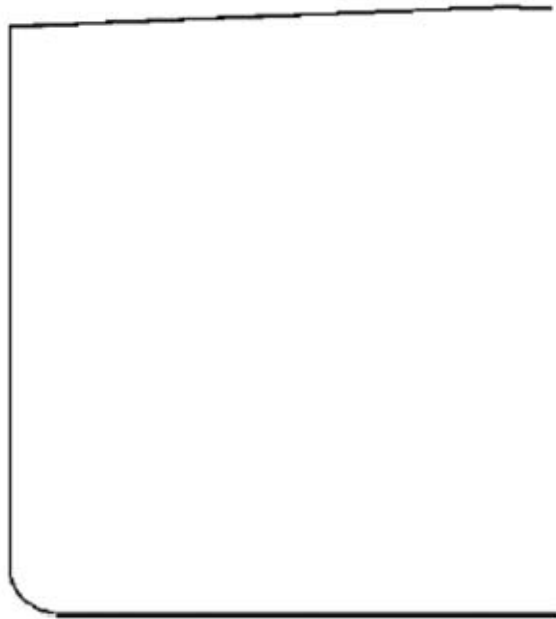
- | | |
|-----|------------------------------------|
| 30. | Deck transverse - centre tank |
| 31. | Deck transverse - wing tank |
| 32. | Vertical web in wing ballast tank |
| 33. | Double bottom floor - wing tank |
| 34. | Double bottom floor - centre tank |
| 35. | Longitudinal bulkhead vertical web |
| 36. | Cross ties |

Thickness Measurement - Double Hull Oil Tankers

Sheet 13

Transverse section outline

The diagram may be used for those ships where the diagrams on sheet 11 and 12 are not suitable



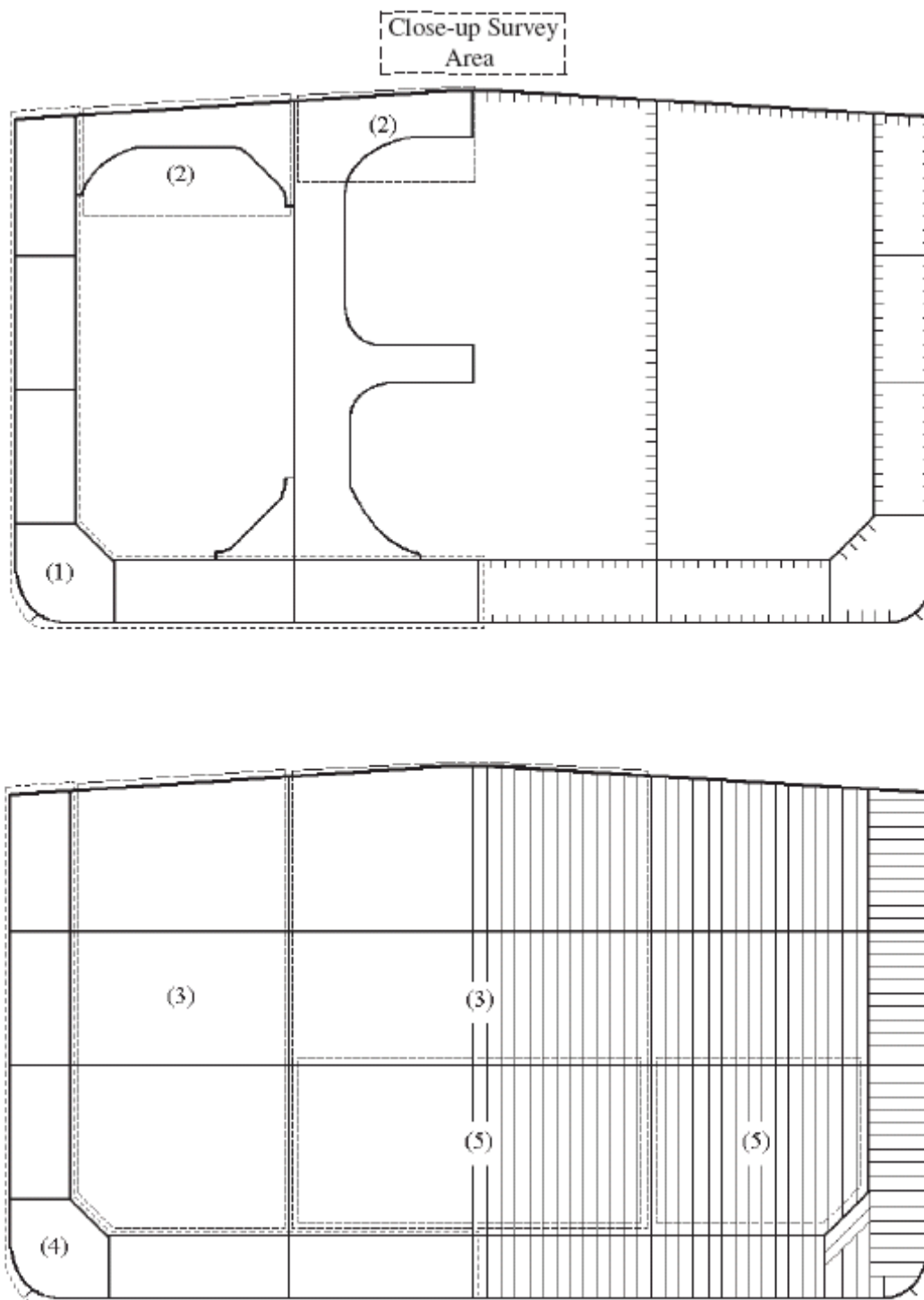
Report on TM2-DHT (i) & (ii)	
0.	Strength deck plating
1.	Stringer plate
2.	Sheerstrake
3.	Side shell plating
4.	Bilge plating
5.	Bottom shell plating
6.	Keel plate

Report on TM3-DHT			
10.	Deck longitudinals	20.	Longitudinal bulkhead plating (remainder)
11.	Sheerstrake longitudinals	21.	Longitudinal bulkhead longitudinals
12.	Side shell longitudinals	22.	Inner side plating
13.	Bilge longitudinals	23.	Inner side longitudinals
14.	Bottom longitudinals	24.	Hopper plating
15.	Deck girders	25.	Hopper longitudinals
16.	Horizontal girders in wing ballast tanks	26.	Inner bottom plating
17.	Bottom girders	27.	Inner bottom longitudinals
18.	Longitudinal bulkhead top strake	28.	Topside tank plating
19.	Longitudinal bulkhead bottom strake	29.	Topside tank longitudinals

Report on TM4-DHT	
30.	Deck transverse - centre tank
31.	Deck transverse - wing tank
32.	Vertical web in wing ballast tank
33.	Double bottom floor - wing tank
34.	Double bottom floor - centre tank
35.	Longitudinal bulkhead vertical web
36.	Cross ties

Close-up Survey and Thickness Measurement Areas

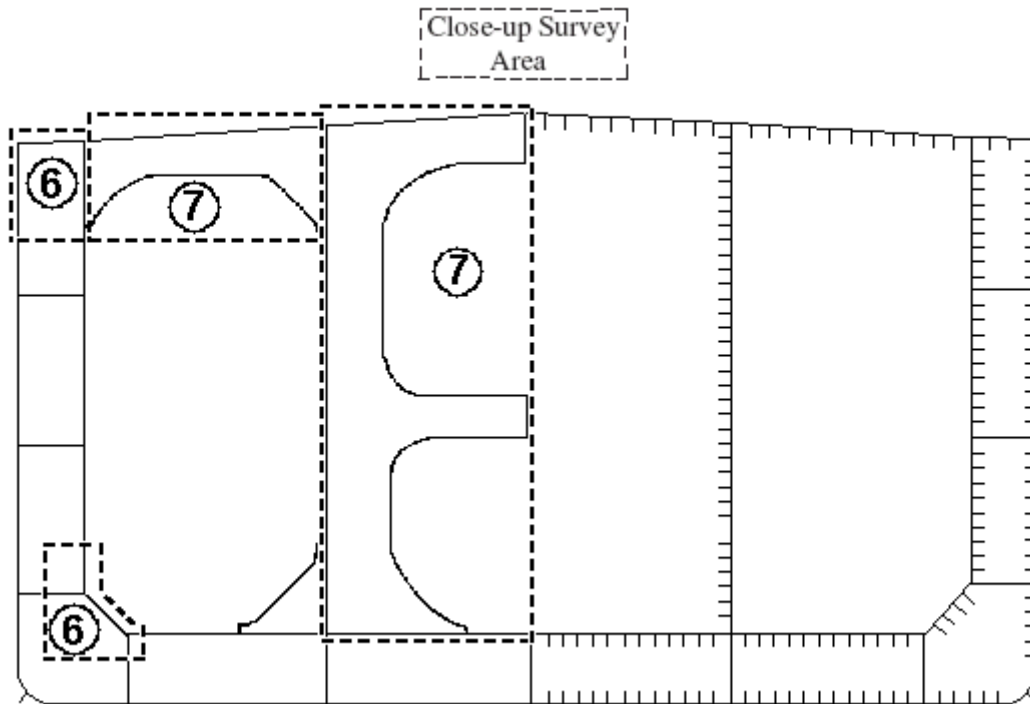
Areas subject to close-up survey and thickness measurements - areas (1) to (5) as defined in Table I of BCS- R Z10.4 - Thickness to be reported on TM3-DHT(CSR), TM4-DHT(CSR) and TM5-DHT(CSR) as appropriate.



Close-up Survey and Thickness Measurement Areas

Sheet 15

Areas subject to close-up survey and thickness measurements - areas (6) to (7) as defined in Table I of BCS- R Z10.4 - Thickness to be reported on TM3-DHT(CSR), TM4-DHT(CSR) as appropriate.



ANNEX II (CSR)

RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS OF DOUBLE HULL OIL TANKERS BUILT UNDER BCS COMMON STRUCTURAL RULES*

*

Note: Annex II (CSR) is recommendatory.

CONTENTS

Sheet 1

- Sheet 1 - Contents
- Sheet 2 - Instructions
- Sheet 3 - General particulars

REPORTS

- Sheet 4 - Report TM1-DHT(CSR) for recording the thickness measurement of all deck plating, all bottom plating and side shell plating
- Sheet 5 - Report TM2-DHT(CSR) (i) for recording the thickness measurement of shell and deck plating at transverse sections - strength deck and sheerstrake plating
- Sheet 6 - Report TM2-DHT(CSR) (ii) for recording the thickness measurement of shell plating at transverse sections
- Sheet 7 - Report TM3-DHT(CSR) for recording the thickness measurement of longitudinal members at transverse sections (including double hull plating)
- Sheet 8 - Report TM4-DHT(CSR) for recording the thickness measurement of transverse structural members
- Sheet 9 - Report TM5-DHT(CSR) for recording the thickness measurement of W.T./O.T. transverse bulkheads
- Sheet 10 - Report TM6-DHT(CSR) for recording the thickness measurement of miscellaneous structural members

GUIDANCE

- Sheet 11 - Typical transverse section of a double hull oil tanker (up to 150,000 dwt). The diagram includes details of the items to be measured and the report forms to be used.
- Sheet 12 - Typical transverse section of a double hull oil tanker (above 150,000 dwt). The diagram includes details of the items to be measured and the report forms to be used.
- Sheet 13 - Transverse section outline. This diagram may be used for those ships where the diagram on sheet 11 and sheet 12 is not suitable.
- Sheet 14 - Transverse section and transverse bulkheads of a double hull oil tanker showing typical areas for thickness measurement in association with close-up survey requirements, areas (1) to (5) as defined in Table I of the BCS- R Z10.4.
- Sheet 15 - Transverse section of a double hull oil tanker showing typical areas for thickness measurement in association with close-up survey requirements, areas (6) to (7) as defined in Table I of the BCS- R Z10.4.

**Recommended Procedures for Thickness Measurements of
Double Hull Oil Tankers Built under BCS Common Structural Rules**

1. This document is to be used for recording thickness measurements of double hull oil tankers built under BCS Common Structural Rules as required by the BCS- R Z10.4 .
2. Reporting forms TM1-DHT(CSR), TM2-DHT(CSR) (i) and (ii), TM3-DHT(CSR), TM4-DHT(CSR), TM5-DHT(CSR) and TM6-DHT(CSR) (sheets 4-10) are to be used for recording thickness measurements. The as-built thickness and the voluntary thickness addition and renewal thickness (minimum allowable thickness) are to be stated in the said forms.
3. The remaining sheets 11-15 are guidance diagrams and notes relating to the reporting forms and the procedure for the thickness measurement.

GENERAL PARTICULARS

Sheet 3

Ships name:-

IMO number:-

Class identity number:-

Port of registry:-

Gross tons:-

Deadweight:-

Date of build:-

Classification Society:-

Name of Firm performing thickness measurement:-

Thickness measurement firm certified by:-

Certificate No:-

Certificate valid from.....to.....

Place of measurement:-

First date of measurement:-

Last date of measurement:-

Special survey/intermediate survey due:-*

Details of measurement equipment:-

Qualification of operators:-

Report Number:-

consisting of.....Sheets

Name of operator:-

Name of surveyor:-

Signature of operator:-

Signature of surveyor:-

Firm
Official Stamp:-Classification Society
Official Stamp:-

* Delete as appropriate

TM1-DHT(CSR)

**Report on THICKNESS MEASUREMENT of ALL DECK PLATING, ALL BOTTOM PLATING
or SIDE SHELL PLATING***
(* - delete as appropriate)

Sheet 4

Ship's name.....

Class Identity No.....

Report No.....

STRAKE POSITION														
PLATE POSITION	No. or Letter	As Built Thk. mm	Voluntary Thickness Addition mm	Renewal Thickness mm (a)	Forward Reading				Aft Reading				Mean Remaining Corr. Addition, mm	
					Gauged Thk. mm (b1)		Remaining Corr. Addition, mm (c1)=(b1)-(a)		Gauged Thk. mm (b2)		Remaining Corr. Addition, mm (c2)=(b2)-(a)		[(c1)+(c2)]/2	
					P	S	P	S	P	S	P	S	P	S
12th forward														
11th														
10th														
9th														
8th														
7th														
6th														
5th														
4th														
3rd														
2nd														
1st														
Amidships														
1st aft														
2nd														
3rd														
4th														
5th														
6th														
7th														
8th														
9th														
10th														
11th														
12th														

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM1-DHT(CSR)

1. This report is to be used for recording the thickness measurement of:-
 - 1.1 All strength deck plating within the cargo length area.
 - 1.2 All keel, bottom shell plating and bilge plating within the cargo length area.
 - 1.3 Side shell plating including selected wind and water strakes outside the cargo length area.
 - 1.4 All wind and water strakes within the cargo length area.
2. The strake position is to be clearly indicated as follows:-
 - 2.1 For strength deck indicate the number of the strake of plating inboard from the stringer plate.
 - 2.2 For bottom plating indicate the number of the strake of plating outboard from the keel plate.
 - 2.3 For side shell plating give number of the strake of plating sheerstrake and letter as shown on shell expansion.
3. Measurements are to be taken at the forward and aft areas of all plates cross ballast/cargo tank boundaries separate measurements for the area of plating in way of each type of tank are to be recorded.
4. The single measurements recorded are to represent the average of multiple measurements.
5. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM2-DHT(CSR) (i) Report on THICKNESS MEASUREMENT OF SHELL AND DECK PLATING
(one, two or three transverse sections)

Sheet 5

Ship's name.....

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													
STRAKE POSITION	No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)				No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)				No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)			
					P	S	P	S	P	S					P	S	P	S	P	S					P	S				
Stringer Plate																														
1st strake inboard																														
2nd																														
3rd																														
4th																														
5th																														
6th																														
7th																														
8th																														
9th																														
10th																														
11th																														
12th																														
13th																														
14th																														
centre strake																														
sheer strake																														
TOPSIDE TOTAL																														

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM2-DHT(CSR) (i)

1. This report is to be used for recording the thickness measurement of:-

Strength deck plating and sheerstrake plating transverse sections:-

One, two or three sections within the cargo length area, comprising of the structural items (0), (1) and (2) as shown on the diagram of typical transverse sections illustrated on sheets 11 and 12 of this document.

2. The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
3. The exact frame station of measurement is to be stated.
4. The single measurements recorded are to represent the average of multiple measurements.
5. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM2-DHT(CSR) (ii) Report on THICKNESS MEASUREMENT OF SHELL PLATING
(one, two or three transverse sections)

Sheet 6

Ship's name.....

Class Identity No.....

Report No.....

SHELL PLATING

SHELL PLATING																											
	FIRST TRANSVERSE SECTION AT FRAME NUMBER								SECOND TRANSVERSE SECTION AT FRAME NUMBER								THIRD TRANSVERSE SECTION AT FRAME NUMBER										
STRAKE POSITION	No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm	Gauged Thk. mm (b)		Remaining Corr. Addition, mm		No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm	Gauged Thk. mm (b)		Remaining Corr. Addition, mm		No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm	Gauged Thk. mm (b)		Remaining Corr. Addition, mm				
					(a)	P	S	P					S	(a)	P	S					P	S	(a)	P	S	P	S
1 st below sheer strake																											
2nd																											
3rd																											
4th																											
5th																											
6th																											
7th																											
8th																											
9th																											
10th																											
11th																											
12th																											
13th																											
14th																											
15th																											
16th																											
17th																											
18th																											
19th																											
20th																											
Keel strake																											
BOTTOM TOTAL																											

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM2-DHT(CSR) (ii)

1. This report is to be used for recording the thickness measurement of:-

Shell plating transverse sections:-

One, two or three sections within the cargo length area comprising of the structural items (3), (4) and (5) and (6) as shown on the diagram of typical transverse sections illustrated on sheets 11 and 12 of this document.

2. The bottom area comprises keel, bottom and bilge plating.
3. The exact frame station of measurement is to be stated.
4. The single measurements recorded are to represent the average of multiple measurements.
5. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM3-DHT(CSR)

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

Sheet 7

Ship's name.....

Class Identity No.....

Report No.....

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM3-DHT(CSR)

1. This report is to be used for recording the thickness measurement of:-

Longitudinal Members at transverse sections:-

One, two or three sections within the cargo length area, comprising of the appropriate structural items (10) to (29) as shown on the diagram of typical transverse sections illustrated on sheets 11 and 12 of this document.

2. The exact frame station of measurement is to be stated.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM4-DHT(CSR)

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

Sheet 8

Ship's name.....

Class Identity No.....

Report No.....

TANK DESCRIPTION:

LOCATION OF STRUCTURE

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM4-DHT(CSR)

1. This report is to be used for recording the thickness measurement of:-

Transverse structural members, comprising of the appropriate structural items (30) to (36) as shown on diagram of typical transverse section, illustrated on sheets 11 and 12 of this document.
2. Guidance for areas if measurement is indicated on the diagrams shown on sheet 14 and 15 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM5-DHT(CSR)

Report on THICKNESS OF W.T./O.T. TRANSVERSE BULKHEADS Within the cargo and ballast tanks

Sheet 9

Ship's name.....

Class Identity No.....

Report No.....

TANK DESCRIPTION:

LOCATION OF STRUCTURE:

FRAME NO.:

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM5-DHT(CSR)

1. This report is to be used for recording the thickness measurement of:-
W.T./O.T. transverse bulkheads.
2. Guidance for areas of measurement is indicated on the diagrams shown on sheet 14 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

Report No.....

[illegible]

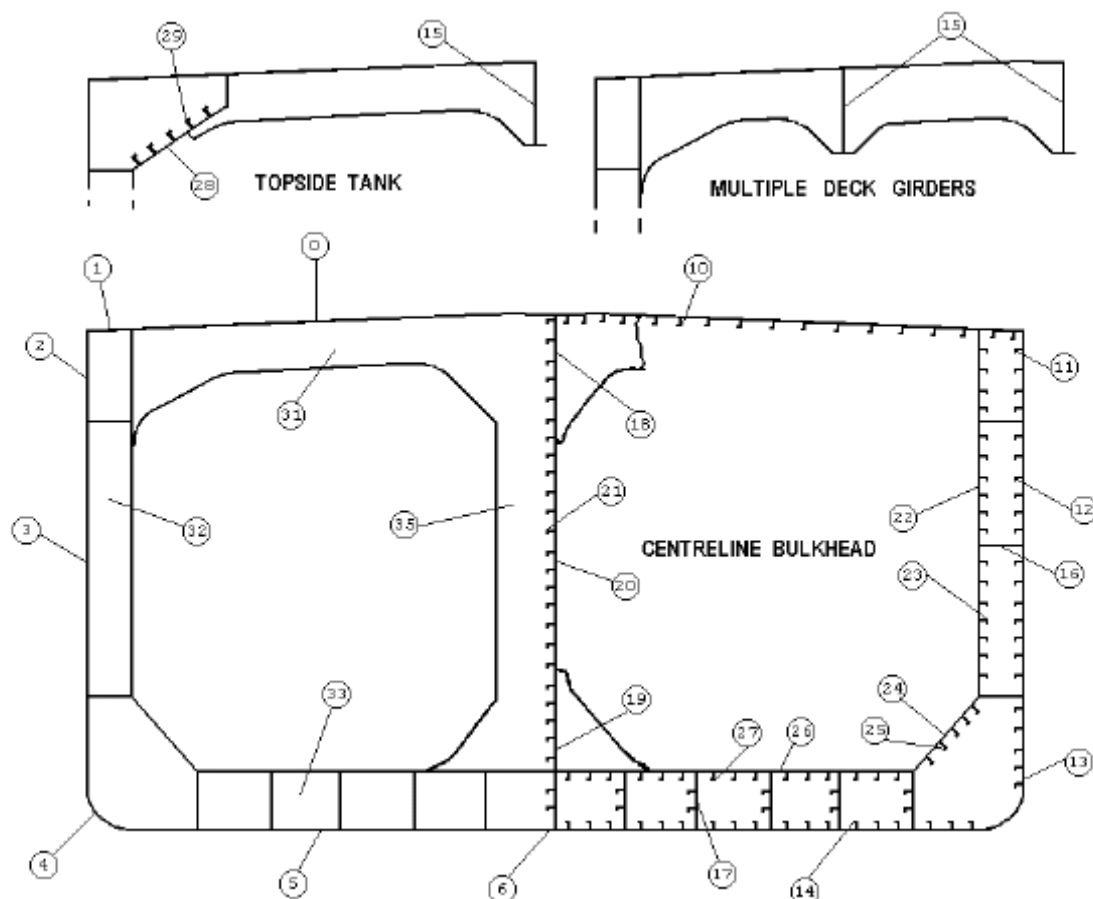
NOTES – See Reverse

NOTES TO REPORT TM6-DHT(CSR)

1. This report is to be used for recording the thickness measurement of:-
Miscellaneous structural members.
2. The single measurements recorded are to represent the average of multiple measurements.
3. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

Thickness Measurement - Double Hull Oil Tankers

Typical transverse section of a double hull oil tanker up to 150,000 dwt with indication of longitudinal and transverse members



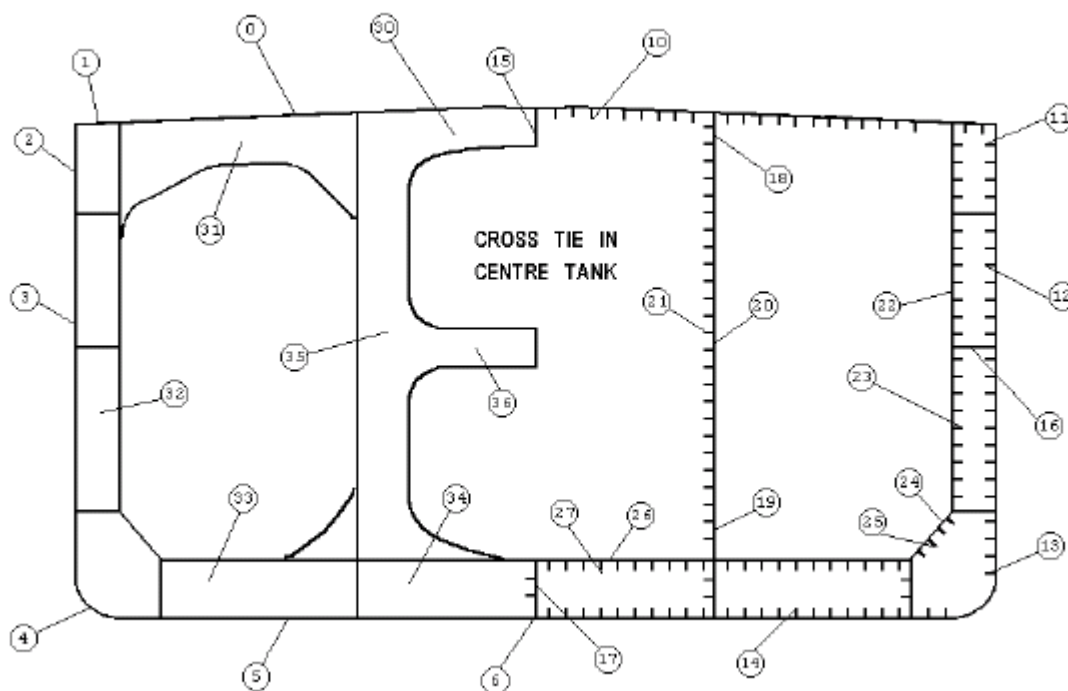
Report on TM2-DHT(CSR) (i) & (ii)	
0.	Strength deck plating
1.	Stringer plate
2.	Sheerstrake
3.	Side shell plating
4.	Bilge plating
5.	Bottom shell plating
6.	Keel plate

Report on TM3-DHT(CSR)	
10.	Deck longitudinals
11.	Sheerstrake longitudinals
12.	Side shell longitudinals
13.	Bilge longitudinals
14.	Bottom longitudinals
15.	Deck girders
16.	Horizontal girders in wing ballast tanks
17.	Bottom girders
18.	Longitudinal bulkhead top strake
19.	Longitudinal bulkhead bottom strake
20.	Longitudinal bulkhead plating (remainder)
21.	Longitudinal bulkhead longitudinals
22.	Inner side plating
23.	Inner side longitudinal
24.	Hopper plating
25.	Hopper longitudinal
26.	Inner bottom plating
27.	Inner bottom longitudinal
28.	Topside tank plating
29.	Topside tank longitudinals

Report on TM4-DHT(CSR)	
30.	Deck transverse - centre tank
31.	Deck transverse - wing tank
32.	Vertical web in wing ballast tank
33.	Double bottom floor - wing tank
34.	Double bottom floor - centre tank
35.	Longitudinal bulkhead vertical web
36.	Cross ties

Thickness Measurement - Double Hull Oil Tankers

Typical transverse section of a double hull oil tanker above 150,000 dwt with indication of longitudinal and transverse members



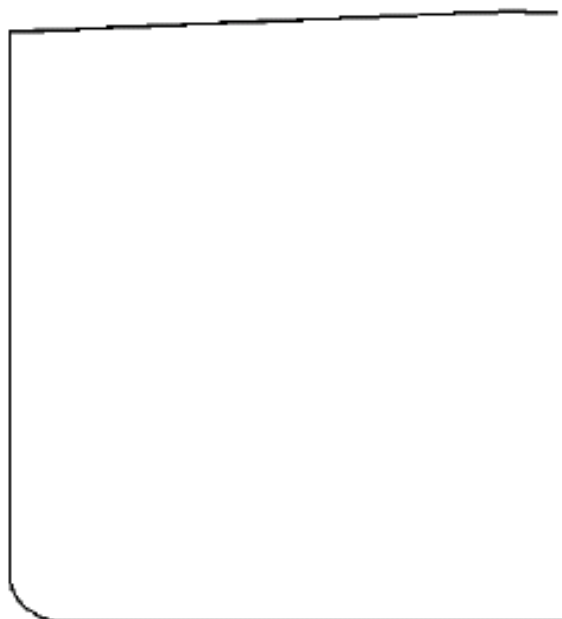
Report on TM2-DHT(CSR) (i) & (ii)	
0.	Strength deck plating
1.	Stringer plate
2.	Sheerstrake
3.	Side shell plating
4.	Bilge plating
5.	Bottom shell plating
6.	Keel plate

Report on TM3-DHT(CSR)			
10.	Deck longitudinals	20.	Longitudinal bulkhead plating (remainder)
11.	Sheerstrake longitudinals	21.	Longitudinal bulkhead longitudinals
12.	Side shell longitudinals	22.	Inner side plating
13.	Bilge longitudinals	23.	Inner side longitudinal
14.	Bottom longitudinals	24.	Hopper plating
15.	Deck girders	25.	Hopper longitudinal
16.	Horizontal girders in wing ballast tanks	26.	Inner bottom plating
17.	Bottom girders	27.	Inner bottom longitudinals
18.	Longitudinal bulkhead top strake	28.	Topside tank plating
19.	Longitudinal bulkhead bottom strake	29.	Topside tank longitudinals

Report on TM4-DHT(CSR)	
30.	Deck transverse - centre tank
31.	Deck transverse - wing tank
32.	Vertical web in wing ballast tank
33.	Double bottom floor - wing tank
34.	Double bottom floor - centre tank
35.	Longitudinal bulkhead vertical web
36.	Cross ties

Transverse section outline

The diagram may be used for those ships where the diagrams on sheet 11 and 12 are not suitable



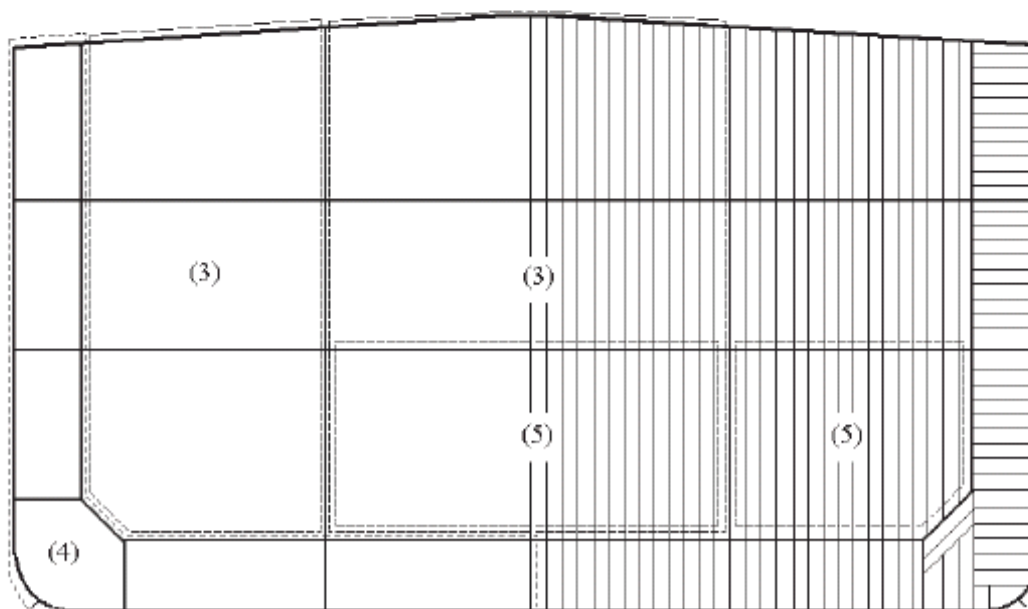
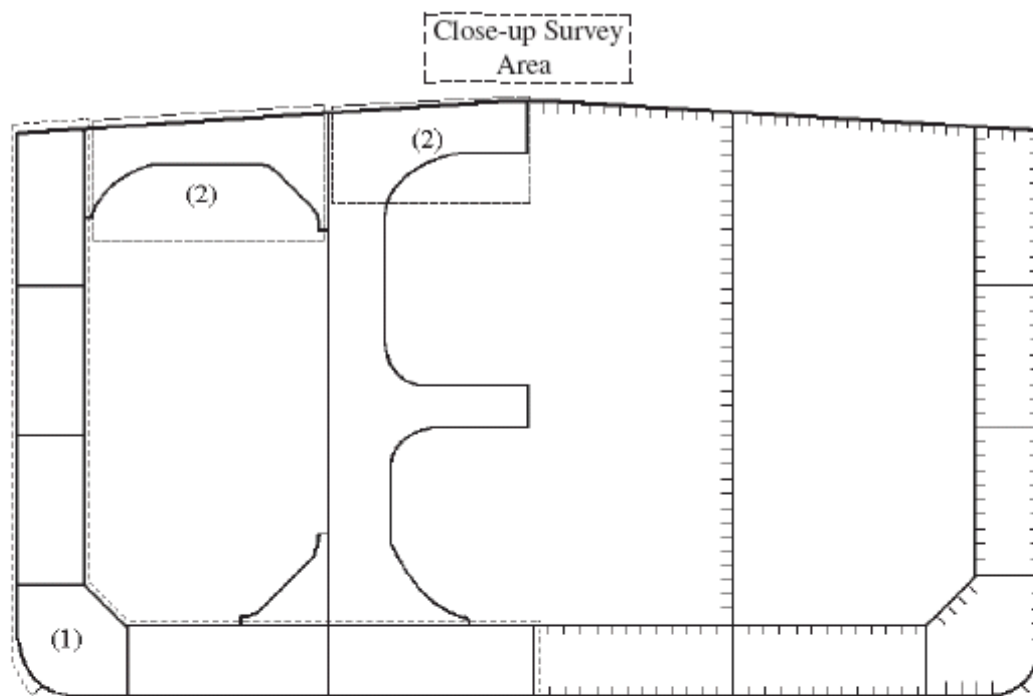
Report on TM2-DHT(CSR) (i) & (ii)	
0.	Strength deck plating
1.	Stringer plate
2.	Sheerstrake
3.	Side shell plating
4.	Bilge plating
5.	Bottom shell plating
6.	Keel plate

Report on TM3-DHT(CSR)			
10.	Deck longitudinals	20.	Longitudinal bulkhead plating (remainder)
11.	Sheerstrake longitudinals	21.	Longitudinal bulkhead longitudinals
12.	Side shell longitudinals	22.	Inner side plating
13.	Bilge longitudinals	23.	Inner side longitudinal
14.	Bottom longitudinals	24.	Hopper plating
15.	Deck girders	25.	Hopper longitudinal
16.	Horizontal girders in wing ballast tanks	26.	Inner bottom plating
17.	Bottom girders	27.	Inner bottom longitudinals
18.	Longitudinal bulkhead top strake	28.	Topside tank plating
19.	Longitudinal bulkhead bottom strake	29.	Topside tank longitudinals

Report on TM4-DHT(CSR)	
30.	Deck transverse - centre tank
31.	Deck transverse - wing tank
32.	Vertical web in wing ballast tank
33.	Double bottom floor - wing tank
34.	Double bottom floor - centre tank
35.	Longitudinal bulkhead vertical web
36.	Cross ties

Close-up Survey and Thickness Measurement Areas

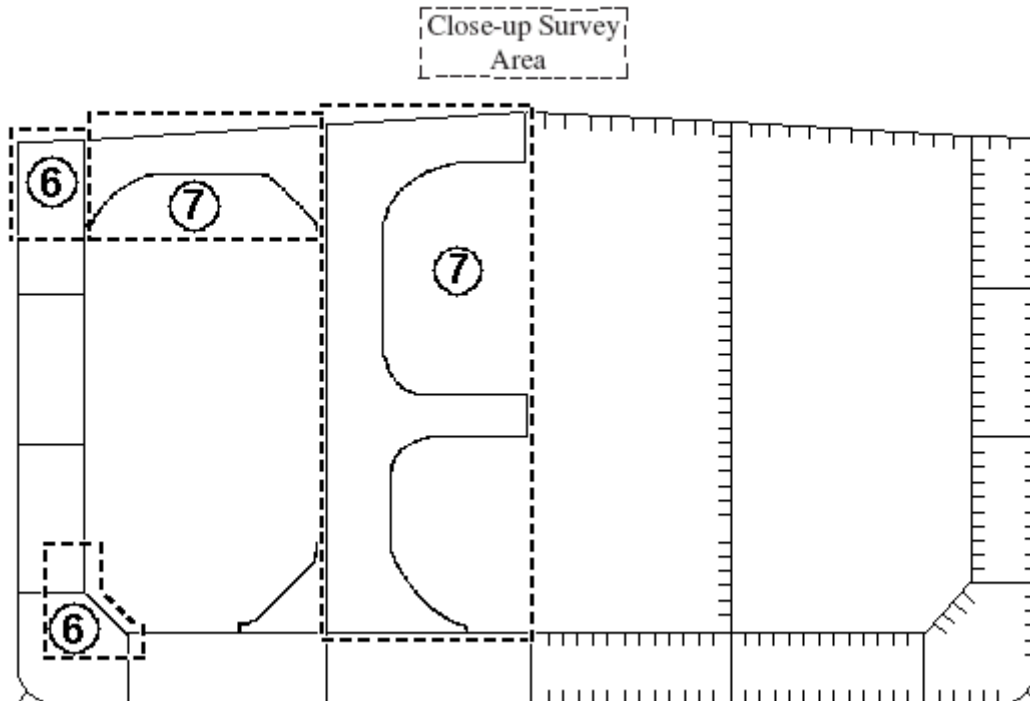
Areas subject to close-up survey and thickness measurements - areas (1) to (5) as defined in Table I of BCS- R Z10.4 - Thickness to be reported on TM3-DHT(CSR), TM4-DHT(CSR) and TM5-DHT(CSR) as appropriate.



Close-up Survey and Thickness Measurement Areas

Sheet 15

Areas subject to close-up survey and thickness measurements - areas (6) to (7) as defined in Table I of BCS- R Z10.4 - Thickness to be reported on TM3-DHT(CSR), TM4-DHT(CSR) as appropriate.



ANNEX III

CRITERIA FOR LONGITUDINAL STRENGTH OF HULL GIRDER FOR OIL TANKERS

ANNEX III

CRITERIA FOR LONGITUDINAL STRENGTH OF HULL GIRDER FOR OIL TANKERS

1 General

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

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

2 Evaluation of longitudinal strength

On oil tankers of 130 m in length and upwards and of over 10 years of age, the longitudinal strength of the ship's hull girder is to be evaluated in compliance with the requirements of this annex on the basis of the thickness measured, renewed or reinforced, as appropriate, during the special survey.

The condition of the hull girder for longitudinal strength evaluation should be determined in accordance with the methods specified in appendix 3.

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

2.1.1 The transverse sectional areas of deck flange (deck plating and deck longitudinals) and bottom flange (bottom shell plating and bottom longitudinals) of the ship's hull girder is to be calculated by using the thickness measured, renewed or reinforced, as appropriate, during the special survey.

2.1.2 If the diminution of sectional areas of either deck or bottom flange exceeds 10% of their respective as-built area (i.e. original sectional area when the ship was built), either one of the following measures is to be taken:

- .1 to renew or reinforce the deck or bottom flanges so that the actual sectional area is not less than 90% of the as-built area; or
- .2 to calculate the actual section moduli (Z_{act}) of transverse section of the ship's hull girder by applying the calculation method specified in appendix 1, by using the thickness measured, renewed or reinforced, as appropriate, during the special survey.

2.2 Requirements for transverse section modulus of hull girder

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

- .1 for ships constructed on or after 1 July 2002, the actual section moduli (Z_{act}) of the transverse section of the ship's hull girder calculated in accordance with the requirements of the foregoing paragraph 2.1.2.2 should be not less than the diminution limits determined by BCS*; or

-
- .2 for ships constructed before 1 July 2002, the actual section moduli (Z_{act}) of the transverse section of the ship's hull girder calculated in accordance with the requirements of the foregoing paragraph 2.1.2.2 is to meet the criteria for minimum section modulus for ships in service required by BCS, provided that in no case Z_{act} is to be less than the diminution limit of the minimum section modulus (Z_{mc}) as specified in appendix 2.

-
- * The actual transverse section modulus of the hull girder of oil tankers calculated under paragraph 2.2.1.1 of Annex III to BCS- R Z10.4 is not to be less than 90% of the required section modulus for new buildings specified in BCS- R S7* or S11, whichever is the greater.

* $C = 1.0 c_n$ is to be used for the purpose of this calculation.

APPENDIX 1

CALCULATION CRITERIA OF SECTION MODULI OF MIDSHIP SECTION OF HULL GIRDER

- 1 When calculating the transverse section modulus of the ship's hull girder, the sectional area of all continuous longitudinal strength members is to be taken into account.
- 2 Large openings, i.e. openings exceeding 2.5m in length or 1.2m in breadth and scallops, where scallop welding is applied, are always to be deducted from the sectional areas used in the section modulus calculation.
- 3 Smaller openings (manholes, lightening holes, single scallops in way of seams, etc.) need not be deducted provided that the sum of their breadths or shadow area breadths in one transverse section does not reduce the section modulus at deck or bottom by more than 3% and provided that the height of lightening holes, draining holes and single scallops in longitudinals or longitudinal girders does not exceed 25% of the web depth, for scallops maximum 75mm.
- 4 A deduction-free sum of smaller opening breadths in one transverse section in the bottom or deck area of $0.06(B - \sum b)$ (where B = breadth of ship, $\sum b$ = total breadth of large openings) may be considered equivalent to the above reduction in sectional modulus.
- 5 The shadow area will be obtained by drawing two tangent lines with an opening angle of 30° .
- 6 The deck modulus is related to the moulded deck line at side.
- 7 The bottom modulus is related to the base line.
- 8 Continuous trunks and longitudinal hatch coamings are to be included in the longitudinal sectional area provided they are effectively supported by longitudinal bulkheads or deep girders. The deck modulus is then to be calculated by dividing the moment of inertia by the following distance, provided this is greater than the distance to the deck line at side:

$$y_t = y \left(0.9 + 0.2 \frac{x}{B} \right)$$

where:

- y = distance from neutral axis to top of continuous strength member,
 x = distance from top of continuous strength member to centreline of the ship.
 x and y to be measured to the point giving the largest value of y_t .

- 9 Longitudinal girders between multi-hatchways will be considered by special calculations.

APPENDIX 2

DIMINUTION LIMIT OF MINIMUM LONGITUDINAL STRENGTH OF SHIPS IN SERVICE

1 The diminution limit of the minimum section modulus (Z_{mc}) of oil tankers in service is given by the following formula:

$$Z_{mc} = cL^2B (C_b + 0.7)k \quad (\text{cm}^3)$$

where

L = Length of ships. L is the distance, in metres, on the summer load waterline from the fore side of stem to the after side of the rudder post, or the centre of the rudder stock if there is no rudder post. L is not to be less than 96%, and need not be greater than 97%, of the extreme length on the summer load waterline. In ships with unusual stern and bow arrangement the length L may be specially considered.

B = Greatest moulded breadth in metres.

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

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

$$c = 0.9 c_n$$

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

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

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

k = material factor, e.g.

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

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

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

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

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

APPENDIX 3

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

1 Extent of longitudinal strength evaluation

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

2 Sampling method of thickness measurement

2.1 Pursuant to the requirements of section 2.4 of BCS- R Z10.4, transverse sections should be chosen such that thickness measurements can be taken for as many different tanks in corrosive environments as possible, e.g. ballast tanks sharing a common plane boundary with cargo tanks fitted with heating coils, other ballast tanks, cargo tanks permitted to be filled with sea water and other cargo tanks. Ballast tanks sharing a common plane boundary with cargo tanks fitted with heating coils and cargo tanks permitted to be filled with sea water should be selected where present.

2.2 The minimum number of transverse sections to be sampled should be in accordance with Table II of BCS- R Z10.4. The transverse sections should be located where the largest thickness reductions are suspected to occur or are revealed from deck and bottom plating measurements prescribed in 2.3 and should be clear of areas which have been locally renewed or reinforced.

2.3 At least two points should be measured on each deck plate and/or bottom shell plate required to be measured within the cargo area in accordance with the requirements of Table II of BCS- R Z10.4.

2.4 Within 0.1D (where D is the ship's moulded depth) of the deck and bottom at each transverse section to be measured in accordance with the requirements of Table II of BCS- R Z10.4, every longitudinal and girder should be measured on the web and face plate, and every plate should be measured at one point between longitudinals.

2.5 For longitudinal members other than those specified in 2.4 to be measured at each transverse section in accordance with the requirements of Table II of BCS- R Z10.4, every longitudinal and girder should be measured on the web and face plate, and every plate should be measured at least in one point per strake.

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

3 Additional measurements where the longitudinal strength is deficient

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

3.2 Additional thickness measurements should also be performed on one transverse section forward and one aft of each repaired area to the extent necessary to ensure that the areas bordering the repaired section also comply with the requirements of BCS- R Z10 .4.

4 Effective repair methods

4.1 The extent of renewal or reinforcement carried out to comply with this annex should be in accordance with 4.2.

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

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

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

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

ANNEX IV

ANNEX IVA

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:

Classification Society:

Class ID:

Date of build of the ship:

Owner:

Thickness measurement firm:

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 area, cargo tanks, ballast tanks, including fore and aft peak tanks, required by BCS- R Z10.4.

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

1.2 Documentation

All documents used in the development of the survey programme are to be available onboard during the survey as required by section 6.

2 Arrangement of tanks and spaces

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

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

This section of the survey programme is to indicate any changes relating to (and is to update) the information on the use of the 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 is to 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 is to indicate any changes relating to (and is to 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 is to 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 is to identify and list the spaces that are to undergo an overall survey for the ship in accordance with 2.3.1.

7.2 Close-up survey

This section of the survey programme is to identify and list the hull structures that are to undergo a close-up survey for the ship in accordance with 2.3.2.

8 Identification of tanks for tank testing

This section of the survey programme is to identify and list the tanks that are to undergo tank testing for the ship in accordance with 2.5.

9 Identification of areas and sections for thickness measurements

This section of the survey programme is to identify and list the areas and sections where thickness measurements are to be taken in accordance with 2.4.1.

10 Minimum thickness of hull structures

This section of the survey programme is to specify the minimum thickness for hull structures of this ship that are subject to BCS- R Z10.4 (indicate either (a) or preferably (b)), if such information is available):

- (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			
Bottom			
Plating			
Longitudinals			
Longitudinal girders			
Ship side			
Plating			
Longitudinals			
Longitudinal girders			
Longitudinal bulkhead			
Plating			
Longitudinals			
Longitudinal girders			
Inner bottom			
Plating			
Longitudinals			
Longitudinal girders			
Transverse bulkheads			
Plating			
Stiffeners			

Transverse web frames, floors and stringers			
Plating			
Flanges			
Stiffeners			
Cross ties			
Flanges			
Webs			

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

For vessels built under BCS Common Structural Rules, the renewal thickness of the hull structure elements is indicated in the appropriate drawings.

11 Thickness measurement firm

This section of the survey programme is to identify changes, if any, relating to the information on the thickness measurement firm provided in the Survey Planning Questionnaire.

12 Damage experience related to the ship

This section of the survey programme is to, using the tables provided below, provide details of the hull damages for at least the last three years in way of the cargo and ballast tanks and void spaces within the cargo area. These damages are subject to survey.

Hull damages sorted by location for the ship

Tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

**Hull damages for sister or similar ships (if available) in the case of
design related damage**

Tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

13 Areas identified with substantial corrosion from previous surveys

This section of the survey programme is to identify and list the areas of substantial corrosion from previous surveys.

14 Critical structural areas and suspect areas

This section of the survey programme is to identify and list the critical structural areas and the suspect areas, if such information is available.

15 Other relevant comments and information

This section of the survey programme is to provide any other comments and information relevant to the survey.

Appendices

Appendix 1 - List of plans

Paragraph 5.1.3.2 requires that main structural plans of cargo and ballast tanks (scantling drawings), including information regarding use of high tensile steel (HTS), to be available. This appendix of the survey programme is to identify and list the main structural plans which form part of the survey programme.

Appendix 2 - Survey Planning Questionnaire

The Survey Planning Questionnaire (annex IVB), which has been submitted by the owner, is to be appended to the survey programme.

Appendix 3 - Other documentation

This part of the survey programme is to identify and list any other documentation that forms part of the Plan.

Prepared by the owner in co-operation with BCS for compliance with 5.1.3.

Date:..... (name and signature of authorized owner's representative)

Date:..... (name and signature of authorized representative of the BCS)

ANNEX IVB

SURVEY PLANNING QUESTIONNAIRE

The following information will enable the owner in co-operation with BCS to develop a survey programme complying with the requirements of BCS- R Z10.4. It is essential that the owner provides, when completing the present questionnaire, up-to-date information. The present questionnaire, when completed, is to provide all information and material required by BCS- R Z10.4.

Particulars

Ship's name:
IMO number:
Flag State:
Port of registry:
Owner:
Classification Society:
Class ID:
Gross tonnage:
Deadweight (metric tonnes):
Date of build:

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

The owner is to 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. normally within reach of hand.

Tank No.	Structure	C(Cargo)/ B(Ballast)	Permanent Means of Access	Temporary staging	Rafts	Ladders	Direct access	Other means (please specify)
F.P.	Fore Peak							
A.P.	Aft Peak							
Wing Tanks	Under deck							
	Side shell							
	Bottom transverse							
	Longitudinal							
	Transverse							
Centre Tanks	Underdeck							
	Bottom transverse							
	Transverse							

History of cargo with H₂S content or heated cargo for the last 3 years together with indication as to whether cargo was heated and, where available, Marine Safety Data Sheets (MSDS)*

* Refer to resolution MSC. 150(77) on Recommendation for material safety data sheets for MARPOL Annex I cargoes and marine fuel oils.

Owner's inspections

Using a format similar to that of the table below (which is given as an example), the owner is to provide details of the results of their inspections for the last 3 years on all cargo and ballast tanks and void spaces within the cargo area, including peak tanks.

Tank No.	Corrosion protection (1)	Coating extent (2)	Coating condition (3)	Structural deterioration (4)	Tank damage history (5)
Cargo centre tanks					
Cargo wing tanks					
Slop					

Tank No.	Corrosion protection (1)	Coating extent (2)	Coating condition (3)	Structural deterioration (4)	Tank damage history (5)
Ballast tanks					
Aft peak					
Fore peak					
Miscellaneous spaces					

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

- 1) HC=hard coating; SC=soft coating;
SH=semi-hard coating; 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 3 years)
- 4) N=no findings recorded; Y=findings recorded,
description of findings is to be attached to the questionnaire
- 5) DR=damage & repair; L=leakages;
CV=conversion
(description is 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:

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

Name and address of the approved thickness measurement firm:

[illegible]

ANNEX IVC
OWNER'S INSPECTION REPORT
Structural condition

Ship's name:

For tank No:

Grade of steel: deck: side:
 bottom: longitudinal bulkhead:

Elements	Cracks	Buckles	Corrosion	Coating condition	Pitting	Modification/repair	Other
Deck							
Bottom							
Side							
Longitudinal bulkhead							
Transverse bulkhead							

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:

BCS- R Z10.5 HULL SURVEYS OF DOUBLE SKIN BULK CARRIERS

1. General

- 1.1 Application
- 1.2 Definitions
- 1.3 Repairs
- 1.4 Thickness Measurements And Close-Up Surveys

2. Special Survey

- 2.1 Schedule
- 2.2 Scope
- 2.3 Extent Of Overall And Close-Up Surveys
- 2.4 Extent Of Thickness Measurements
- 2.5 Extent Of Tank Testing
- 2.6 Additional Special Survey Requirements After Determining Compliance With SOLAS XII/12 And XII/13

3. Annual Survey

- 3.1 Schedule
- 3.2 Scope
- 3.3 Additional Annual Survey Requirements After Determining Compliance With SOLAS XII/12 And XII/13

4. Intermediate Survey

- 4.1 Schedule
- 4.2 Scope

5. Preparation For Survey

- 5.1 Survey Programme
- 5.2 Conditions For Survey
- 5.3 Access To Structures
- 5.4 Equipment For Survey
- 5.5 Rescue and emergency response equipment
- 5.6 Survey At Sea Or At Anchorage
- 5.7 Survey Planning Meeting

6. Documentation On Board

- 6.1 General
- 6.2 Survey Report File
- 6.3 Supporting Documents
- 6.4 Review Of Documentation On Board

7. Procedures For Thickness Measurement

- 7.1 General
- 7.2 Certification Of Thickness Measurement Firm
- 7.3 Number and Locations of Measurements
- 7.4 Reporting

8. Acceptance Criteria

8.1 General

8.2 Acceptance criteria for pitting corrosion of CSR ships

8.3 Acceptance criteria for edge corrosion of CSR ships

8.4 Acceptance criteria for grooving corrosion of CSR ships

9. Reporting and Evaluation of Survey

9.1 Evaluation of Survey Report

9.2 Reporting

ENCLOSURES

Table I:	Minimum Requirements For Close-Up Survey At Special Hull Survey
Table II:	Minimum Requirements For Thickness Measurements At Special Hull Survey Of Double Skin Bulk Carriers
Table III:	Requirements For Extent Of Thickness Measurements At Those Areas Of Substantial Corrosion Of Double Skin Bulk Carriers Within The Cargo Length Area
Table IV:	Minimum Requirements Of Overall And Close-Up Survey And Thickness Measurements At Intermediate Survey Of Double Skin Bulk Carriers
Table V:	Procedures For Certification Of Firms Engaged In Thickness Measurement Of Hull Structures
Table VI:	Survey Reporting Principles
Table VII:	Executive Hull Summary
Annex I:	Guidelines For Technical Assessment In Conjunction With Planning For Enhanced Surveys Of Double Skin Bulk Carriers - Special Survey - Hull
Annex II:	Recommended Procedures For Thickness Measurements Of Double Skin Bulk Carriers Recommended Procedures For Thickness Measurements Of Double Skin Bulk Carriers Built Under BCS Common Structural Rules
Annex IIIA:	Survey Programme Appendix 1 List of Plans Appendix 2 Survey Planning Questionnaire Appendix 3 Other documentation
Annex IIIB:	Survey Planning Questionnaire

Note:

1. This requirement is applied for surveys commenced onnn or after 1 July 2020.

1. GENERAL

1.1 Application

1.1.1 The requirements apply to all self-propelled Double Skin Bulk Carriers.

1.1.2 For bulk carriers with hybrid cargo hold arrangements, e.g. with some cargo holds of single side skin and others of double side skin, the requirements of BCS- R Z10.2 are to apply to cargo holds of single side skin.

1.1.3 The requirements apply to surveys of hull structure and piping systems in way of cargo holds, cofferdams, pipe tunnels, void spaces, fuel oil tanks within the cargo length area and all ballast tanks. The requirements are additional to the classification requirements applicable to the remainder of the ship. Refer to BCS- R Z7.

1.1.4 The requirements contain the minimum extent of examination, thickness measurements and tank testing. The survey is to be extended when Substantial Corrosion and/or structural defects are found and include additional close-up survey when necessary.

1.2 Definitions

1.2.1 Double Skin Bulk Carrier

A Double Skin Bulk Carrier is a ship which is constructed generally with single deck, double bottom, top-side tanks and hopper side tanks in cargo spaces, and is intended primarily to carry dry cargo in bulk, including such types as ore carriers and combination carriers¹⁾, in which all cargo holds are bounded by a double-side skin (regardless of the width of the wing space). Ore and combination carriers are not covered by TLCommon Structural Rules.

1.2.2 Ballast Tank

A Ballast Tank is a tank which is used solely for salt water ballast, or, where applicable, a space which is used for both cargo and salt water ballast will be treated as a Ballast tank when substantial corrosion has been found in that space. A Double Side Tank is to be considered as a separate tank even if it is in connection to either the topside tank or the hopper side tank.

1.2.3 Spaces

Spaces are separate compartments including holds, tanks, cofferdams and void spaces bounding cargo holds, decks and the outer hull.

1.2.4 Overall Survey

An 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

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

1) For combination carriers with longitudinal bulkheads additional requirements are specified in BCS- R Z10.1 or R Z10.4, as applicable.

1.2.6 Transverse Section

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

1.2.7 Representative Space

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 is to be taken of the service and repair history onboard and identifiable Critical Structural Areas and/or Suspect Areas.

NOTE: Critical Structural Areas are defined in Annex I.

1.2.8 Suspect Area

Suspect Areas are locations showing Substantial Corrosion and/or are considered by the surveyor to be prone to rapid wastage.

1.2.9 Critical Structural Area

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

1.2.10 Renewal Thickness

Renewal thickness (t_{ren}) is the minimum allowable thickness, in mm, below which renewal of structural members is to be carried out.

1.2.11 Substantial Corrosion

Substantial Corrosion is an extent of corrosion such that assessment of corrosion pattern indicates a wastage in excess of 75% of allowable margins, but within acceptable limits. For vessels built under BCS Common Structural Rules, substantial corrosion is an extent of corrosion such that the assessment of the corrosion pattern indicates a measured thickness between $t_{ren} + 0.5\text{mm}$ and t_{ren} .

1.2.12 Corrosion Prevention System

A Corrosion Prevention System is normally considered a full hard protective coating.

Hard Protective Coating is usually to be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specifications.

1.2.13 Coating Condition

Coating condition is defined as follows:

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

1.2.14 Cargo Length Area

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

1.2.15 Special Consideration

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

1.2.16 Prompt and Thorough Repair

A Prompt and Thorough Repair is a permanent repair completed at the time of survey to the satisfaction of the Surveyor, therein removing the need for the imposition of any associated condition of classification.

1.2.17 Pitting Corrosion

Pitting corrosion is defined as scattered corrosion spots/areas with local material reductions which are greater than the general corrosion in the surrounding area. Pitting intensity is defined in Figure 1.

1.2.18 Edge Corrosion

Edge corrosion is defined as local corrosion at the free edges of plates, stiffeners, primary support members and around openings. An example of edge corrosion is shown in Figure 2.

1.2.19 Grooving Corrosion

Grooving corrosion is typically local material loss adjacent to weld joints along abutting stiffeners and at stiffener or plate butts or seams. An example of groove corrosion is shown in Figure 3.

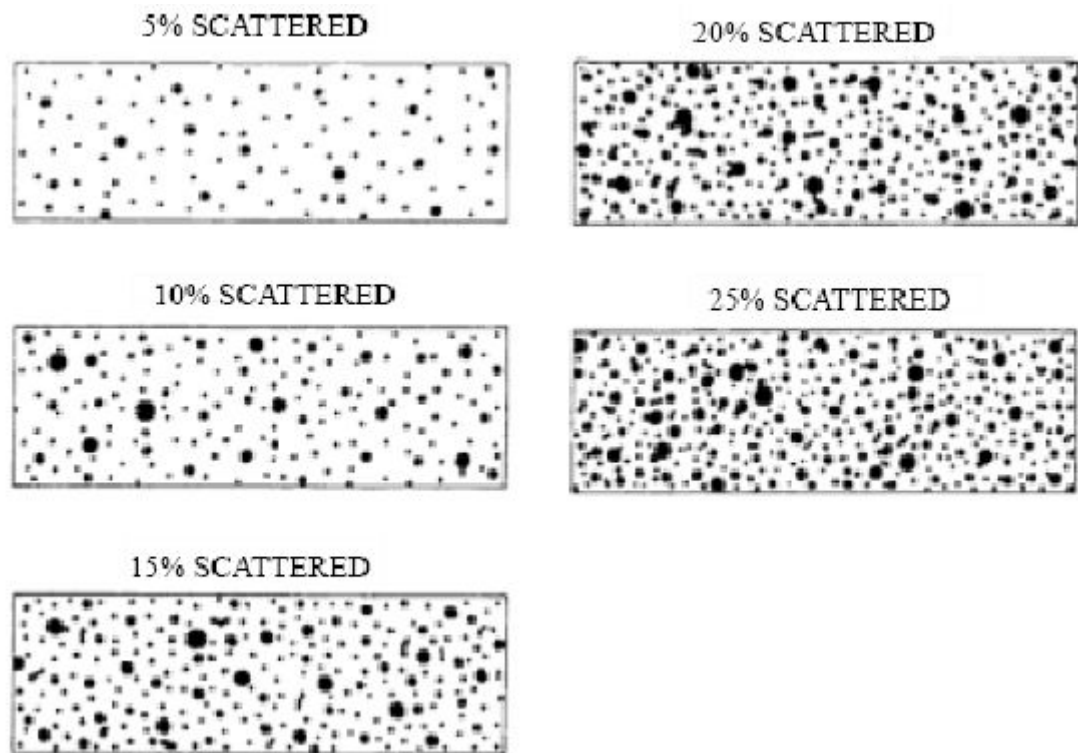


Figure 1 - Pitting intensity diagrams

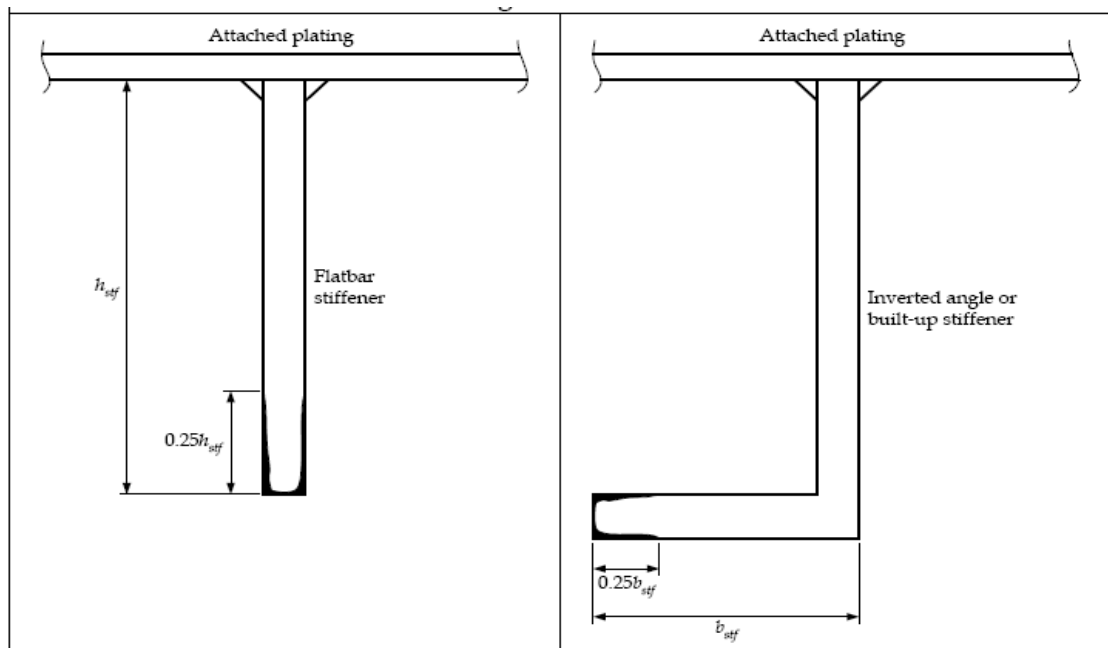


Figure 2 - Edge corrosion

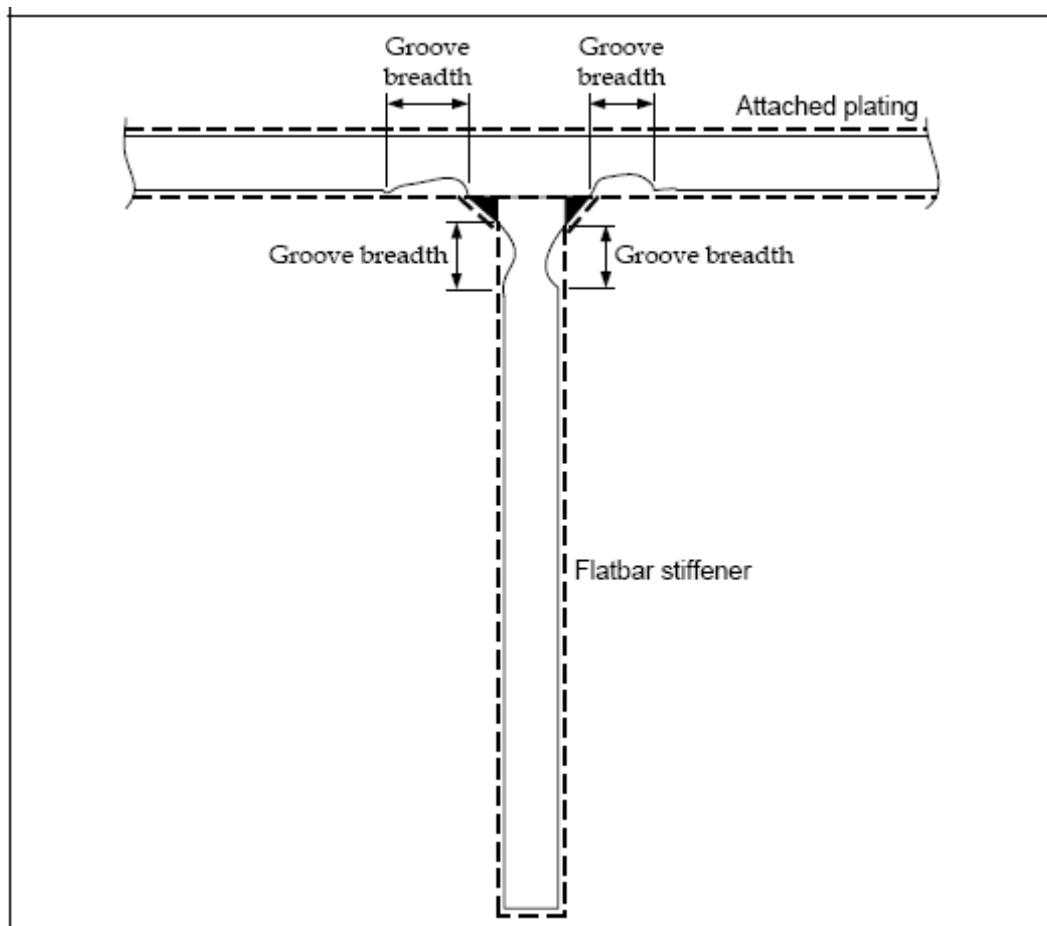


Figure 3 - Grooving corrosion

1.3 Repairs

1.3.1 Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Surveyor, will affect the vessel's structural, watertight or weathertight integrity, is to be promptly and thoroughly (see 1.2.15) repaired.

Areas to be considered include:

- bottom structure and bottom plating
- side structure and side plating
- deck structure and deck plating
- inner bottom structure and inner bottom plating
- inner side structure and inner side plating
- watertight or oiltight bulkheads
- hatch covers and hatch coamings
- items in 3.2.3.10.

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

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

1.3.3 Where the damage found on structure mentioned in Para. 1.3.1 is isolated and of a localised nature which does not affect the ship's structural integrity, consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weather tight integrity and impose a condition of class in accordance with BCS- PR 35, with a specific time limit.

1.4 Thickness measurements and close-up surveys

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

2. SPECIAL SURVEY

2.1 Schedule

2.1.1 Special Surveys are to be carried out at 5 years intervals to renew the Classification Certificate.

2.1.2 The first Special Survey is to be completed within 5 years from the date of the initial classification survey and thereafter within 5 years from the credited date of the previous Special Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances.

In this case, the next period of class will start from the expiry date of the Special Survey before the extension was granted.

2.1.3 For surveys completed within 3 months before the expiry date of the Special Survey, the next period of class will start from the expiry date of the Special Survey. For surveys completed more than 3 months before the expiry date of the Special Survey, the period of class will start from the survey completion date. In cases where the vessel has been laid up or has been out of service for a considerable period because of a major repair or modification and the owner elects to only carry out the overdue surveys, the next period of class will start from the expiry date of the special survey. If the owner elects to carry out the next due special survey, the period of class will start from the survey completion date.

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

2.1.5 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

2.2 Scope

2.2.1 General

2.2.1.1 The Special Survey is to include, in addition to the requirements of the annual survey, examination, tests and checks of sufficient extent to ensure that the hull and related piping, as required in 2.2.1.3, is in a satisfactory condition and is fit for its intended purpose for the new period of class of 5 years to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

2.2.1.2 All cargo holds, ballast tanks, including double bottom and double side tanks, pipe tunnels, cofferdams and void spaces bounding cargo holds, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing as required in 2.4 and 2.5, to ensure that the structural integrity remains effective. The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

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

Some Societies use the term "Special Periodical Survey" others use the term "Class Renewal Survey" instead of the term "Special Survey".

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

2.2.2 Dry Dock Survey

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

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

2.2.3 Tank Protection

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

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

2.2.3.2

Where a hard protective coating is provided in cargo holds, as defined by BCS- R Z9 and is found in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.

2.2.4 Hatch Covers and Coamings

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

2.2.4.1 A thorough inspection of the items listed in 3.2.3 is to be carried out, in addition to all hatch covers and coamings.

2.2.4.2 Checking of the satisfactory operation of all mechanically operated hatch covers is to be made, including:

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

2.2.4.3 Checking the effectiveness of sealing arrangements of all hatch covers by hose testing or equivalent.

2.2.4.4 Close-up survey and thickness measurement¹ of the hatch cover and coaming plating and stiffeners is to be carried out as given in Table I and Table II.

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

2.3 Extent of Overall and Close-up Surveys

2.3.1 An overall survey of all tanks and spaces is to be carried out at each Special Survey. Fuel oil tanks in the cargo length area are to be surveyed as follows:

Special Survey No.1 Age ≤ 5	Special Survey No.2 $5 < \text{Age} \leq 10$	Special Survey No.3 $10 < \text{Age} \leq 15$	Special Survey No.4 and Subsequent $15 < \text{Age}$
None	One	Two	Half, minimum two

Notes

1. These requirements apply to tanks of integral (structural) type.
2. If a selection of tanks is accepted to be examined, then different tanks are to be examined at each special survey, on a rotational basis.
3. Peak tanks (all uses) are subject to internal examination at each special survey.
4. At special survey No.3 and subsequent special surveys, one deep tank for fuel oil in the cargo area is to be included, if fitted.

2.3.2 The minimum requirements for close-up surveys at Special Surveys are given in Table I/Sheet 1 for double skin bulk carriers, excluding ore carriers and in Table I/Sheet 2 for ore carriers, respectively.

2.3.3 The Surveyor may extend the close-up survey as deemed necessary taking into account the maintenance of the spaces under survey, the condition of the corrosion prevention system and where spaces have structural arrangements or details which have suffered defects in similar spaces or on similar ships according to available information.

2.3.4 For areas in spaces where hard protective coatings are found to be in a GOOD condition, the extent of close-up surveys according to Table I may be specially considered, refer also to 2.2.3.2.

2.4 Extent of Thickness Measurements

2.4.1 The minimum requirements for thickness measurements at Special Surveys are given in Table II.

2.4.2 Provisions for extended measurements for areas with Substantial Corrosion are given in Table III and as may be additionally specified in the Survey Programme as required by 5.1. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

For vessels built under BCS Common Structural Rules, the identified substantial corrosion areas may be:

a) protected by coating applied in accordance with the coating manufacturer's requirements and examined at annual intervals to confirm the coating in way is still in good condition, or alternatively

b) required to be measured at annual intervals.

2.4.3 The Surveyor may further extend the thickness measurements as deemed necessary.

2.4.4 For areas in tanks where hard protective coatings are found to be in a GOOD condition, the extent of thickness measurements according to Table II may be specially considered. Refer also to 2.2.3.2.

2.4.5 Transverse sections are to be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements, one of which is to be in the amidships area.

2.4.6 Representative thickness measurement to determine both general and local levels of corrosion in the transverse web frames in all water ballast tanks is to be carried out. Thickness measurement is also to be carried out to determine the corrosion levels on the transverse bulkhead plating. The extent of thickness measurements may be specially considered provided the surveyor is satisfied by the close-up survey, that there is no structural diminution, and the hard protective coating where applied remains efficient.

2.5 Extent of Tank Testing

2.5.1 All boundaries of water ballast tanks, deep tanks and cargo holds used for water ballast within the cargo length area are to be pressure tested. For Fuel Oil Tanks, only representative tanks are to be pressure tested.

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

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

2.5.4 Boundaries of ballast holds are to be tested with a head of liquid to near to the top of hatches.

2.5.5 Boundaries of fuel oil tanks are to be tested with a head of liquid to the highest point that liquid will rise under service conditions. Tank testing of fuel oil tanks may be specially considered based on a satisfactory external examination of the tank boundaries, and a confirmation from the Master stating that the pressure testing has been carried out according to the requirements with satisfactory results.

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

2.6 Additional special survey requirements after determining compliance with SOLAS XII/12 and XII/13

2.6.1 For ships complying with the requirements of SOLAS XII/12 for hold, ballast and dry space water level detectors, the special survey is to include an examination and a test of the water ingress detection systems and of their alarms.

2.6.2 For ships complying with the requirements of SOLAS XII/13 for the availability of pumping systems, the special survey is to include an examination and a test of the means for draining and pumping ballast tanks forward of the collision bulkhead and bilges of dry spaces any part of which extends forward of the foremost cargo hold, and of their controls.

3. ANNUAL SURVEY

3.1 Schedule

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

3.2 Scope

3.2.1 General

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

3.2.2 Examination of the hull

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

3.2.2.2 Examination of watertight penetrations as far as practicable.

3.2.3 Examination of weather decks, hatch covers and coamings

3.2.3.1 Confirmation is to be obtained that no unapproved changes have been made to the hatch covers, hatch coamings and their securing and sealing devices since the last survey.

3.2.3.2 A thorough survey of cargo hatch covers and coamings is only possible by examination in the open as well as closed positions and is to include verification of proper opening and closing operation. As a result, the hatch cover sets within the forward 25% of the ship's length and at least one additional set, such that all sets on the ship are assessed at least once in every 5-year period, are to be surveyed open, closed and in operation to the full extent on each direction at each annual survey, including:

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

3.2.3.3 If there are indications of difficulty in operating and securing hatch covers, additional sets above those required by 3.2.3.2, at the discretion of the surveyor, are to be tested in operation.

3.2.3.4 Where the cargo hatch securing system does not function properly, repairs are to be carried out under the supervision of BCS. Where hatch covers or coamings undergo substantial repairs, the strength of securing devices should be upgraded to comply with S21.5 of BCS- R S21.

3.2.3.5 For each cargo hatch cover set, at each annual survey, the following items are to 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 non return 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. guide rails 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.

3.2.3.6 At each hatchway, at each annual survey, the coamings, with plating, stiffeners and brackets are to be checked for corrosion, cracks and deformation, especially of the coaming tops, including close-up survey.

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

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

- wooden covers and portable beams, carriers or sockets for the portable beam, and their securing devices;
- steel pontoons, including close-up survey of hatchcover plating;
- tarpaulins;
- cleats, battens and wedges;
- hatch securing bars and their securing devices;
- loading pads/bars and the side plate edge;
- guide plates and chocks;
- compression bars, drainage channels and drain pipes (if any).

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

3.2.3.10 Examination of bunker and vent piping systems, including ventilators.

3.2.4 Examination of Cargo Holds.

3.2.4.1 Double Skin Bulk Carriers 10-15 years of age. The following is to apply:

- a) Overall survey of two selected cargo holds.
- b) When considered necessary by the Surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with Table III. These extended thickness measurements are to be carried out before the annual survey is credited as complete. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

For vessels built under BCS Common Structural Rules, the annual thickness gauging may be omitted where a protective coating has been applied in accordance with the coating manufacturer's requirements and is maintained in good condition.

- c) All piping and penetrations in cargo holds, including overboard piping, are to be examined.

3.2.4.2 Double Skin Bulk Carriers over 15 years of age. The following is to apply:

- a) Overall survey of all cargo holds.
- b) When considered necessary by the Surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with Table III. These extended thickness measurements are to be carried out before the annual survey is credited as complete. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

For vessels built under BCS Common Structural Rules, the annual thickness gauging may be omitted where a protective coating has been applied in accordance with the coating manufacturer's requirements and is maintained in good condition.

- c) All piping and penetrations in cargo holds, including overboard piping, are to be examined.

3.2.5 Examination of Ballast Tanks

3.2.5.1 Examination of Ballast Tanks when required as a consequence of the results of the Special Survey and Intermediate Survey is to be carried out. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurements are to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with Table III. These extended thickness measurements are to be carried out before the survey is credited as complete.

Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

For vessels built under BCS Common Structural Rules, the annual thickness gauging may be omitted where a protective coating has been applied in accordance with the coating manufacturer's requirements and is maintained in good condition.

3.3 Additional annual survey requirements after determining compliance with SOLAS XII/12 and XII/13

3.3.1 For ships complying with the requirements of SOLAS XII/12 for hold, ballast and dry space water level detectors, the annual survey is to include an examination and a test, at random, of the water ingress detection systems and of their alarms.

3.3.2 For ships complying with the requirements of SOLAS XII/13 for the availability of pumping systems, the annual survey is to include an examination and a test, of the means for draining and pumping ballast tanks forward of the collision bulkhead and bilges of dry spaces any part of which extends forward of the foremost cargo hold, and of their controls.

4. INTERMEDIATE SURVEY

4.1 Schedule

4.1.1 The Intermediate Survey is to be held at or between either the 2nd or 3rd Annual Survey.

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

4.1.3 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

4.2 Scope

4.2.1 General

4.2.1.1 The survey extent is dependent on the age of the vessel as specified in 4.2.2 to 4.2.4 and shown in Table IV.

4.2.2 Double Skin Bulk Carriers 5 - 10 years of age. The following is to apply:

4.2.2.1 Ballast Tanks

- a) For tanks used for water ballast, an overall survey of representative tanks selected by the Surveyor is to be carried out. The selection is to include fore and aft peak tanks and a number of other tanks, taking into account the total number and type of ballast tanks. If such overall survey reveals no visible structural defects, the examination may be limited to verification that the corrosion prevention system remains efficient.
- b) Where POOR coating condition, corrosion or other defects are found in water ballast tanks or where a hard protective coating was not applied from the time of construction, the examination is to be extended to other ballast tanks of the same type.
- c) In ballast tanks other than double bottom tanks, where a hard protective coating is found in POOR condition, and it is not renewed, or where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the tanks in question are to be examined and thickness measurements carried out as considered necessary at annual intervals. When such breakdown of hard protective coating is found in ballast double bottom tanks, or where a soft or semi-hard coating has been applied, or where a hard protective coating has not been applied, the tanks in question may be examined at annual intervals. When considered necessary by the Surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.
- d) In addition to the requirements above, suspect areas identified at previous surveys are to be overall and close-up surveyed.

4.2.2.2 Cargo Holds

- a) An overall survey of all cargo holds is to be carried out.
- b) Where considered necessary by the Surveyor as a result of the overall survey as described in 4.2.2.2a, the survey is to be extended to include a close-up survey of those areas of structure in the cargo holds selected by the Surveyor.

4.2.2.3 Extent of Thickness Measurements

- a) Thickness measurements are to be carried out to an extent sufficient to determine both general and local corrosion levels at areas subject to close-up survey, where required as per 4.2.2.2b), and as provided in 4.2.2.1c).
- b) The extent of thickness measurement may be specially considered provided the Surveyor is satisfied by the close-up survey that there is no structural diminution and the hard protective coatings are found to be in a GOOD condition.
- c) Where Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with the requirements of Table III. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

For vessels built under BCS Common Structural Rules, the identified substantial corrosion areas may be:

- a) protected by coating applied in accordance with the coating manufacturer's requirements and examined at annual intervals to confirm the coating in way is still in good condition, or alternatively
- b) required to be measured at annual intervals.
- d) Where the hard protective coating in cargo holds, as defined by BCS- R Z9 is found to be in GOOD condition , the extent of close -up surveys and thickness measurements may be specially considered.

Explanatory note:

For existing bulk carriers, where owners may elect to coat or recoat cargo holds as noted above, consideration may be given to the extent of the close-up and thickness measurement surveys. Prior to the coating of cargo holds of existing ships, scantlings are to be ascertained in the presence of a surveyor.

4.2.3 Double Skin Bulk Carriers 10 – 15 years of age. The following is to apply:

4.2.3.1 The requirements of the Intermediate Survey are to the same extent as the previous Special Survey as required in 2 and 5.1. However, internal examination of fuel oil tanks and pressure testing of all tanks are not required unless deemed necessary by the attending Surveyor.

4.2.3.2 In application of 4.2.3.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.4.

4.2.3.3 In application of 4.2.3.1, an under water survey may be considered in lieu of the requirement of 2.2.2.

4.2.4 Double Skin Bulk Carriers over 15 years of age. The following is to apply:

4.2.4.1 The requirements of the Intermediate Survey are to be to the same extent as the previous Special Survey as required in 2 and 5.1.

However, internal examination of fuel oil tanks and pressure testing of all tanks are not required unless deemed necessary by the attending Surveyor.

4.2.4.2 In application of 4.2.4.1, the intermediate survey may be commenced at the second Annual Survey and be progressed during the succeeding year with a view to completion at the third Annual Survey in lieu of the application of 2.1.4.

4.2.4.3 In application of 4.2.4.1, a survey in dry dock is to be part of the Intermediate Survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo holds and ballast tanks are to be carried out in accordance with the applicable requirements for Intermediate Surveys, if not already performed.

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

5. PREPARATION FOR SURVEY

5.1 Survey Programme

5.1.1 The Owner in co-operation with BCS is to work out a specific Survey Programme prior to the commencement of any part of:

- the Special Survey
- the Intermediate Survey for double skin bulk carriers over 10 years of age.

The Survey Programme is to be in a written format based on the information in Annex IIIA. The survey is not to commence until the Survey programme has been agreed.

5.1.1.1 Prior to the development of the survey programme, the survey planning questionnaire is to be completed by the owner based on the information set out in Annex IIIB, and forwarded to BCS.

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

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

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

- survey status and basic ship information,
- documentation on-board, as described in 6.2 and 6.3,
- main structural plans (scantlings drawings), including information regarding use of high tensile steels (HTS),
- relevant previous survey and inspection reports from both BCS and the Owner,
- information regarding the use of the ship's holds and tanks, typical cargoes and other relevant data,
- information regarding corrosion prevention level on the new-building,
- 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 Tables I and II and paragraph 2.5 for close-up survey, thickness measurement and tank testing, respectively, and is to include relevant information including at least:

- basic ship information and particulars,
- main structural plans (scantling drawings), including information regarding use of high tensile steels (HTS),

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- plan of holds and tanks,
 - list of holds and tanks with information on use, protection and condition of coating,
 - conditions for survey (e.g., information regarding hold and tank cleaning, gas freeing, ventilation, lighting, etc.),
 - provisions and methods for access to structures,
 - equipment for surveys,
 - nomination of holds and tanks and areas for close-up survey (per 2.3),
 - nominations of sections and areas for thickness measurement (per 2.4),
 - nomination of tanks for tank testing (per 2.5),
 - damage experience related to the ship in question.

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

5.1.5 Use may also be made of the Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Double Skin Bulk Carriers - Special Survey - Hull, contained in Annex I. These guidelines are a recommended tool which may be invoked at the discretion of BCS, 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 is to 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, are to be agreed between the owner and BCS are to be in accordance with BCS- PR 37.

5.2.1.2 Details of the means of access are to 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 surveyor(s) not to be adequate, the survey of the spaces involved is not to proceed.

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

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

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

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

5.3 Access to structures

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

5.3.2 For close-up surveys, one or more of the following means for access, acceptable to the Surveyor, is to be provided:

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

5.4 Equipment for survey

5.4.1 Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required.

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

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

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

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

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

5.5 Rescue and emergency response equipment

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

5.6 Survey at sea or at anchorage

5.6.1 Survey at sea or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel onboard. Necessary precautions and procedures for carrying out the survey are to be in accordance with 5.1, 5.2, 5.3 and 5.4.

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

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

5.6.4 When rafts or boats will be used for close-up survey the following conditions are to be observed:

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

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

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

- .1 when the coating of the under deck structure is in GOOD condition and there is no evidence of wastage; or

.2 if a permanent means of access is provided in each bay to allow safe entry and exit. This means:

- i. access direct from the deck via a vertical ladder and a small platform fitted approximately 2 m below the deck in each bay; or
- ii. access to deck from a longitudinal permanent platform having ladders to deck in each end of the tank. The platform shall, for the full length of the tank, be arranged in level with, or above, the maximum water level needed for rafting of under deck structure. For this purpose, the ullage corresponding to the maximum water level is to be assumed not more than 3m from the deck plate measured at the midspan of deck transverse and in the middle length of the tank.

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

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

Reference is made to BCS- G 39 - Guidelines for the use of Boats or Rafts for Close-up surveys.

5.7 Survey Planning Meeting

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

5.7.2 Prior to commencement of any part of the renewal and intermediate survey, a survey planning meeting is to be held between the attending surveyor(s), the owner's representative in attendance, the TM firm representative, where involved, and the master of the ship or an appropriately qualified representative appointed by the master or Company for the purpose to ascertain that all the arrangements envisaged in the survey programme are in place, so as to ensure the safe and efficient conduct of the survey work to be carried out. See also 7.1.2.

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

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

-
- .9 communication between attending surveyor(s) the thickness measurement
firm operator(s) and owner representative(s) concerning findings.

6. DOCUMENTATION ON BOARD

6.1 General

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

6.1.2 The documentation is to be kept on board for the life time of the ship.

6.1.3 For tankers and bulk carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10, the Owner is to arrange the updating of the Ship Construction File (SCF) throughout the ship's life whenever a modification of the documentation included in the SCF has taken place. Documented procedures for updating the SCF are to be included within the Safety Management System.

6.2 Survey report file

6.2.1 A Survey Report File is to be a part of the documentation on board consisting of

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

6.2.2 The Survey Report File is to be available also in the Owner's and BCS's management offices.

6.3 Supporting documents

6.3.1 The following additional documentation is to be available onboard:

- Survey Programme as required by 5.1 until such time as the Special Survey or Intermediate Survey, as applicable, has been completed,
- Main structural plans of cargo holds and ballast tanks (for CSR ships these plans are to include for each structural element both the as-built and renewal thickness. Any thickness for voluntary addition is also to be clearly indicated on the plans. The midship section plan to be supplied on board the ship is to include the minimum allowable hull girder sectional properties for hold transverse section in all cargo holds),
- Previous repair history,
- Cargo and ballast history,
- Inspection by ship's personnel with reference to
 - structural deterioration in general,
 - leakage in bulkheads and piping,
 - condition of corrosion prevention system, if any.
- Any other information that will help identify critical structural areas and/or Suspect Areas requiring inspection.

6.3.2 For tankers and bulk carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10, the Ship Construction File (SCF), limited to the items to be retained on board, is to be available on board.

6.4 Review of documentation on board

6.4.1 Prior to survey, the Surveyor is to examine the completeness of the documentation onboard, and its contents as a basis for the survey.

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

6.4.2.1 For the SCF stored on board ship, the surveyor is to examine the information on board ship.

In cases where any major event, including, but not limited to, substantial repair and conversion, or any modification to the ship structures, the surveyor is to also verify that the updated information is kept on board the ship.

If the updating of the SCF onboard is not completed at the time of survey, the Surveyor records it and requires confirmation at the next periodical survey.

6.4.2.2 For the SCF stored on shore archive, the surveyor is to examine the list of information included on shore archive.

In cases where any major event, including, but not limited to, substantial repair and conversion, or any modification to the ship structures, the surveyor is to also verify that the updated information is stored on shore archive by examining the list of information included on shore archive or kept on board the ship.

In addition, the surveyor is to confirm that the service contract with of the Archive Center is valid.

If the updating of the SCF Supplement ashore is not completed at the time of survey, the Surveyor records it and requires confirmation at the next periodical survey.

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

7. PROCEDURES FOR THICKNESS MEASUREMENT

7.1 General

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

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

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

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

7.2 Certification of thickness measurement firm

7.2.1 The thickness measurement is to be carried out by a qualified firm certified by BCS according to principles stated in Table V.

7.3 Number and locations of measurements

7.3.1 Application

The item 7.3 only applies to vessels built under BCS Common Structural Rules¹. For vessels not built under BCS Common Structural Rules, the requirements for number and locations of measurements are according to the Rules of BCS and/or specific BCS- Rs depending on ship's age and structural elements concerned.

7.3.2 Number of measurements

Considering the extent of thickness measurements according to the different structural elements of the ship and surveys (special, intermediate and annual), the locations of the points to be measured are given for the most important items of the structure.

7.3.3 Locations of measurements

Table 1 provides explanations and/or interpretations for the application of those requirements indicated in the Rules, which refer to both systematic thickness measurements related to the calculation of global hull girder strength and specific measurements connected to close-up surveys.

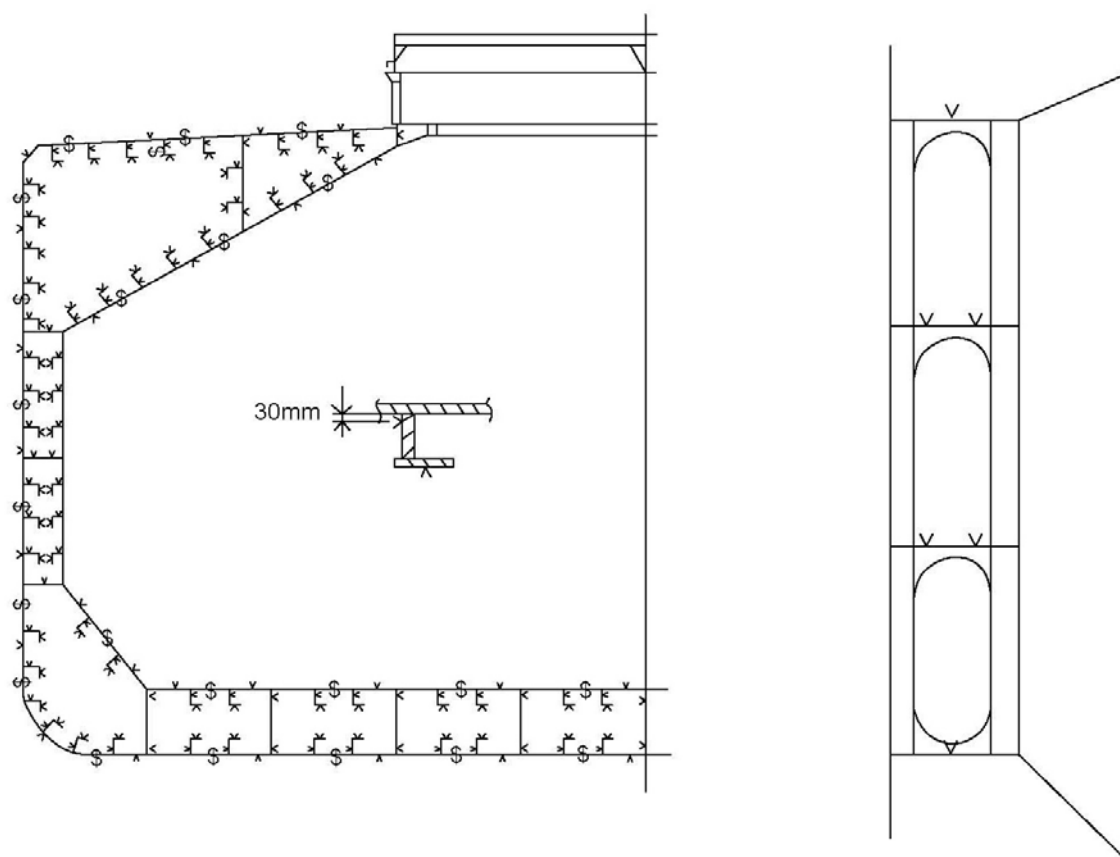
Fig 4 to Fig 9 are provided to facilitate the explanations and/or interpretations given in Table 1, to show typical arrangements of double side skin bulk carriers.

¹ BCS Common Structural Rules mean BCS Common Structural Rules for Bulk Carriers (BCS CSR for Bulk Carriers) or BCS Common Structural Rules for Bulk Carriers and Oil Tankers (BCS CSR BC&OT).

Table 1: Interpretations of rule requirements for the locations and number of points to be measured for CSR bulk carriers (double skin)

Item	Interpretation	Figure reference
Selected plates on deck, tank top, bottom, double bottom and wind-and-water area	«Selected» means at least a single point on one out of three plates, to be chosen on representative areas of average corrosion	
All deck, tank top and bottom plates and wind-and-water strakes	At least two points on each plate to be taken either at each 1/4 extremity of plate or at representative areas of average corrosion	
Transverse section	A transverse section includes all longitudinal members such as plating, longitudinals and girders at the deck, sides, bottom, inner bottom, hopper sides, inner sides and top wing inner sides.	Fig 4
All cargo hold hatch covers and coamings	Including plates and stiffeners	Locations of points are given in Fig 5
Transverse section of deck plating outside line of cargo hatch openings	Two single points on each deck plate (to be taken either at each 1/4 extremity of plate or at representative areas of average corrosion) between the ship sides and hatch coamings in the transverse section concerned	
All deck plating and underdeck structure inside line of hatch openings between cargo hold hatches	<p>«All deck plating» means at least two points on each plate to be taken either at each 1/4 extremity of plate or at representative areas of average corrosion.</p> <p>“Under deck structure”: at each short longitudinal girder: three points for web plating (fwd/middle/aft), single point for face plate, one point for web plating and one point for face plating of transverse beam in way. At each ends of transverse beams, one point for web plating and one point for face plating</p>	<p>Extent of areas is shown in Fig 10</p> <p>Locations of points are given in Fig 9</p>

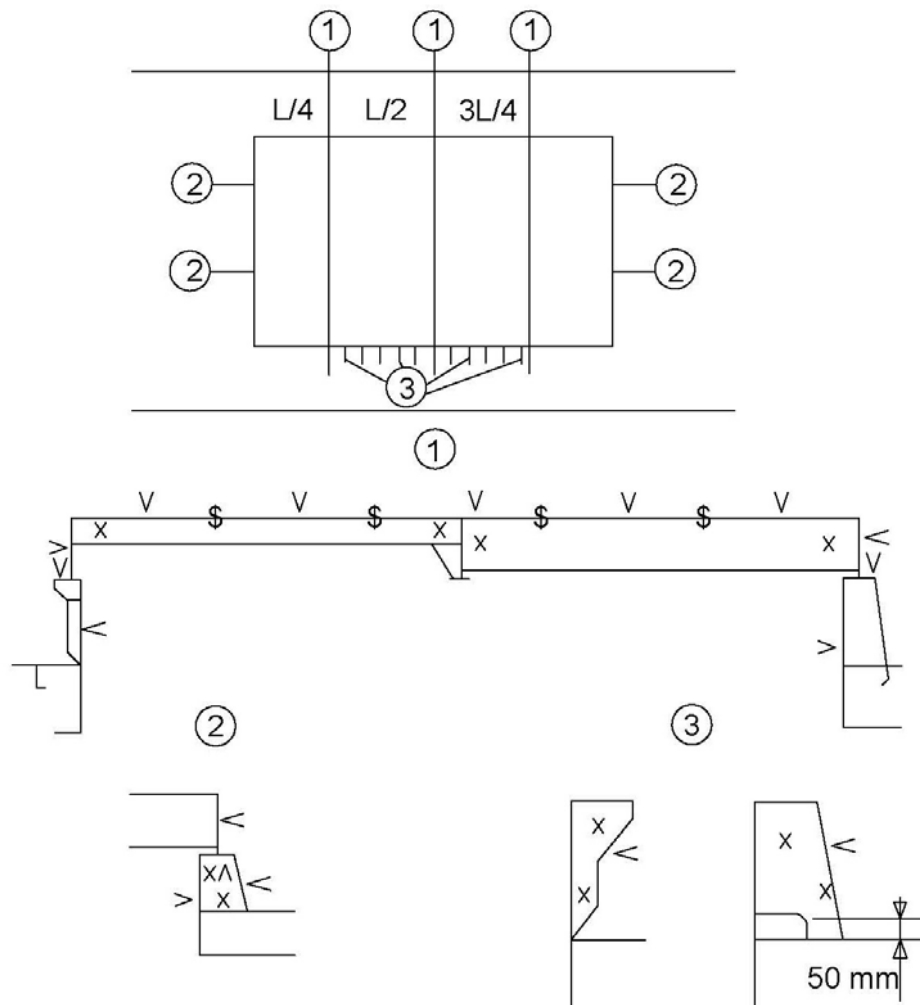
Item	Interpretation	Figure reference
Transverse frame in double skin tank		Fig 4
Transverse bulkheads in cargo holds	Includes bulkhead plating, stiffeners and girders, including internal structure of upper and lower stools, where fitted. Two selected bulkheads: one is to be the bulkhead between the two foremost cargo holds and the second may be chosen in other positions	Areas of measurements are shown in Fig 10 Locations of points are given in Fig 7
One transverse bulkhead in each cargo hold	This means that the close-up survey and related thickness measurements are to be performed on one side of the bulkhead; the side is to be chosen based on the outcome of the overall survey of both sides. In the event of doubt, the Surveyor may also require (possibly partial) close-up survey on the other side	Areas of measurements are shown in Fig 10 Locations of points are given in Fig 7
Transverse bulkheads in one topside, hopper and double bottom ballast tank	Includes bulkhead and stiffening systems. The ballast tank is to be chosen based on the history of ballasting among those prone to have the most severe conditions	Locations of points are given in Fig 8
Transverse webs in ballast tanks	Includes web plating, face plates, stiffeners and associated plating and longitudinals. One of the representative tanks of each type (i.e. topside or hopper or side tank) is to be chosen in the forward part	Areas of measurements are shown in Fig 10 Locations of points are given in Fig 6



Double Skin Bulk Carrier

Note: Measurements are to be taken on both port and starboard sides of the selected transverse section.

Figure 4 - Transverse section of a double skin bulk carrier



Notes:

1. Three sections at $L/4$, $L/2$, $3L/4$ of hatch cover length, including:
 - one measurement of each hatch cover plate and skirt plate
 - measurements of adjacent beams and stiffeners
 - one measurement of coaming plates and coaming flange, each side
2. Measurements of both ends of hatch cover skirt plate, coaming plate and coaming flange
3. One measurement (two points for web plate and one point for face plate) of one out of three hatch coaming brackets and bars, on both sides and both ends

Figure 5 - Locations of measurements on hatch covers and coamings

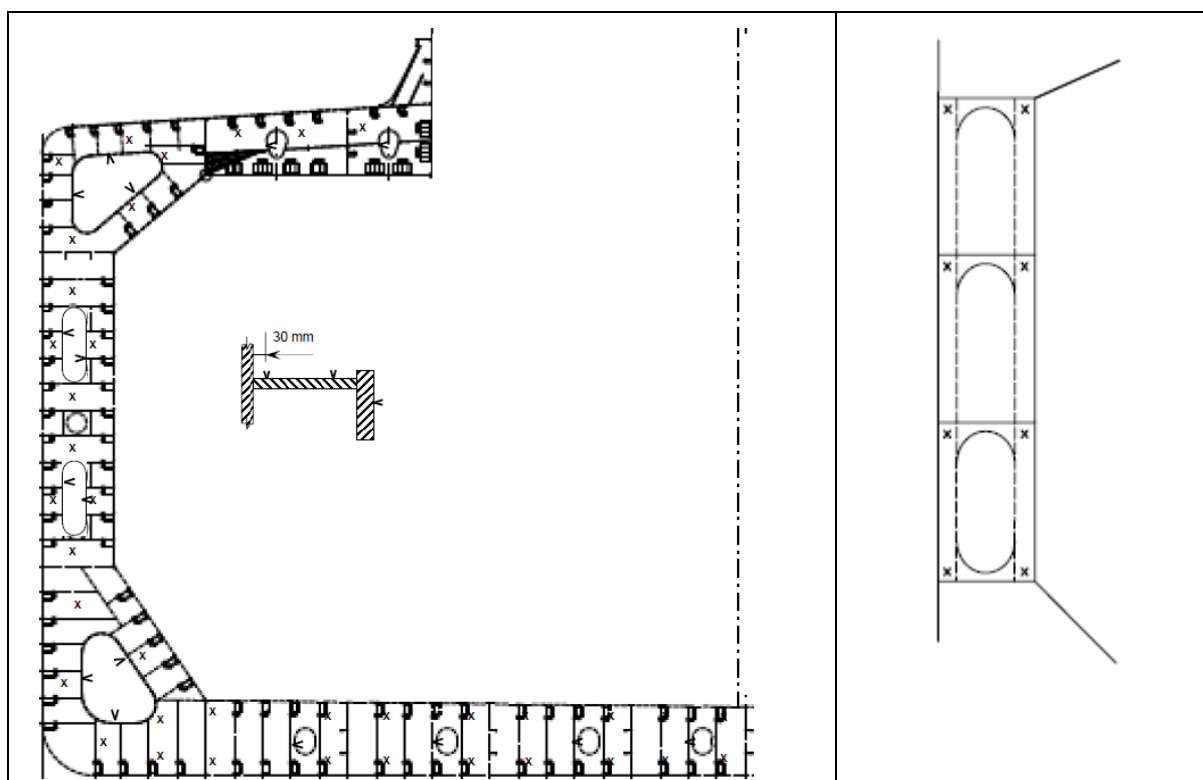
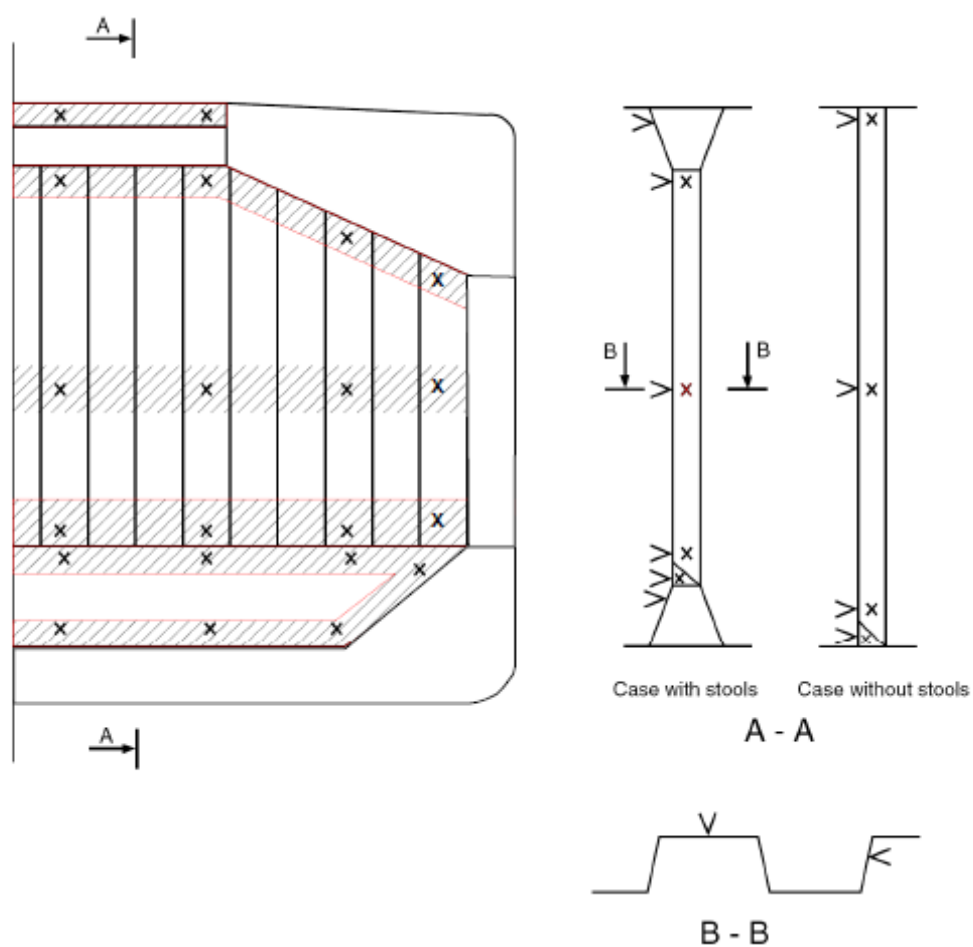
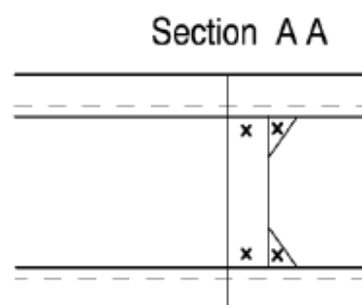
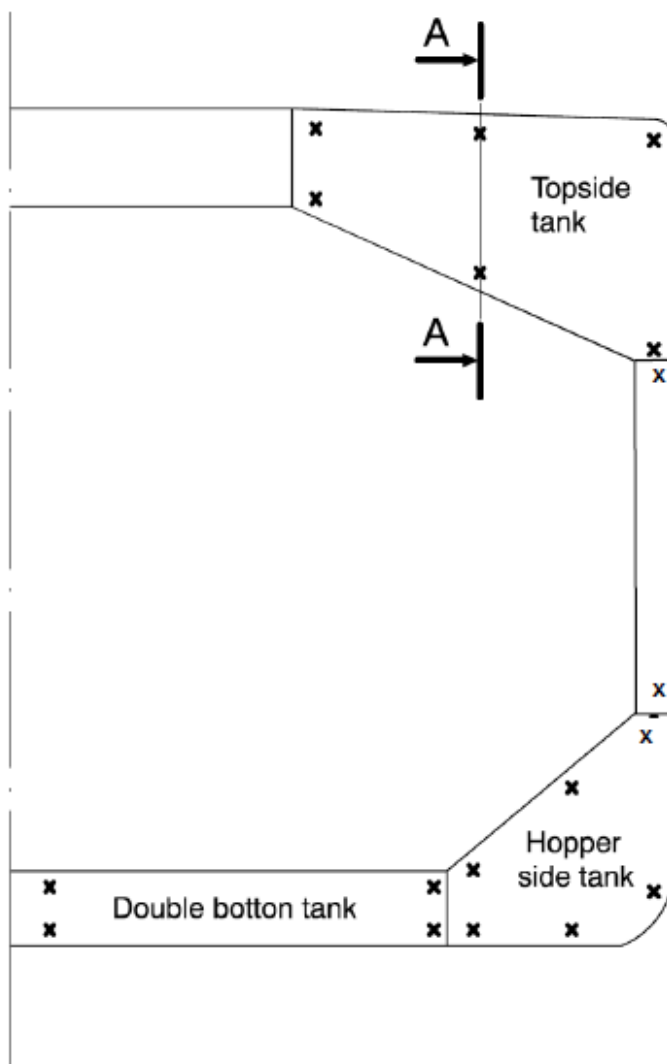


Figure 6 - Locations of measurements on structural members in ballast tanks of double skin bulk carriers (topside or hopper or side tank)



Note: Measurements to be taken in each shaded area as per views A - A and B - B

Figure 7 - Locations of measurements on cargo hold transverse bulkheads (additional measurements to internal structure of upper and lower stools to be added, e.g. two points in the upper and two points in the lower stools to be indicated in section A - A)



Note: Measurements to be taken in each vertical section as per view A - A

Figure 8 - Locations of measurements on transverse bulkheads of topside, hopper and double bottom tanks (two additional measurements to internal structure of double bottom tank to be added at midspan)

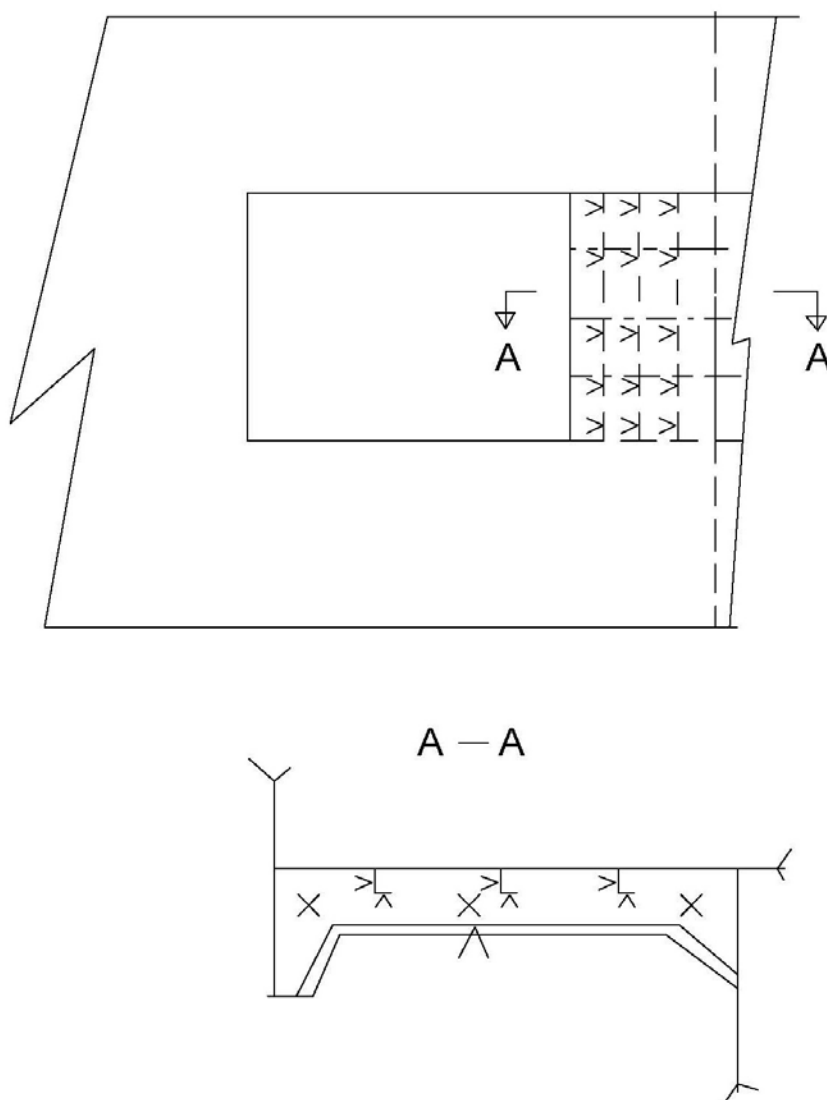


Figure 9 - Locations of measurements on underdeck structure

7.4 Reporting

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

The thickness measurement report is to follow the principles as specified in the Recommended Procedures for Thickness Measurement of Double Skin Bulk Carriers, contained in Annex II.

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

8. ACCEPTANCE CRITERIA

8.1 General

8.1.1 For vessels built under BCS Common Structural Rules, the Acceptance Criteria is according to BCS Common Structural Rules¹ and as specified in 8.2, 8.3 and 8.4.

8.1.2 For vessels not built under BCS Common Structural Rules, the Acceptance Criteria are according to the Rules of BCS and/or specific BCS- Rs depending on ship's age and structural elements concerned, e.g. BCS- R S18 for corrugated transverse watertight bulkheads, BCS- R S19 for the transverse watertight corrugated bulkhead between Cargo Holds Nos. 1 and 2, and BCS- R S21 for all cargo hatch covers and hatch forward and side coamings on exposed decks in position 1 (as defined in ILLC), as applicable.

8.2 Acceptance criteria for pitting corrosion of CSR ships

8.2.1 Side structures

If pitting intensity in an area where coating is required, according to BCS Common Structural Rules², is higher than 15% (see Figure 1), thickness measurements are to be performed to check the extent of pitting corrosion. The 15% is based on pitting or grooving on only one side of a plate.

In cases where pitting is exceeding 15%, as defined above, an area of 300 mm or more, at the most pitted part of the plate, is to be cleaned to bare metal and the thickness is to be measured in way of the five deepest pits within the cleaned area. The least thickness measured in way of any of these pits is to be taken as the thickness to be recorded.

The minimum remaining thickness in pits, grooves or other local areas is to be greater than 70% of the as-built thickness, in the side shell, hopper tank and topside tank plating attached to the each side frame, over a width up to 30 mm from each side of it, without being greater than t_{ren} .

8.2.2 Other structures

For plates with pitting intensity less than 20%, see Figure 1, the measured thickness, t_m of any individual measurement is to meet the lesser of the following criteria:

$$t_m \geq 0.7 (t_{as-built} - t_{vol add}) \text{ mm}$$

$$t_m \geq t_{ren} - 1 \text{ mm}$$

Where:

$t_{as-built}$	As-built thickness of the member, in mm
$t_{vol add}$	Voluntary thickness addition; thickness, in mm, voluntarily added as the Owner's extra margin for corrosion wastage in addition to t_c
t_{ren}	Renewal thickness; minimum allowable thickness, in mm, below which renewal of structural members is to be carried out

¹ Ch.13 of BCS CSR for Bulk Carriers, or Ch. 13, Part 1 of BCS CSR BC&OT

² Sec. 5, Ch. 3 of BCS CSR for Bulk Carriers, or Sec. 4, Ch. 3, Part 1 of BCS CSR BC&OT

t_c	Total corrosion addition, in mm, defined in BCS Common Structural Rules ¹
t_m	Measured thickness, in mm, on one item, i.e. average thickness on one item using the various measurements taken on this same item during periodical ship's in service surveys.

The average thickness across any cross section in the plating is not to be less than the renewal criteria for general corrosion given in Chapter 13 of CSR.

8.3 Acceptance criteria for edge corrosion of CSR ships

8.3.1 Provided that the overall corroded height of the edge corrosion of the flange, or web in the case of flat bar stiffeners, is less than 25%, see Figure 2, of the stiffener flange breadth or web height, as applicable, the measured thickness, t_m , is to meet the lesser of the following criteria:

$$t_m \geq 0.7 (t_{as-built} - t_{vol add}) \text{ mm}$$

$$t_m \geq t_{ren} - 1 \text{ mm}$$

8.3.2 The average measured thickness across the breadth or height of the stiffener is not to be less than that defined in BCS Common Structural Rules².

8.3.3 Plate edges at openings for manholes, lightening holes etc. may be below the minimum thickness given in BCS Common Structural Rules² provided that:

- (a) the maximum extent of the reduced plate thickness, below the minimum given in BCS Common Structural Rules², from the opening edge is not more than 20% of the smallest dimension of the opening and does not exceed 100mm.
- (b) rough or uneven edges may be cropped-back provided that the maximum dimension of the opening is not increased by more than 10% and the remaining thickness of the new edge is not less than $t_{ren} - 1 \text{ mm}$.

8.4 Acceptance criteria for grooving corrosion of CSR ships

8.4.1 Where the groove breadth is a maximum of 15% of the web height, but not more than 30mm, see Figure 3, the measured thickness, t_m , in the grooved area is to meet the lesser of the following criteria:

$$t_m \geq 0.75 (t_{as-built} - t_{vol add}) \text{ mm}$$

$$t_m \geq t_{ren} - 0.5 \text{ mm}$$

but is not to be less than

$$t_m = 6 \text{ mm}$$

8.4.2 Structural members with areas of grooving greater than those in 8.4.1 above are to be assessed based on the criteria for general corrosion as defined in BCS Common Structural Rules² using the average measured thickness across the plating/stiffener.

¹ Sec. 3, Ch. 3 of BCS CSR for Bulk Carriers, or Sec. 3, Ch. 3, Part 1 of BCS CSR BC & OT

² Ch.13 of BCS CSR for Bulk Carriers, or Ch. 13, Part 1 of BCS CSR BC&OT

9 REPORTING AND EVALUATION OF SURVEY

9.1 Evaluation of survey report

9.1.1 The data and information on the structural condition of the vessel collected during the survey is to be evaluated for acceptability and continued structural integrity of the vessel.

9.1.1.1 For CSR bulk carriers, the ship's longitudinal strength is to be evaluated by using the thickness of structural members measured, renewed and reinforced, as appropriate, during the special surveys carried out after the ship reached 15 years of age (or during the special survey no. 3, if this is carried out before the ship reaches 15 years) in accordance with the criteria for longitudinal strength of the ship's hull girder for CSR bulk carriers specified in BCS Common Structural Rules¹.

9.1.1.2 The final result of evaluation of the ship's longitudinal strength required in 9.1.1.1, after renewal or reinforcement work of structural members, if carried out as a result of initial evaluation, is to be reported as a part of the Executive Hull Summary.

9.2 Reporting

9.2.1 Principles for survey reporting are shown in Table VI.

9.2.2 When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items examined and / or tested (pressure testing, thickness measurements etc.) and an indication of whether the item has been credited, are to be made available to the next attending Surveyor(s), prior to continuing or completing the survey.

9.2.3 An Executive Hull Summary of the survey and results is to be issued to the Owner as shown in Table VII and placed on board the vessel for reference at future surveys. The Executive Hull Summary is to be endorsed by BCS's head office or regional managerial office.

¹ Ch.13 of BCS CSR for Bulk Carriers, or Ch. 13, Part 1 of BCS CSR BC&OT

TABLE I / Sheet I

**MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT SPECIAL HULL SURVEY OF
DOUBLE SKIN BULK CARRIERS, EXCLUDING ORE CARRIERS**

Special Survey No.1 age ≤ 5	Special Survey No.2 5 < age ≤ 10	Special Survey No.3 10 < age ≤ 15	Special Survey No.4 and subsequent age > 15
One transverse web with associated plating and longitudinals in two representative water ballast tanks of each type. (This is to include the foremost topside and double side water ballast tanks on either side) (A)	One transverse web with associated plating and longitudinals as applicable in each water ballast tank. (A) Forward and aft transverse bulkheads including stiffening system in a transverse section including topside, hopper side and double side ballast tanks on one side of the ship (i.e. port or starboard). (A) 25% of ordinary transverse frames for transverse framing system or 25% of longitudinals for longitudinal framing system on side shell and inner side plating at forward, middle and aft parts, in the foremost double side tanks. (B)	All transverse webs with associated plating and longitudinals as applicable in each water ballast tank. (A) All transverse bulkheads including stiffening system in each water ballast tank. (A) 25% of ordinary transverse frames for transverse framing system or 25% of longitudinals for longitudinal framing system on side shell and inner side plating at forward, middle and aft parts, in all double side tanks. (B)	All transverse webs with associated plating and longitudinals as applicable in each water ballast tank. (A) All transverse bulkheads including stiffening system in each water ballast tank. (A) All ordinary transverse frames for transverse framing system or all of longitudinals for longitudinal framing system on side shell and inner side plating at forward, middle and aft parts, in all double side tanks. (B) Areas (C) – (E) as for age interval 10 to 15 years.
Two selected cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted. (C)	One transverse bulkhead in each cargo hold, including internal structure of upper and lower stools, where fitted. (C)	All cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted. (C)	
All cargo hold hatch covers and coamings (platings and stiffeners). (D)	All cargo hold hatch covers and coamings (platings and stiffeners). (D)	All cargo hold hatch covers and coamings (platings and stiffeners). (D)	

	All deck plating and under deck structure inside line of hatch openings between all cargo hold hatches. (E)	All deck plating and under deck structure inside line of hatch openings between all cargo hold hatches. (E)	
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(A), (B), (C), (D) and (E) are areas to be subjected to close-up surveys and thickness measurements (see Figure 10 and 11).

- (A):** Transverse web frame or watertight transverse bulkhead in topside, hopper side and double side ballast tanks. In fore and aft peak tanks transverse web frame means a complete transverse web frame ring including adjacent structural members
- (B):** Ordinary transverse frame in double side tanks
- (C):** Cargo hold transverse bulkheads plating, stiffeners and girders
- (D):** Cargo hold hatch covers and coamings. Subject to cargo hold hatch covers of approved design which structurally have no access to the internals, close-up survey/thickness measurement shall be done of accessible parts of hatch covers structures.
- (E):** Deck plating and under deck structure inside line of hatch openings between cargo hold hatches

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

- Level (a): Immediately above the inner bottom and immediately above the line of gussets (if fitted) and shedders for 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): Above mid-height of the bulkhead.
- Level (d): Immediately below the upper deck plating and immediately adjacent to the upper wing tank, and immediately below the upper stool shelf plate for those ships fitted with upper stools, or immediately below the topside tanks.

TABLE I / Sheet 2

**MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT SPECIAL HULL
SURVEY OF ORE CARRIERS**

Special Survey No.1 age ≤ 5	Special Survey No.2 5 < age ≤ 10	Special Survey No.3 10 < age ≤ 15	Special Survey No.4 and subsequent age > 15
<p>One web frame ring complete including adjacent structural members in a ballast wing tank. (A)</p> <p>One transverse bulkhead lower part - including girder system and adjacent structural members - in a ballast tank. (A)</p>	<p>All web frame rings complete including adjacent structural members in a ballast wing tank. (A)</p> <p>One deck transverse including adjacent deck structural members in each remaining ballast tank. (A)</p> <p>Forward and aft transverse bulkheads complete - including girder system and adjacent structural members - in a ballast wing tank. (A)</p> <p>One transverse bulkhead lower part - including girder system and adjacent structural members - in each remaining ballast tank. (A)</p>	<p>All web frame rings complete including adjacent structural members in each ballast tank. (A)</p> <p>All transverse bulkheads complete - including girder system and adjacent structural members - in each ballast tank. (A)</p> <p>One web frame ring complete including adjacent structural members in each wing void space. (A)</p> <p>Additional web frame rings in void spaces as deemed necessary by BCS. (A)</p>	<p>As for Special Survey for age from 10 to 15 years.</p>
Two selected cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted. (C)	One transverse bulkhead in each cargo hold, including internal structure of upper and lower stools, where fitted. (C)	All cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted. (C)	Areas (C) - (E) as for age interval 10 to 15 years.
All cargo hold hatch covers and coamings (plating and stiffeners). (D)	All cargo hold hatch covers and coamings (plating and stiffeners). (D)	All cargo hold hatch covers and coamings (plating and stiffeners). (D)	
	All deck plating and under deck structure inside line of hatch openings between all cargo hold hatches. (E)	All deck plating and under deck structure inside line of hatch openings between all cargo hold hatches. (E)	

(A), (C), (D) and (E) are areas to be subjected to close-up surveys and thickness measurements (see Figure 10 and Figure 11).

- (A):** Transverse web frame or watertight transverse bulkhead in ballast wing tanks and void spaces. In fore and aft peak tanks transverse web frame means a complete transverse web frame ring including adjacent structural members
- (C):** Cargo hold transverse bulkheads plating, stiffeners and girders
- (D):** Cargo hold hatch covers and coamings. Subject to cargo hold hatch covers of approved design which structurally have no access to the internals, close-up survey/thickness measurement shall be done of accessible parts of hatch covers structures.
- (E):** Deck plating and under deck structure inside line of hatch openings between cargo hold hatches

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

- Level (a): Immediately above the inner bottom and immediately above the line of gussets (if fitted) and shedders for ships without lower stool.
- Level (b): Immediately above and below the lower stool shelf plate (for those ships fitted with lower stools), and immediately above the line of the shedder plates.
- Level (c): About mid-height of the bulkhead.
- Level (d): Immediately below the upper deck plating and immediately adjacent to the upper wing tank, and immediately below the upper stool shelf plate for those ships fitted with upper stools, or immediately below the topside tanks.

TABLE II

MINIMUM REQUIREMENTS FOR THICKNESS MEASUREMENTS AT SPECIAL HULL SURVEY OF DOUBLE SKIN BULK CARRIERS

Special Survey No.1 age ≤ 5	Special Survey No.2 5 < age ≤ 10	Special Survey No.3 10 < age ≤ 15	Special Survey No.4 and subsequent age > 15
Suspect areas	Suspect areas	Suspect areas	Suspect areas
	<p>Within the cargo length:</p> <ul style="list-style-type: none"> - Two transverse sections of deck plating outside line of cargo hatch openings 	<p>Within the cargo length:</p> <ul style="list-style-type: none"> - each deck plate outside line of cargo hatch openings - two transverse sections, one in the amidship area, outside line of cargo hatch openings - all wind and water strakes 	<p>Within the cargo length:</p> <ul style="list-style-type: none"> - each deck plate outside line of cargo hatch openings - three transverse sections, one in the amidship area, outside line of cargo hatch openings - each bottom plate
	<p>Wind and water strakes in way of the two transverse sections considered above</p> <p>Selected wind and water strakes outside the cargo length area</p>	<p>Selected wind and water strakes outside the cargo length area</p>	<p>All wind and water strakes, full length</p>
	<p>Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I/Sheet 1 or Table I/Sheet 2, as applicable.</p>	<p>Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I/Sheet 1 or Table I/Sheet 2, as applicable.</p>	<p>Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I/Sheet 1 or Table I/Sheet 2, as applicable.</p>

TABLE III / Sheet 1

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS
OF SUBSTANTIAL CORROSION OF DOUBLE SKIN BULK CARRIERS WITHIN THE
CARGO LENGTH AREA**

BOTTOM, INNER BOTTOM AND HOPPER STRUCTURE		
Structural member	Extent of measurement	Pattern of measurement
Bottom, inner bottom and hopper structure plating	Minimum of three bays across double bottom tank, including aft bay Measurements around and under all suction bell mouths	Five-point pattern for each panel between longitudinals and floors
Bottom, inner bottom and hopper structure longitudinals	Minimum of three longitudinals in each bay where bottom plating measured	Three measurements in line across the flange and three measurements on the vertical web
Bottom girders, including the watertight ones	At fore and aft watertight floors and in centre of tanks	Vertical line of single measurements on girder plating with one measurement between each panel stiffener, or a minimum of three measurements
Bottom floors, including the watertight ones	Three floors in the bays where bottom plating measured, with measurements at both ends and middle	Five-point pattern over two square metre area
Hopper structure web frame ring	Three floors in bays where bottom plating measured	Five-point pattern over one square metre of plating Single measurements on flange
Hopper structure transverse watertight bulkhead or swash bulkhead	- lower 1/3 of bulkhead	- five-point pattern over one square metre of plating
	- upper 2/3 of bulkhead	- five-point pattern over two square metre of plating
	- stiffeners (minimum of three)	- For web, five-point pattern over span (two measurements across web at each end and one at centre of span). For flange, single measurements at each end and centre of span
Plate stiffening	Where applicable	Single measurements

TABLE III / Sheet 2

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS
OF SUBSTANTIAL CORROSION OF DOUBLE SKIN BULK CARRIERS WITHIN THE
CARGO LENGTH AREA**

DECK STRUCTURE INCLUDING CROSS STRIPS, MAIN CARGO HATCHWAYS, HATCH COVERS, COAMINGS AND TOPSIDE TANKS		
Structural member	Extent of measurement	Pattern of measurement
Cross Deck Strip plating	Suspect Cross Deck Strip plating	Five-point pattern between underdeck stiffeners over 1 metre length
Underdeck Stiffeners	Transverse members	Five-point pattern at each end and mid span
	Longitudinal member	Five-point pattern on both web and flange
Hatch Covers	Side and end skirts, each three locations	Five-point pattern at each location
	Three longitudinal bands, outboard strakes (2) and centreline strake (1)	Five-point measurement each band
Hatch Coamings	Each side and end of coaming, one band lower 1/3, one band upper 2/3 of coaming	Five-point measurement each band i.e. end or side coaming
Topside Ballast Tanks	a) watertight transverse bulkheads:	
	- Lower 1/3 of bulkhead	Five-point pattern over 1 sq. metre of plating
	- Upper 2/3 of bulkhead	Five-point pattern over 1 sq. metre of plating
Topside Ballast Tanks	- Stiffeners	Five-point pattern over 1 metre length
	b) two representative swash transverse bulkheads:	
	- Lower 1/3 of bulkhead	Five-point pattern over 1 sq. metre of plating
Topside Ballast Tanks	- Upper 2/3 of bulkhead	Five-point pattern over 1 sq. metre of plating
	- Stiffeners	Five-point pattern over 1 metre length
Topside Ballast Tanks	c) three representative bays of slope plating	
	- Lower 1/3 of tank	Five-point pattern over 1 sq. metre of plating
	- Upper 2/3 of tank	Five-point pattern over 1 sq. metre of plating
Topside Ballast Tanks	d) Longitudinals, suspect and adjacent	Five-point pattern on both web and flange over 1 metre length
Main Deck Plating	Suspect plates and adjacent (4)	Five-point pattern over 1 sq. metre of plating
Main Deck Longitudinals	Suspect Plates	Five-point pattern on both web and flange over 1 metre length
Web Frames/Transverses	Suspect Plates	Five-point pattern over 1 sq. metre

TABLE III / Sheet 3

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS
OF SUBSTANTIAL CORROSION OF DOUBLE SKIN BULK CARRIERS WITHIN THE
CARGO LENGTH AREA**

STRUCTURE IN DOUBLE SIDE SPACES OF DOUBLE SKIN BULK CARRIERS INCLUDING WING VOID SPACES OF ORE CARRIERS		
Structural member	Extent of measurement	Pattern of measurement
Side shell and inner plating:		
- Upper strake and strakes in way of horizontal girders	- Plating between each pair of transverse frames / longitudinals in a minimum of three bays (along the tank)	- Single measurement
- All other strakes	- Plating between every third pair of longitudinals in same three bays	- Single measurement
Side shell and inner side transverse frames / longitudinals on:		
- upper strake	- Each transverse frame / longitudinal in same three bays	- Three measurements across web and 1 measurement on flange
- all other strakes	- Every third transverse frame / longitudinal in same three bays	- Three measurements across web and 1 measurement on flange
Transverse frames / Longitudinals	Minimum of three at top, middle and bottom of tank in same three bays	Five-point pattern over area of bracket
- brackets		
Vertical web and transverse bulkheads:		
- strakes in way of horizontal girders	- Minimum of two webs and both transverse bulkheads	- Five-point pattern over approx. two square metre area
- other strakes	- Minimum of two webs and both transverse bulkheads	- Two measurements between each pair of vertical stiffeners
Horizontal girders	Plating on each girder in a minimum of three bays	Two measurements between each pair of longitudinal girder stiffeners
Plate stiffening	Where applicable	Single measurements

TABLE III / Sheet 4

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS
OF SUBSTANTIAL CORROSION OF DOUBLE SKIN BULK CARRIERS WITHIN THE
CARGO LENGTH AREA**

TRANSVERSE BULKHEADS IN CARGO HOLDS		
Structural member	Extent of measurement	Pattern of measurement
Lower stool, where fitted	<ul style="list-style-type: none">- Transverse band within 25mm of welded connection to inner bottom- Transverse bands within 25mm of welded connection to shelf plate	<ul style="list-style-type: none">- Five-point pattern between stiffeners over one metre length- Five-point pattern between stiffeners over one metre length
Transverse bulkheads	<ul style="list-style-type: none">- Transverse band at approximately mid height- Transverse band at part of bulkhead adjacent to upper deck or below upper stool shelf plate (for those ships fitted with upper stools)	<ul style="list-style-type: none">- Five-point pattern over one square metre of plating- Five-point pattern over one square metre of plating

TABLE IV

MINIMUM REQUIREMENTS OF OVERALL AND CLOSE-UP SURVEY AND THICKNESS MEASUREMENTS AT INTERMEDIATE SURVEY OF DOUBLE SKIN BULK CARRIERS

Age of ship at time of intermediate survey due date		
5 < age ≤ 10	10 < age ≤ 15	age > 15
Overall survey of Representative ballast tanks selected by the attending surveyor (the selection is to include fore and aft peak tanks and a number of other tanks, taking into account the total number and type of ballast tanks)	The requirements of the previous special survey (see 4.2.3)	The requirements of the previous special survey (see 4.2.4)
Overall and close-up survey of Suspect Areas identified at previous surveys		
Overall survey of all cargo holds		
Thickness measurements to an extent sufficient to determine both general and local corrosion levels at areas subject to close-up survey at 'suspect areas' identified at previous surveys		

TABLE V

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

1. Application

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

2. Procedures for Certification

(1) Submission of Documents:

Following documents are to be submitted to BCS for approval:

- a) Outline of firm, e.g. organization and management structure.
- b) Experience of the firm on thickness measurement inter alia of hull structures of the vessels.
- c) Technicians' careers, i.e. experience of technicians as thickness measurement operators, technical knowledge of hull structure, etc. Operators, are to be qualified according to a recognized industrial NDT Standard.
- d) Equipment used for thickness measurement such as ultra-sonic testing machines and its maintenance/calibration procedures.
- e) A guide for thickness measurement operators.
- f) Training programmes of technicians for thickness measurement.
- g) Measurement record format in accordance with the Recommended Procedures for Thickness Measurements of Bulk Carriers, contained in Annex II.

(2) Auditing of the firm:

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

(3) Certification is conditional on an onboard demonstration at thickness measurements as well as satisfactory reporting.

3. Certification

(1) Upon satisfactory results of both the audit of the firm in 2(2) and the demonstration tests in 2(3) above, BCS will issue a Certificate of Approval as well as a notice to the effect that the thickness measurement operation system of the firm has been certified by BCS.

(2) Renewal/endorsement of the Certificate is to be made at intervals not exceeding 3 years by verification that original conditions are maintained.

4. Information of any alteration to the Certified Thickness Measurement Operation System

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

5. Cancellation of Approval

Approval may be cancelled in the following cases:

- (1) Where the measurements were improperly carried out or the results were improperly reported.
- (2) Where BCS's surveyor found any deficiencies in the approved thickness measurement operation systems of the firm.
- (3) Where the firm failed to inform of any alteration in 4 above to BCS.

TABLE VI

SURVEY REPORTING PRINCIPLES

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

1. General

1.1 A survey report is to be generated in the following cases:

- In connection with commencement, continuation and / or completion of periodical hull surveys, i.e. annual, intermediate and special surveys, as relevant
- When structural damages / defects have been found
- When repairs, renewals or modifications have been carried out
- When condition of class has been imposed or deleted

1.2 The purpose of reporting is to provide:

- Evidence that prescribed surveys have been carried out in accordance with applicable classification rules
- Documentation of surveys carried out with findings, repairs carried out and condition of class imposed or deleted
- Survey records, including actions taken, which shall form an auditable documentary trail. Survey reports are to be kept in the survey report file required to be on board
- Information for planning of future surveys
- Information which may be used as input for maintenance of classification rules and instructions

1.3 When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items surveyed, relevant findings and an indication of whether the item has been credited, 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 of 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 is to include a confirmation with description of individual structural members corresponding to the extent of requirements stipulated in BCS- R Z10. 2 based on type of periodical survey and the ship's age.

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

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 are to 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:

- Examination including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been carried out
- 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).

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

- Identification of findings, such as:
 - Corrosion with description of location, type and extent
 - Areas with substantial corrosion
 - Cracks / fractures with description of location and extent
 - Buckling with description of location and extent
 - Indents with description of location and extent
- Identification of compartments where no structural damages / defects are found

The report may be supplemented by sketches / photos.

3.3 Thickness measurement report is to be verified and signed by the surveyor controlling the measurements on board.

4. Actions taken with respect to findings

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

4.2 Repairs carried out are to be reported with identification of:

- Compartment
- Structural member
- Repair method (i.e. renewal or modification) including:
 - steel grades and scantlings (if different from the original);
 - sketches/photos, as appropriate.
- Repair extent
- NDT / Tests

4.3 For repairs not completed at the time of survey, condition of class is to be imposed with a specific time limit for the repairs. In order to provide correct and proper information to the surveyor attending for survey of the repairs, condition of class is to be sufficiently detailed with identification of each item to be repaired. For identification of extensive repairs, reference may be given to the survey report.

TABLE VII (i)

**REQUIREMENTS FOR ENHANCED SURVEYS
EXECUTIVE HULL SUMMARY**

Issued upon Completion of Special Survey

GENERAL PARTICULARS

SHIP'S NAME:

CLASS IDENTIFY NUMBER:

IMO IDENTIFY NUMBER:

PORT OF REGISTRY:

NATIONAL FLAG:

DEADWEIGHT (M. TONNES):

GROSS TONNAGE:

NATIONAL:

ITC (69):

DATE OF BUILD:

CLASSIFICATION NOTATION:

DATE OF MAJOR CONVERSION:

TYPE OF CONVERSION:

- a) The survey reports and documents listed below have been reviewed by the undersigned and found to be satisfactory
- b) A summary of the survey is attached herewith on sheet 2
- c) The hull special survey has been completed in accordance with the Regulations on [date]

Executive Summary Report completed by:	Name Signature	Title
OFFICE	DATE	
Executive Summary Report verified by:	Name Signature	Title
OFFICE	DATE	

Attached reports and documents:

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)

TABLE VII (ii)

EXECUTIVE HULL SUMMARY

- | | | | |
|----|-------------------------------------|---------------------------|--|
| A) | General Particulars: | - | Ref.Table VII (i) |
| B) | Report Review: | - | Where and how survey was done |
| C) | Close-up Survey: | - | Extent (Which tanks) |
| D) | Thickness measurements: | - | Reference to Thickness Measurement report |
| | | - | Summary of where measured |
| | | - | Separate form indicating the tanks/areas with Substantial Corrosion, and corresponding |
| | | - | Thickness diminution |
| | | - | Corrosion pattern |
| E) | Tank Protection: | Separate form indicating: | |
| | | - | Location of coating |
| | | - | Condition of coating (if applicable) |
| F) | Repairs: | - | Identification of tanks/areas |
| G) | Condition of Class/Recommendations: | | |
| H) | Memoranda: | - | Acceptable defects |
| | | - | Any points of attention for future surveys, e.g. for Suspect Areas. |
| | | - | Extended Annual/Intermediate survey due to coating breakdown |
| I) | Conclusion: | - | Statement on evaluation/verification of survey report |

TABLE VII (iii) A – non CSR vessels

EXTRACT OF THICKNESS MEASUREMENT

Reference is made to the thickness measurements report:

Position of substantially corroded Tanks/Areas or Areas with deep pitting ¹⁾	Thickness diminution[%]	Corrosion pattern ²⁾	Remarks: e.g. Ref. attached sketches

Remarks:

- 1) Substantial corrosion, i.e. 75 – 100% of acceptable margins wasted.
- 2) P = Pitting; C = Corrosion in General
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 1/3 or more of actual plate thickness is to be noted.

TABLE VII (iii) B – CSR vessels

EXTRACT OF THICKNESS MEASUREMENTS

Reference is made to the thickness measurements report:

1) Position of substantially corroded Tanks/Areas or Areas with deep pitting	$t_m - t_{ren}$ (mm)	2) Corrosion pattern	Remarks: e.g. Ref. Attached sketches

Remarks

- 1) Substantial corrosion, an extent of corrosion such that the assessment of the corrosion pattern indicates a measured thickness between $t_{ren} + 0.5\text{mm}$ and t_{ren} .
- 2) P = Pitting
C = Corrosion in General
Areas with deep pitting assessed according to 8.2 are to be recorded in this column.

TABLE VII (iv)
TANK PROTECTION

Tank/hold nos. ¹⁾	Tank/hold protection ²⁾	Coating condition ³⁾	Remarks

Remarks:

1) All ballast tanks and cargo holds to be listed.

2) C = Coating; NP = No Protection

3) Coating condition according to the following standard:

GOOD condition with only minor spot rusting.

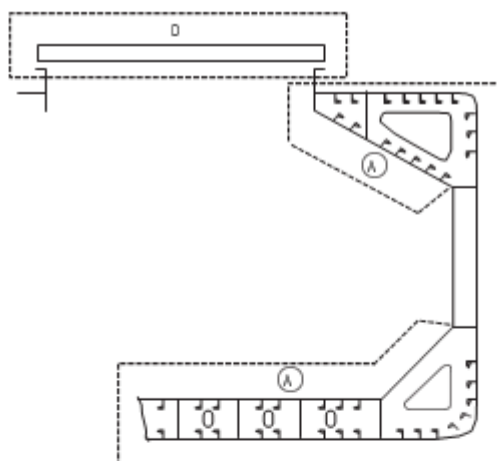
FAIR condition with local breakdown at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition.

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

If coating condition "**POOR**" is given, extended annual surveys are to be introduced. This is to be noted in part H) of the Executive Hull Summary.

Typical transverse section

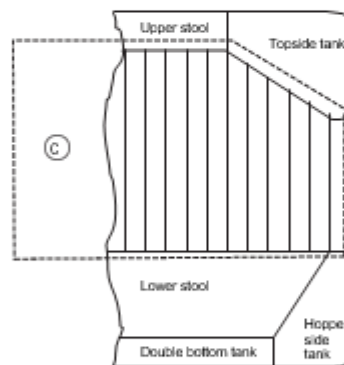
Areas (A) and (D)



Thickness to be reported on TM3-BC, TM4-BC, TM6-BC and TM7-BC as appropriate

A cargo hold, transverse bulkhead

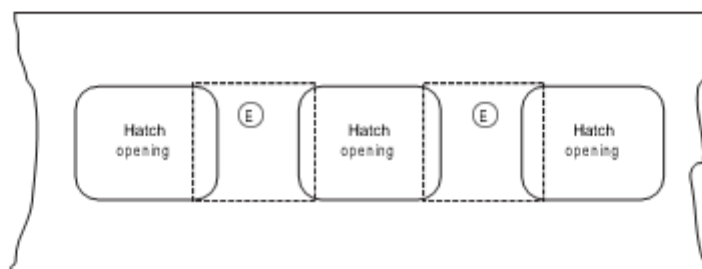
Area (C)



Thickness to be reported on TM5-BC

Typical areas of deck plating and underdeck structure inside line of hatch openings between cargo hold hatches

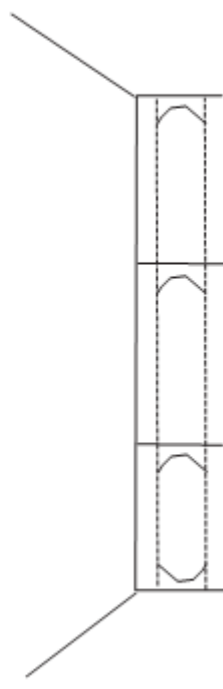
Area (E)



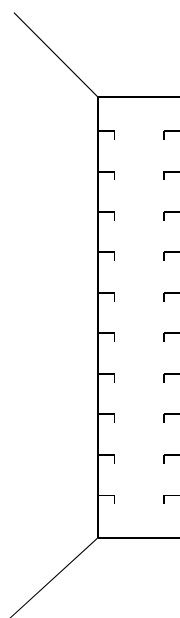
Thickness to be reported on TM6-BC

Figure 10 - Close-up survey and thickness measurement areas

Area (B)



**Figure 11(a) - Close-up survey and thickness measurement areas
ordinary transverse frame in double skin tank**



**Figure 11(b) - Close-up survey and thickness measurement areas
ordinary longitudinal structure in double skin tank**



ANNEX I

GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH PLANNING FOR ENHANCED SURVEYS OF DOUBLE SKIN BULK CARRIERS SPECIAL SURVEY– HULL

Contents:

1. INTRODUCTION
2. PURPOSE AND PRINCIPLES
 - 2.1 Purpose
 - 2.2 Minimum Requirements
 - 2.3 Timing
 - 2.4 Aspects to be considered
3. TECHNICAL ASSESSMENT
 - 3.1 General
 - 3.2 Methods
 - 3.2.1 Design Details
 - 3.2.2 Corrosion
 - 3.2.3 Locations for Close-up Survey and Thickness Measurement

REFERENCES

1. BCS- R Z10.5, "Hull Surveys of Double Skin Bulk Carriers"
2. BCS, "Bulk Carriers: Guidelines for Surveys, Assessment and Repair of Hull Structures, January 2002"
3. TSCF, "Guidelines for the Inspection and Maintenance of Double Hull Tanker Structures, 1995"
4. TSCF, "Guidance Manual for Tanker Structures, 1997"

1. INTRODUCTION

These guidelines contain information and suggestions concerning technical assessments, which may be of use in conjunction with the planning of enhanced Special Surveys of double skin bulk carriers. As indicated in 5.1.5 of BCS- R Z10.5, "Hull Surveys of Double Skin Bulk Carriers" (Ref. 1), the guidelines are a recommended tool which may be invoked at the discretion of BCS, 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.

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

2.2 Minimum Requirements

However, these guidelines may not be used to reduce the requirements pertaining to thickness measurement, close-up survey and tank testing contained in Tables I and II and in paragraph 2.5, respectively, of BCS- R Z10.5, which are, in all cases, to be complied with as a minimum.

2.3 Timing

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

2.4 Aspects to be considered

Technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of holds, tanks and areas for survey:

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

Technical assessments of the relative risks of susceptibility to damage or deterioration of various structural elements and areas are to be judged and decided on the basis of recognized principles and practices, such as may be found in publications (Ref 2) and Tanker Structure Cooperative Forum (TSCF), (Refs. 3 and 4).

3. TECHNICAL ASSESSMENT

3.1 General

There are three basic types of possible failure, which may be the subject of technical assessment in connection with planning of surveys; **corrosion**, **cracks** and **buckling**. Contact damages are not normally covered by the survey planning since indents are usually noted in memoranda and assumed to be dealt with as a normal routine by Surveyors.

Technical assessments performed in conjunction with the survey planning process are, in principle, to be as shown schematically in Figure 1. The approach is basically an evaluation of the risk in the following aspects based on the knowledge and experience related to:

- Design
- Corrosion.

The design is to be considered with respect to structural details, which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue. Corrosion is related to the ageing process, and is closely connected with the quality of corrosion prevention systems fitted at new building, and subsequent maintenance during the service life. Corrosion may also lead to cracking and/or buckling.

3.2 Methods

3.2.1 Design Details

Damage experience related to the ship in question and sister and/or similar ships, where available, is the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings is to be included.

Typical damage experience to be considered will consist of:

- Number, extent, location and frequency of cracks
- Location of buckles.

This information may be found in the survey reports and/or the Owner's files, including the results of the Owner's own inspections. The defects are to be analyzed, noted and marked on sketches.

In addition, general experience is to be utilized. Also, reference is to be made to BCS's "Bulk Carriers: Guidelines for Survey, Assessment and Repair," (Ref. 2) which contains a catalogue of typical damages and proposed repair methods for various structural details on single skin bulk carriers. Reference should also be made to the TSCF's publication mentioned in Ref. 3, which contains catalogues of typical damages and proposed repair methods for double hull oil tanker structural details which may to some extent be similar to structural details in double skin bulk carriers. Such figures are to be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details that may be susceptible to damage. In particular, Chapter 3 of Ref. 3 deals with various aspects specific to double hull tankers, such as stress concentration locations, misalignment during construction, corrosion trends, fatigue considerations and areas requiring special attention, while Chapter 4 of Ref. 3 addresses experience gained on structural defects in double hulls (chemical tankers, OBO carriers, ore/oil carriers, gas carriers), which are also to be considered in working out the survey planning.

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

The use of high tensile steel (HTS) is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favourable, e.g. side structures.

In this respect, stress calculations of typical and important components and details, in accordance with the latest Rules or other relevant methods may prove useful and are to be considered.

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

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

- Usage of Tanks, Holds and Spaces
- Condition of Coatings
- Cleaning Procedures
- Previous Corrosion Damage
- Ballast use and time for Cargo Holds
- Risk of Corrosion in Cargo Holds and Ballast Tanks
- Location of Ballast Tanks Adjacent to Heated Fuel Oil Tanks

Ref. 4 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

The evaluation of corrosion risks is to be based on information in both Ref. 2 and Ref. 4, as far as applicable to double skin bulk carriers, together with relevant information on the anticipated condition of the ship as derived from the information collected in order to prepare the Survey Programme and the age of the ship. The various holds, tanks and spaces are to be listed with the corrosion risks nominated accordingly.

3.2.3 Locations for Close-up Survey and Thickness Measurement

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

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

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

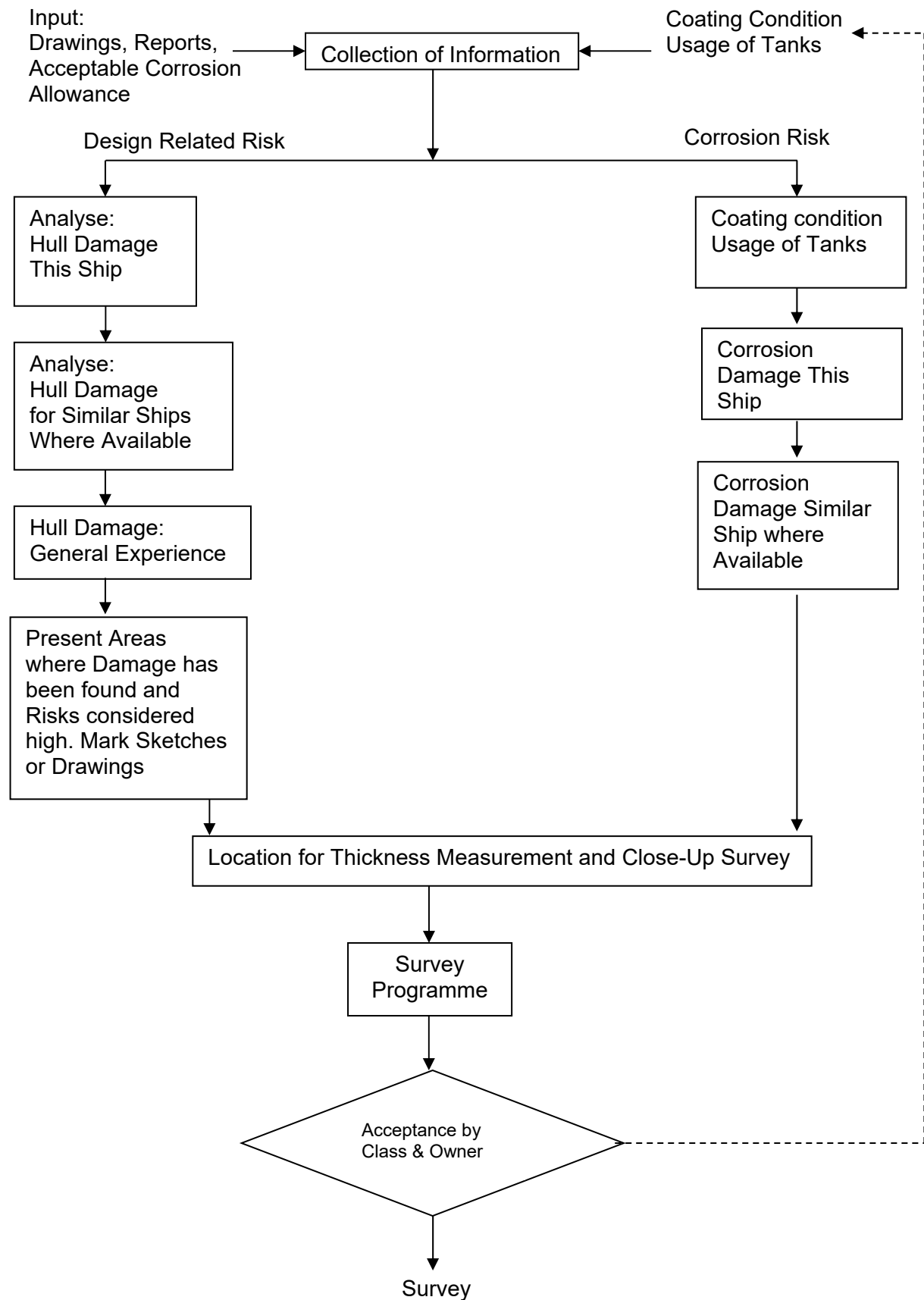


Figure 1: Technical Assessment & the Survey Planning Process

ANNEX II

RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS OF DOUBLE SKIN BULK CARRIERS *

*

Note: Annex II is recommendatory.

CONTENTS

Sheet 1

- Sheet 1 - Contents
- Sheet 2 - Instructions
- Sheet 3 - General Particulars

REPORTS

- Sheet 4 - Report TM1-DSBC for recording the thickness measurements of all deck plating, all bottom shell plating and side shell plating
- Sheet 5 - Report TM2-DSBC (i) for recording the thickness measurement of shell and deck plating at transverse sections - strength deck and sheerstrake plating
- Sheet 6 - Report TM2-DSBC (ii) for recording the thickness measurement of shell and deck plating at transverse sections - shell plating
- Sheet 7 - Report TM3-DSBC for recording the thickness measurement of longitudinal members at transverse sections (including double hull structure)
- Sheet 8 - Report TM4-DSBC for recording the thickness measurement of transverse structural members (including common frames, web frames and transverse bulkheads in double hull tanks)
- Sheet 9 - Report TM5-DSBC for recording the thickness measurement of W.T. transverse bulkheads in cargo holds
- Sheet 10 - Report TM6-DSBC for recording the thickness measurement of miscellaneous structural members

GUIDANCE

- Sheet 11 - Typical transverse section of a double skin bulk carrier. The diagram includes details of the items to be measured and the report forms to be used.
- Sheet 12 - Typical transverse section of an ore carrier. The diagram includes details of the items to be measured and the report forms to be used.
- Sheet 13 - Thickness Measurement - Double Skin Bulk Carriers
Transverse section outline. The diagram may be used for those ships where the diagrams on sheet 11 and 12 are not suitable.
- Sheet 14 - Thickness Measurement - Ore Carriers
Areas subject to close-up surveys and thickness measurements
- areas (A) to (E) as defined in Table I of the BCS- R Z10.5.

Recommended Procedures for Thickness Measurements of Double Skin Bulk Carriers

1. This document is to be used for recording thickness measurements as required by BCS- R Z10.5.
2. Reporting forms TM1-DSBC, TM2-DSBC, TM3-DSBC, TM4-DSBC, TM5-DSBC and TM6-DSBC (sheets 4-10) are to be used for recording thickness measurements and the maximum allowable diminution should be stated.
The maximum allowable diminution could be stated in an attached document.
3. The remaining sheets 11-14 are guidance diagrams and notes relating to the reporting forms and the procedure for the thickness measurements.

GENERAL PARTICULARS

Sheet 3

Ship's name:-

IMO Number:-

Class Identification number:-

Port of registry:-

Gross tons:-

Deadweight:-

Date of build:-

Classification Society:-

Name of Firm performing the thickness measurement:-

Thickness measurement firm certified by:-

Certificate No. :-

Certificate valid from.....to.....

Place of measurement:-

First date of measurement:-

Last date of measurement:-

Special survey/intermediate survey due:-*

Details of measurement equipment:-

Qualification of operator:-

Report Number:-

Consisting of.....Sheets

Name of operator:-

Name of surveyor:-

Signature of operator:-.

Signature of surveyor:-

Firm official stamp:-

Classification Society
Official Stamp:-

* Delete as appropriate

TM1-DSBC

**Report on THICKNESS MEASUREMENT of ALL DECK PLATING, ALL BOTTOM SHELL PLATING
and SIDE SHELL PLATING*** (* - delete as appropriate)

Sheet 4

Ship's name.....

Class Identity No.

Report No.

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

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM1-DSBC

1. This report is to be used for recording the thickness measurement of:-
 - 1.1 All strength deck plating within cargo length area.
 - 1.2 All keel, bottom shell plating and bilge plating within the cargo length area.
 - 1.3 Side shell plating including selected wind and water strakes outside cargo length area.
 - 1.4 All wind and water strakes within cargo length area.
2. The strake position is to be cleared indicates as follows:-
 - 2.1 For strength deck indicate the number of the strake of plating inboard from the stringer plate.
 - 2.2 For bottom plating indicate the number of the strake of plating outboard from the keel plate.
 - 2.3 For side shell plating give number of the strake of plating sheerstrake and letter as shown on shell expansion.
3. Only the deck plating strakes outside line of openings are to be recorded.
4. Measurements are to be taken at the forward and aft areas of all plates and where plates cross ballast/cargo tank boundaries separate measurements for the area of plating in way of each type of tank are to be recorded.
5. The single measurements recorded are to represent the average of multiple measurements.
6. The maximum allowable diminution could be stated in an attached document.

TM2-DSBC (i)

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

Sheet 5

Ship's name.....

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									
STRAKE POSITION	No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		No. or Letter	Org. Thk.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S	
		mm	mm	P	S	mm	%	mm	%		mm	mm	P	S	mm	%	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																											
sheer strake																											
TOPSIDE TOTAL																											

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM2-DSBC (i)

1. This report is to be used for recording the thickness measurement of:-

Strength deck plating and sheerstrake plating transverse sections:-

One, two or three sections within the cargo length area, comprising the structural items (0), (1) and (2) as shown on the diagrams of typical transverse sections illustrated on sheets 11, 12 and 13 of this document.

2. Only the deck plating strakes outside line of hatch openings are to be recorded.
3. The top side area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
4. The exact frame station of measurement is to be stated.
5. The single measurements recorded are to represent the average of multiple measurements.
6. The maximum allowable diminution could be stated in an attached document.

TM2-DSBC (ii)

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

Sheet 6

Ship's name.....

Class Identity No.

Report No.

SHELL PLATING

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

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM2-DSBC (ii)

1. This report is to be used for recording the thickness measurement of:-

Shell plating at transverse sections:

One, two or three sections within the cargo length area, comprising the structural items (3), (4), (5) and (6) as shown on the diagrams of typical transverse sections illustrated on sheets 11, 12 and 13 of this document.

2. The bottom area comprises keel, bottom and bilge plating.
3. The exact frame station of measurement is to be stated.
4. The single measurements recorded are to represent the average of multiple measurements.
5. The maximum allowable diminution could be stated in an attached document.

TM3-DSBC

**Report on THICKNESS MEASUREMENT OF LONGITUDINAL MEMBERS at transverse sections
(one, two or three transverse sections)**

Sheet 7

Ship's name.....

Class Identity No.

Report No.

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM3-DSBC

1. This report is to be used for recording the thickness measurement of:-

Longitudinal Members at transverse sections:-

Two, or three sections within the cargo length area comprising the appropriate structural items (10) to (25) as shown on diagrams of typical transverse sections illustrated on sheets 11, 12 and 13 of this document.

2. The exact frame station of measurement is to be stated.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

Sheet 8

Report No.

[illegible]

NOTES – See Reverse

NOTES TO REPORT TM4-DSBC

1. This report is to be used for recording the thickness measurement of:

Transverse structural members, comprising the appropriate structural items (30) to (34) as shown on diagrams of typical transverse sections illustrated on sheets 11, 12 and 13 of this document.
2. Guidance for areas of measurements is indicated on sheet 14 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

Report No.

[illegible]

NOTES – See Reverse

NOTES TO REPORT TM5-DSBC

1. This report form is to be used for recording the thickness measurement of:
W.T. transverse bulkheads in cargo holds
2. Guidance for areas of measurements is indicated on sheet 14 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

TM6-DSBC

Report on THICKNESS MEASUREMENT OF MISCELLANEOUS STRUCTURAL MEMBERS

Sheet 10

Ship's name.....

Class Identity No.

Report No.

[illegible]

Operators Signature.....

NOTES – See Reverse

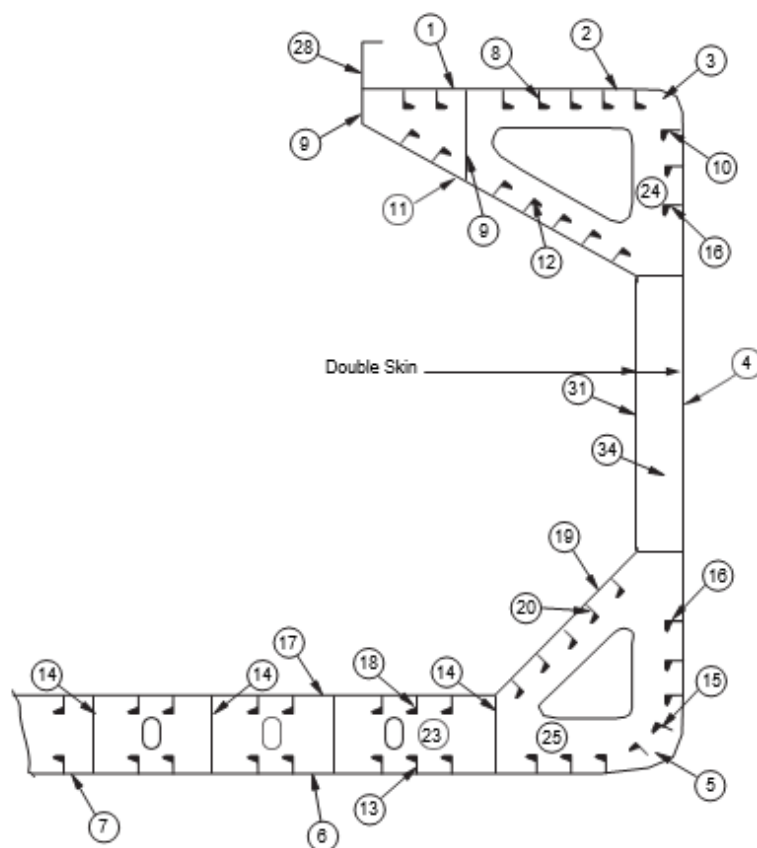
NOTES TO REPORT TM6-DSBC

1. This report is to be used for recording the thickness measurement of:

Miscellaneous structural members including the structural items (40), (41) and (42) as shown on diagrams of typical transverse sections illustrated on sheets 11, 12 and 13 of this document.
2. Guidance for areas of measurement is indicated on sheet 14 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

Thickness Measurement - Double Skin Bulk Carriers

Typical transverse section of a double skin bulk carrier with indication of longitudinal and transverse members



Report on TM2-DSBC (i) & (ii)	
1.	Strength deck plating
2.	Stringer plate
3.	Sheerstrake
4.	Side shell plating
5.	Bilge plating
6.	Bottom shell plating
7.	Keel plate

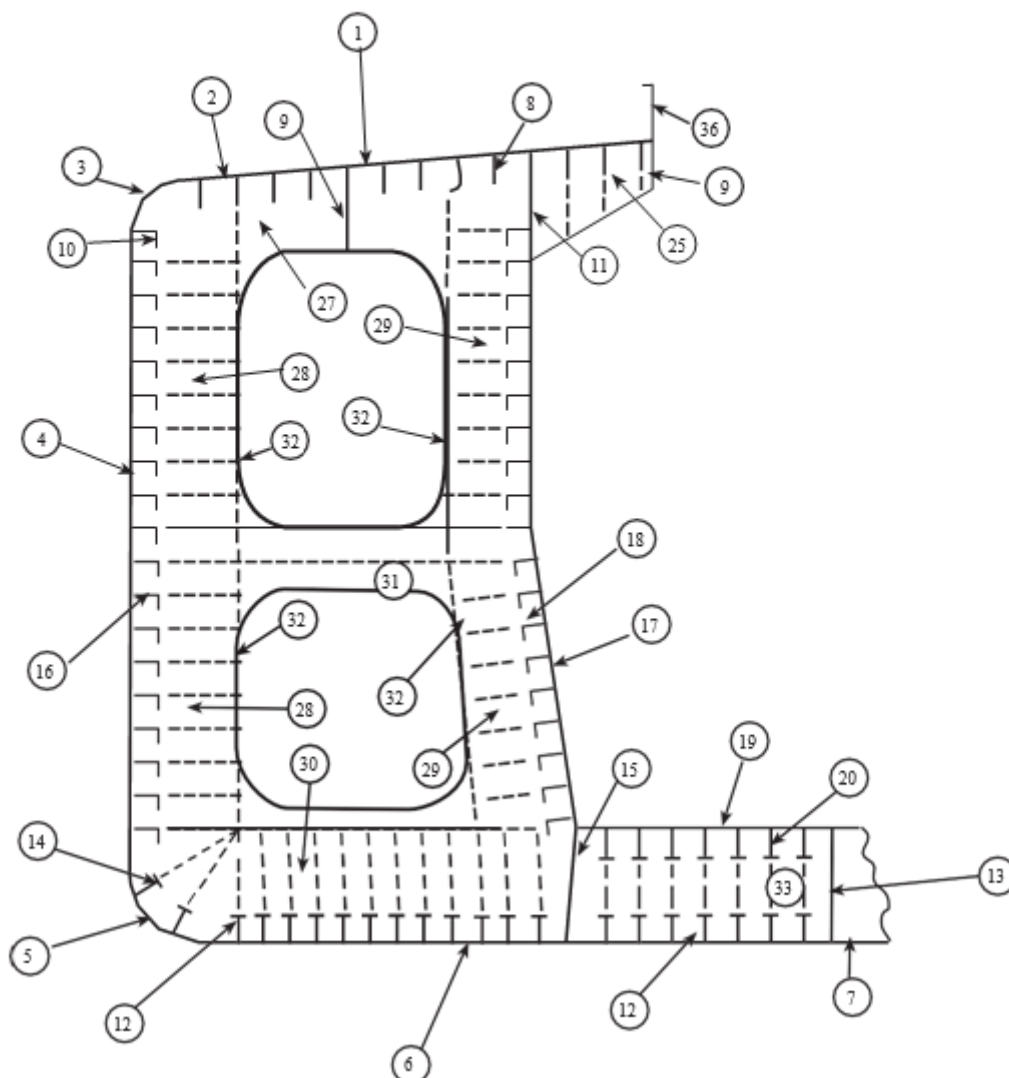
Report on TM3-DSBC			
8.	Deck longitudinals	17.	Inner bottom plating
9.	Deck girders	18.	Inner bottom longitudinals
10.	Sheerstrake longitudinals	19.	Hopper plating
11.	Topside tank sloping plate	20.	Hopper longitudinals
12.	Topside tank sloping plate longitudinals	31.	Inner side plating
13.	Bottom longitudinals	-	Inner side longitudinals, if any
14.	Bottom girders	-	Horizontal girders in wing ballast tanks
15.	Bilge longitudinals		
16.	Side shell longitudinals, if any		

Report on TM4-DSBC	
23.	Double bottom tank floors
25.	Hopper side tank transverses
34.	Transverse web frame
-	Topside tank transverses

Report on TM6-DSBC	
28.	Hatch coamings
-	Deck plating between hatches
-	Hatch covers

Thickness Measurement - Ore Carriers

Typical transverse section of an ore carrier with indication of longitudinal and transverse members



Report on TM2-DSBC (i) & (ii)

1. Strength deck plating
2. Stringer plate
3. Sheerstrake
4. Side shell plating
5. Bilge plating
6. Bottom shell plating
7. Keel plate

Report on TM3-DSBC

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

Report on TM4-DSBC

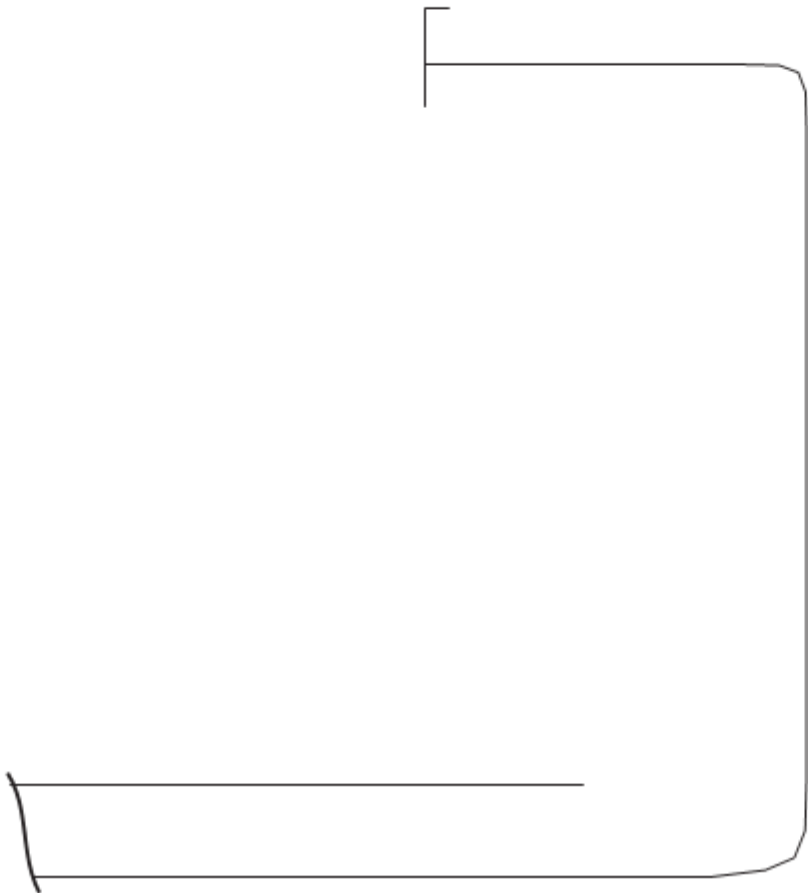
25. Deck transverse centre tank
26. Bottom transverse centre tank
27. Deck transverse wing tank
28. Side shell vertical web
29. Longitudinal bulkhead vertical web
30. Bottom transverse wing tank
31. Struts
32. Transverse web face plate
33. D.B. Floors
- 34.
- 35.

Report on TM6-DSBC

36. Hatch coamings
37. Deck plating between hatches
38. Hatch covers
- 39.
- 40.

Thickness Measurement - Double Skin Bulk Carriers

Transverse section outline: The diagram may be used for those ships where the diagrams on sheet 11 and 12 are not suitable



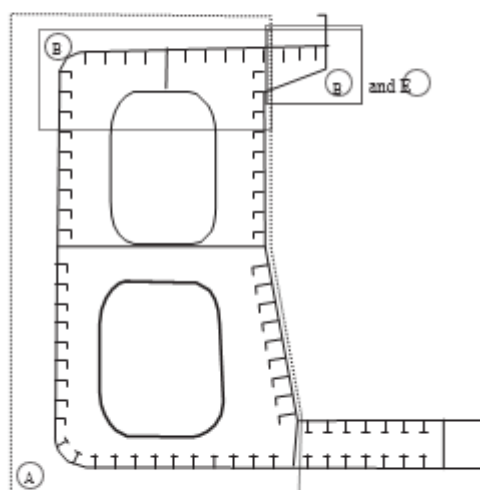
Report on TM2-DSBC (i) & (ii)		Report on TM3-DSBC	
1.	Strength deck plating	8.	Deck longitudinals
2.	Stringer plate	9.	Deck girders
3.	Sheerstrake	10.	Sheerstrake longitudinals
4.	Side shell plating	11.	Topside tank sloping plate
5.	Bilge plating	12.	Topside tank sloping plate longitudinals
6.	Bottom shell plating	13.	Bottom longitudinals
7.	Keel plate	14.	Bottom girders
		15.	Bilge longitudinals
		16.	Side shell longitudinals, if any
		17.	Inner bottom plating
		18.	Inner bottom longitudinals
		19.	Hopper plating
		20.	Hopper longitudinals
		31.	Inner side plating
		-	Inner side longitudinals, if any
		-	Horizontal girders in wing ballast tanks

Report on TM4-DSBC		Report on TM6-DSBC	
23.	Double bottom tank floors	28.	Hatch coamings
25.	Hopper side tank transverses	-	Deck plating between hatches
34.	Transverse web frame	-	Hatch covers
-	Topside tank transverses		

Thickness Measurement - Ore Carriers

Areas subject to close up survey and thickness measurements - areas (A) to (E) as defined in Table I of UR Z10.5 - Thickness to be reported on TM3-DSBC, TM4-DSBC, TM5-DSBC and TM6-DSBC as appropriate

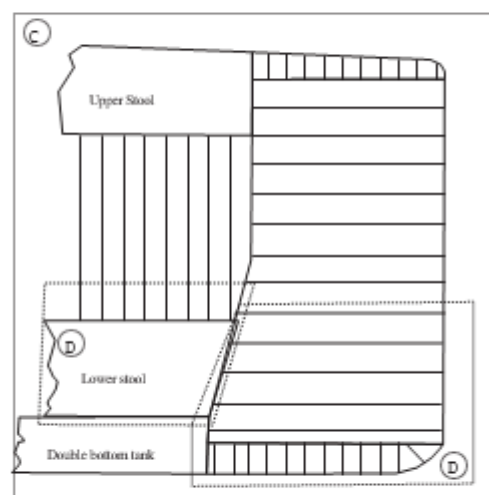
Typical transverse section close-up survey



Thickness to be reported on
TM3-DSBC and TM4-DSBC as appropriate

Close-up survey
area

Typical transverse bulkhead



Thickness to be reported on TM5-DSBC

ANNEX II (CSR)

RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS OF DOUBLE SKIN BULK CARRIERS BUILT UNDER BCS COMMON STRUCTURAL RULES*

*

Note: Annex II (CSR) is recommendatory.

CONTENTS

Sheet 1

- Sheet 1 - Contents
- Sheet 2 - Instructions
- Sheet 3 - General particulars

REPORTS

- Sheet 4 - Report TM1-DSBC(CSR) for recording the thickness measurement of all deck plating, all bottom plating and side shell plating
- Sheet 5 - Report TM2-DSBC(CSR) (i) for recording the thickness measurement of shell and deck plating at transverse sections - strength deck and sheerstrake plating
- Sheet 6 - Report TM2-DSBC(CSR) (ii) for recording the thickness measurement of shell plating at transverse sections
- Sheet 7 - Report TM3-DSBC(CSR) for recording the thickness measurement of longitudinal members at transverse sections (including double hull structure)
- Sheet 8 - Report TM4-DSBC(CSR) for recording the thickness measurement of transverse structural members (including common frames, web frames and transverse bulkheads in double hull tanks)
- Sheet 9 - Report TM5-DSBC(CSR) for recording the thickness measurement of W.T. transverse bulkheads in cargo holds
- Sheet 10 - Report TM6-DSBC(CSR) for recording the thickness measurement of miscellaneous structural members

GUIDANCE

- Sheet 11 - Typical transverse section of a double skin bulk carrier. The diagram includes details of the items to be measured and the report forms to be used.
- Sheet 12 - Thickness Measurement - Double Skin Bulk Carriers
Transverse section outline. This diagram may be used for those ships where the diagram on sheet 11 is not suitable.
- Sheet 13 - Sketches of double skin bulk carrier showing typical areas for thickness measurement of structural members and transverse bulkheads in association with close-up survey requirements. – areas (A) to (E) as defined in Table I of the BCS- R Z10.5.

IACS Recommended Procedures for Thickness Measurements of Double Skin Bulk Carriers Built under IACS Common Structural Rules

1. This document is to be used for recording thickness measurements of double skin bulk carriers built under BCS Common Structural Rules as required by BCS- R Z10.5.
2. Reporting forms TM1-DSBC(CSR), TM2-DSBC(CSR) (i) and (ii), TM3-DSBC(CSR), TM4-DSBC(CSR), TM5-DSBC(CSR) and TM6-DSBC(CSR) (sheets 4-10) are to be used for recording thickness measurements. The as-built thickness and the voluntary thickness addition and renewal thickness (minimum allowable thickness) are to be stated in the said forms.
3. The remaining sheets 11-13 are guidance diagrams and notes relating to the reporting forms and the procedure for the thickness measurement.

GENERAL PARTICULARS**Sheet 3**

Ships name:-

IMO number:-

Class identity number:-

Port of registry:-

Gross tons:-

Deadweight:-

Date of build:-

Classification Society:-

Name of Firm performing thickness measurement:-

Thickness measurement firm certified by:-

Certificate No:-

Certificate valid from.....to.....

Place of measurement:-

First date of measurement:-

Last date of measurement:-

Special survey/intermediate survey due:-*

Details of measurement equipment:-

Qualification of operators:-

Report Number:- consisting of.....Sheets

Name of operator:- Name of surveyor:-

Signature of operator:-. Signature of surveyor:-

Firm official stamp:-
Classification Society
Official Stamp:-

* Delete as appropriate

TM1-DSBC(CSR)

**Report on THICKNESS MEASUREMENT of ALL DECK PLATING, ALL BOTTOM PLATING
or SIDE SHELL PLATING***
(* - delete as appropriate)

Sheet 4

Ship's name.....

Class Identity No.....

Report No.....

STRAKE POSITION														
PLATE POSITION	No. or Letter	As Built Thk. mm	Voluntary Thickness Addition mm	Renewal Thickness mm (a)	Forward Reading				Aft Reading				Mean Remaining Corr. Addition, mm	
					Gauged Thk. mm (b1)		Remaining Corr. Addition, mm (c1)=(b1)-(a)		Gauged Thk. mm (b2)		Remaining Corr. Addition, mm (c2)=(b2)-(a)		[(c1)+(c2)]/2	
					P	S	P	S	P	S	P	S	P	S
12th forward														
11th														
10th														
9th														
8th														
7th														
6th														
5th														
4th														
3rd														
2nd														
1st														
Amidships														
1st aft														
2nd														
3rd														
4th														
5th														
6th														
7th														
8th														
9th														
10th														
11th														
12th														

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM1-DSBC(CSR)

1. This report is to be used for recording the thickness measurement of:-
 - 1.1 All strength deck plating within cargo length area.
 - 1.2 All keel, bottom shell plating and bilge plating within the cargo length area.
 - 1.3 Side shell plating including selected wind and water strakes outside the cargo length area.
 - 1.4 All wind and water strakes within the cargo length area.
2. The strake position is to be cleared indicated as follows:-
 - 2.1 For strength deck indicate the number of the strake of plating inboard from the stringer plate.
 - 2.2 For bottom plating indicate the number of the strake of plating outboard from the keel plate.
 - 2.3 For side shell plating give number of the strake of plating sheerstrake and letter as shown on shell expansion.
3. Only the deck plating strakes outside line of openings are to be recorded.
4. Measurements are to be taken at the forward and aft areas of all plates and the single measurements recorded are to represent the average of multiple measurements.
5. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM2-DSBC(CSR) (i) Report on THICKNESS MEASUREMENT OF SHELL AND DECK PLATING
(one, two or three transverse sections)

Sheet 5

Ship's name.....

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							
STRAKE POSITION	No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm	Gauged Thk. mm (b)		Remaining Corr. Addition, mm		No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm	Gauged Thk. mm (b)		Remaining Corr. Addition, mm		No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm	Gauged Thk. mm (b)		Remaining Corr. Addition, mm	
					P	S	P	S					P	S	P	S					P	S	P	S
Stringer Plate																								
1st strake inboard																								
2nd																								
3rd																								
4th																								
5th																								
6th																								
7th																								
8th																								
9th																								
10th																								
11th																								
12th																								
13th																								
14th																								
centre strake																								
sheer strake																								
TOPSIDE TOTAL																								

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM2-DSBC(CSR) (i)

1. This report is to be used for recording the thickness measurement of:-

Strength deck plating and sheerstrake plating transverse sections:-

One, two or three sections within the cargo length area, comprising of the structural items (1), (2) and (3) as shown on the diagram of typical transverse sections illustrated on sheets 11 and 12 of this document.

2. Only the deck plating strakes outside the line of openings are to be recorded.
3. The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
4. The exact frame station of measurement is to be stated.
5. The single measurements recorded are to represent the average of multiple measurements.
6. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM2-DSBC(CSR) (ii) Report on THICKNESS MEASUREMENT OF SHELL PLATING
(one, two or three transverse sections)

Sheet 6

Ship's name.....

Class Identity No.....

Report No.....

SHELL PLATING

	FIRST TRANSVERSE SECTION AT FRAME NUMBER								SECOND TRANSVERSE SECTION AT FRAME NUMBER								THIRD TRANSVERSE SECTION AT FRAME NUMBER																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
STRAKE POSITION	No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)				No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)				No. or Letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk. mm (b)		Remaining Corr. Addition, mm (b)-(a)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM2-DSBC(CSR) (ii)

1. This report is to be used for recording the thickness measurement of:-

Shell plating at transverse sections:-

One, two or three sections within the cargo length area, comprising of the structural items (4), (5), (6) and (7) as shown on the diagram of typical transverse sections illustrated on sheets 11 and 12 of this document.

2. The bottom area comprises keel, bottom and bilge plating.
3. The exact frame station of measurement is to be stated.
4. The single measurements recorded are to represent the average of multiple measurements.
5. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

**TM3-DSBC(CSR) Report on THICKNESS MEASUREMENT OF LONGITUDINAL MEMBERS
(one, two or three transverse sections)**

Sheet 7

Report No.....

[illegible]

NOTES – See Reverse

NOTES TO REPORT TM3-DSBC(CSR)

1. This report is to be used for recording the thickness measurement of:-

Longitudinal Members at transverse sections:-

One, two or three sections within the cargo length area, comprising of the appropriate structural items (8) to (20) and (31) as shown on diagram of typical transverse sections illustrated on sheets 11 and 12 of this document.

2. The exact frame station of measurement is to be stated.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

TM4-DSBC(CSR)

Report on THICKNESS MEASUREMENT OF TRANSVERSE STRUCTURAL MEMBERS In the double bottom, hopper side and topside water ballast tanks

Sheet 8

Ship's name.....

Class Identity No.....

Report No.....

TANK DESCRIPTION:

LOCATION OF STRUCTURE

[illegible]

Operators Signature.....

NOTES – See Reverse

NOTES TO REPORT TM4-DSBC(CSR)

1. This report is to be used for recording the thickness measurement of:-

Transverse structural members, comprising of the appropriate structural items (23) to (25) and (34) as shown on diagram of typical transverse section, illustrated on sheets 11 and 12 of this document.
2. Guidance for areas if measurement is indicated on the diagrams shown on sheet 13 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

Report No.....

[illegible]

NOTES – See Reverse

NOTES TO REPORT TM5-DSBC(CSR)

1. This report form is to be used for recording the thickness measurement of:-
W.T. transverse bulkheads in cargo holds
2. Guidance for areas of measurement is indicated on the diagrams shown on sheet 13 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

Ship's name.....

Class Identity No.....

Report No.....

[illegible]

Operators Signature.....

NOTES – See Reverse

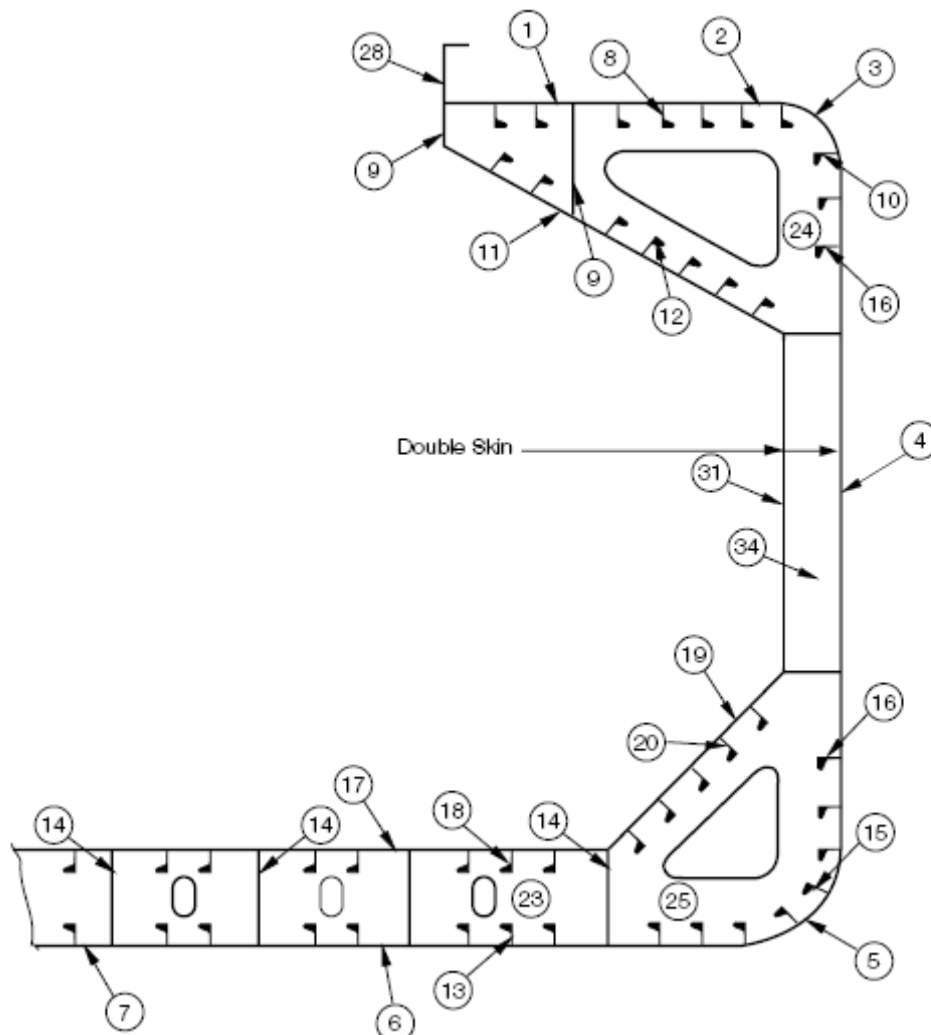
NOTES TO REPORT TM6-DSBC(CSR)

1. This report is to be used for recording the thickness measurement of:-

Miscellaneous structural members including the structural items (28) as shown on diagram of typical transverse section illustrated on sheets 11 and 12 of this document.
2. Guidance for areas of measurement is indicated on sheet 13 of this document.
3. The single measurements recorded are to represent the average of multiple measurements.
4. The remaining corrosion addition is to be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark "R" is to be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark "S" is to be indicated in the right-hand column.

Thickness Measurement - Double Skin Bulk Carriers

Typical transverse section of a double skin bulk carrier with indication of longitudinal and transverse members



Report on TM2-DSBC(CSR) (i) & (ii)	
1.	Strength deck plating
2.	Stringer plate
3.	Sheerstrake
4.	Side shell plating
5.	Bilge plating
6.	Bottom plating
7.	Keel plate

Report on TM3-DSBC(CSR)			
8.	Deck longitudinals	17.	Inner bottom plating
9.	Deck girders	18.	Inner bottom longitudinals
10.	Sheerstrake longitudinals	19.	Hopper plating
11.	Topside tank sloping plate	20.	Hopper longitudinals
12.	Topside tank sloping plate longitudinals	31.	Inner side plating
13.	Bottom longitudinals	-	Inner side longitudinals, if any
14.	Bottom girders	-	Horizontal girders in wing ballast tanks
15.	Bilge longitudinals		
16.	Side shell longitudinals, if any		

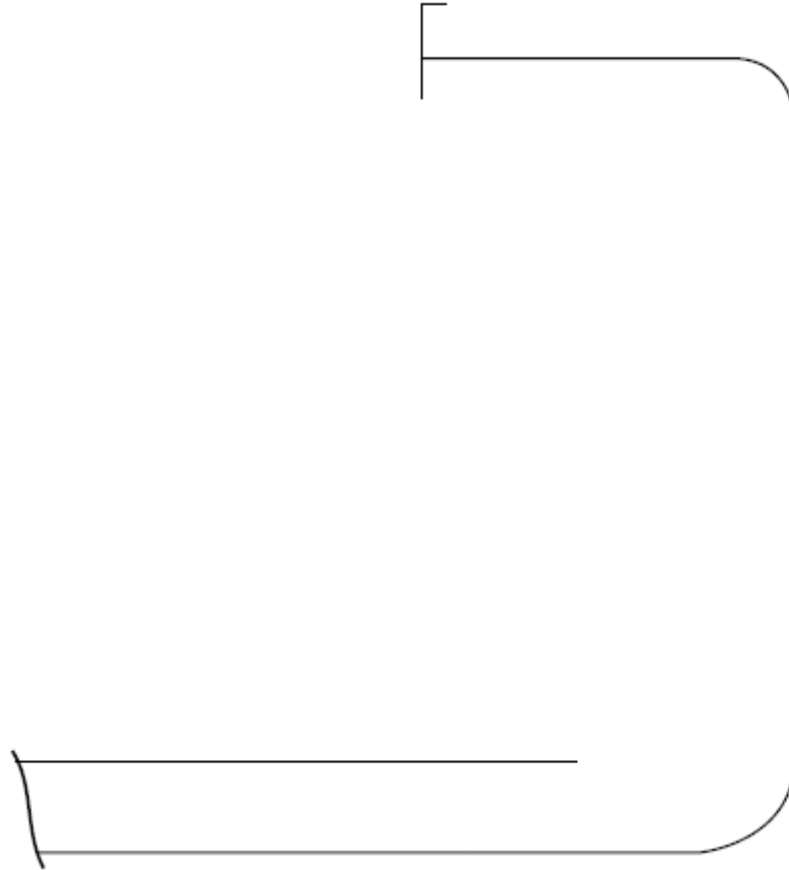
Report on TM4-DSBC(CSR)	
23.	Double bottom tank floors
24.	Topside tank transverses
25.	Hopper side tank transverses
34.	Transverse web frame
-	Ordinary transverse frame in double skin tank

Report on TM6-DSBC(CSR)	
28.	Hatch coamings
-	Deck plating between hatches
-	Hatch covers

Thickness Measurement - Double Skin Bulk Carriers

Sheet 12

Transverse section outline: This diagram may be used for those ships where the diagram on sheet 11 is not suitable

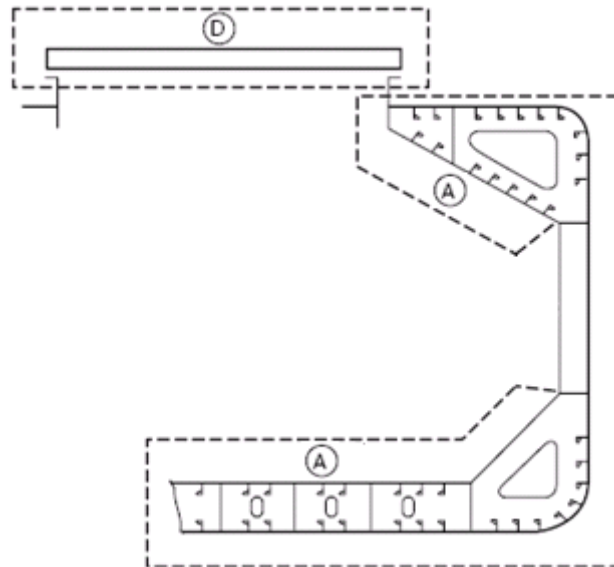


Report on TM2-DSBC(CSR) (i) & (ii)		Report on TM3-DSBC(CSR)	
1. Strength deck plating		8. Deck longitudinal	17. Inner bottom plating
2. Stringer plate		9. Deck girders	18. Inner bottom longitudinals
3. Sheerstrake		10. Sheerstrake longitudinals	19. Hopper plating
4. Side shell plating		11. Topside tank sloping plating	20. Hopper longitudinals
5. Bilge plating		12. Topside tank sloping plating longitudinal	31. Inner side plating
6. Bottom plating		13. Bottom longitudinals	- Inner side longitudinals, if any
7. Keel plate		14. Bottom girders	- Horizontal girders in wing ballast tanks
		15. Bilge longitudinals	
		16. Side shell longitudinals, if any	

Report on TM4-DSBC(CSR)		Report on TM6-DSBC(CSR)	
23. Double bottom tank floors		28. Hatch coamings	
24. Topside tank transverses		- Deck plating between hatches	
25. Hopper side tank transverses		- Hatch covers	
34. Transverse web frame			
- Ordinary transverse frame in double skin tank			

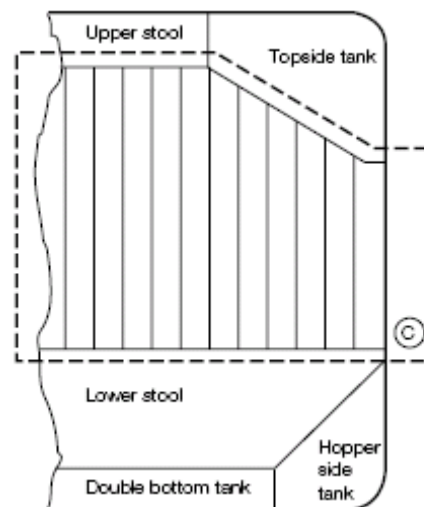
Close-up Survey and Thickness Measurement Areas

Typical transverse section
Areas A and D



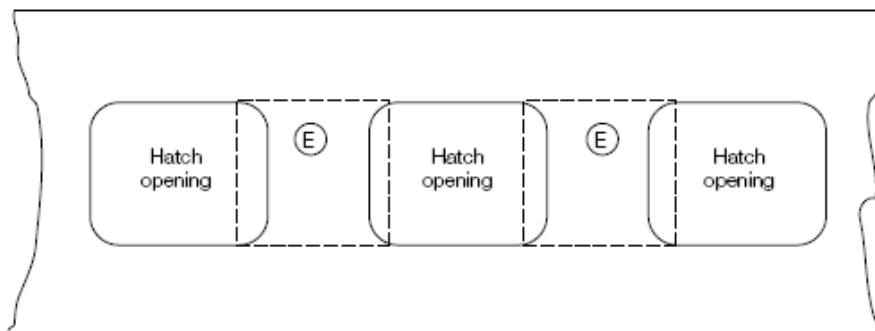
Thickness to be reported on TM3-DSBC(CSR), TM4-DSBC(CSR), TM6-DSBC(CSR) as appropriate

A cargo hold, transverse bulkhead
Area C



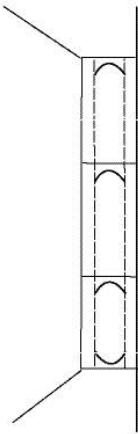
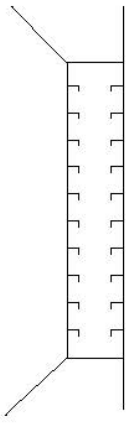
Thickness to be reported on TM5-DSBC(CSR)

Typical areas of deck plating inside line
of hatch openings between cargo hold hatches
Area E



Thickness to be reported on TM6-DSBC(CSR)

Framing in double-side tanks
Area (B)

	
Ordinary transverse frame in double skin tank	Ordinary longitudinal structure in double skin tank

Thickness to be reported on TM4-DSBC(CSR)

ANNEX III

ANNEX IIIA
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:
Classification Society:
Class ID:
Date of build of the ship:
Owner:
Thickness measurement firm:

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 BCS- R Z10.5.

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

1.2 Documentation

All documents used in the development of the survey programme are to be available onboard during the survey as required by section 6.

2 Arrangement of cargo holds, tanks and spaces

This section of the survey programme is to 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 prevention system

This section of the survey programme is to indicate any changes relating to (and is to update) the information on the use of the holds and tanks of the ship, the extent of coatings and the corrosion prevention system provided in the Survey Planning Questionnaire.

4 Conditions for survey

This section of the survey programme is to 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 is to indicate any changes relating to (and is to 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 is to 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 is to identify and list the spaces that should undergo an overall survey for this ship in accordance with 2.3.1.

7.2 Close-up survey

This section of the survey programme is to identify and list the hull structures that are to undergo a close-up survey for this ship in accordance with 2.3.2.

8 Identification of tanks for tank testing

This section of the survey programme is to identify and list the cargo holds and tanks that are to undergo tank testing for this ship in accordance with 2.5.

9 Identification of areas and sections for thickness measurements

This section of the survey programme is to identify and list the areas and sections where thickness measurements are to be taken in accordance with 2.4.1.

10 Minimum thickness of hull structures

This section of the survey programme is to specify the minimum thickness for hull structures of this ship that are subject to BCS- R Z10.5 (indicate either (a) or preferably (b)), if such information is available):

- (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			
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 double hull tanks			
Plating			
Longitudinals or ordinary transverse frames			

Longitudinal stringers			
Longitudinal bulkhead (inner side)			
Plating			
Longitudinals or ordinary transverse frames			
Longitudinal girders (if applicable)			
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 double hull tanks			
Plating			
Flanges			
Stiffeners			
Transverse web frames in hopper tanks			
Plating			
Flanges			
Stiffeners			
<i>Hatch Covers</i>			
Plating			
Stiffeners			
<i>Hatch Coamings</i>			
Plating			
Stiffeners			

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

For vessels built under BCS Common Structural Rules, the renewal thickness of the hull structure elements is indicated in the appropriate drawings.

11 Thickness measurement firm

This section of the survey programme is to identify changes, if any, relating to the information on the thickness measurement firm provided in the Survey Planning Questionnaire.

12 Damage experience related to the ship

This section of the survey programme is to, using the tables provided below, provide details of the hull damages for at least the last three years in way of the cargo holds, ballast tanks and void spaces within the cargo length area. These damages are subject to survey.

Hull damages sorted by location for this ship

Cargo hold, tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

**Hull damages for sister or similar ships (if available) in the case of
design related damage**

Cargo hold, tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

13 Areas identified with substantial corrosion from previous surveys

This section of the survey programme is to identify and list the areas of substantial corrosion from previous surveys.

14 Critical structural areas and suspect areas

This section of the survey programme is to identify and list the critical structural areas and the suspect areas, when such information is available.

15 Other relevant comments and information

This section of the survey programme is to provide any other comments and information relevant to the survey.

Appendices

Appendix 1 - List of plans

Paragraph 5.1.3 requires that main structural plans of cargo holds and ballast tanks (scantling drawings), including information regarding use of high tensile steel (HTS) are to be available. This Appendix of the survey programme is to identify and list the main structural plans which form part of the survey programme.

Appendix 2 - Survey Planning Questionnaire

The Survey Planning Questionnaire (annex IIIB), which has been submitted by the owner, is to be appended to the survey programme.

Appendix 3 - Other documentation

This part of the survey programme is to identify and list any other documentation that forms part of the plan.

Prepared by the owner in co-operation with BCS for compliance with 5.1.3:

Date:.....(name and signature of authorized owner's representative)

Date:.....(name and signature of authorized representative of BCS)

ANNEX IIIB

SURVEY PLANNING QUESTIONNAIRE

1 The following information will enable the owner in co-operation with BCS to develop a Survey Programme complying with the requirements of BCS- R Z10.5. 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 BCS- R Z10.5.

Particulars

Ship's name:

IMO number:

Flag State:

Port of registry:

Owner:

Classification Society:

Class ID:

Gross tonnage:

Deadweight (metric tonnes):

Date of build:

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

2 The owner is to 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. normally within reach of hand.

Hold/ Tank No.	Structure	Permanent Means of Access	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						
	Double side tank plating						
	Transverse bulkhead						
	Hopper tank plating						
	Lower stool plating						
	Tank top						
TOPSIDE TANKS	Underdeck structure						
	Side shell & structure						
	Sloping plate & structure						
	Webs & bulkheads						
HOPPER TANKS	Hopper sloping plate & structure						
	Side shell & structure						
	Bottom structure						
	Webs & bulkheads						
DOUBLE SIDE SKIN TANKS	Side shell & structure						
	Inner skin & structure						
	Webs & bulkheads						
	Double bottom structure						
	Upper stool internal structure						
	Lower stool internal structure						
WING TANKS OF ORE CARRIE RS	Underdeck & structure						
	Side shell & structure						
	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 is to provide details of the results of their inspections, for the last 3 years - in accordance with BCS- R Z10.5 - 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 carriers)					
Fore peak					
Aft peak					
Miscellaneous other spaces:					

Note: Indicate tanks which are used for oil/ballast

- 1) HC=hard coating; SC=soft coating;
SH=semihard coating; 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 3 years)
 - 4) N=no findings recorded; Y=findings recorded,
description of findings is to 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, 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 firm:

BCS- R Z11 Mandatory Ship Type and Enhanced Survey Programme (ESP) Notations

1 PREAMBLE

1.1 The regime of enhanced surveys given in BCS- Rs Z10.1, Z10.2, Z10.3, Z10.4 and Z10.5 as appropriate, are applicable to a number of ship types falling within the broad definitions of oil tankers, chemical tankers and bulk carriers contained in those requirements.

1.2 To clearly indicate to shipowners and the users of BCS's register books those ships which are subject to an enhanced survey programme, the following notations shall be included within the class notation assigned to all such ships, built and/or maintained in accordance with BCS's Rules and Regulations.

1.3 Survey requirements can be found in:

- BCS- R Z10.1 for oil tankers which are not double hull oil tankers;
- BCS- R Z10.2 for single side skin bulk carriers¹;
- BCS- R Z10.3 for chemical tankers;
- BCS- R Z10.4 for double hull oil tankers;
- BCS- R Z10.5 for double side skin bulk carriers¹;
- BCS- R Z10.2 and/or Z10.5 for ore carriers, depending on the structural configuration;
- BCS- R Z10.2 and/or Z10.5 and Z10.1 and/or Z10.4 for combination carriers (ore/oil and oil/bulk/ore), depending on the structural configuration;
- BCS- R Z10.2 and/or Z10.5 for self-unloaders, depending on the structural configuration.

These requirements should be referred to for their detailed applicability.

2 SHIP TYPE AND ENHANCED SURVEY PROGRAMME (ESP) NOTATIONS

2.1 Oil Tanker

The ship type notation "OIL TANKER", or equivalent, and the notation "ESP" shall be assigned to sea going self-propelled ships² which are constructed generally with integral tanks and intended primarily to carry oil in bulk. This type notation shall be assigned to tankers of both single and double hull construction, as well as tankers with alternative structural arrangements, e.g. mid-deck designs. Typical midship sections are given in Figure 1.

Note: Oil Tankers that do not comply with MARPOL I/19 may be subject to International and/or National Regulations requiring phase out under MARPOL I/20 and/or MARPOL I/21

- 1 For bulk carriers with hybrid cargo hold arrangements, i.e. with some cargo holds of single side skin and others of double side skin, the requirements of BCS- R Z10.2 are to apply to cargo holds of single side skin and BCS- R Z10.5 to cargo holds of double side skin.
- 2 Self-propelled ships are ships with mechanical means of propulsion not requiring assistance from another ship during normal operation.

Note:

1. This requirement is implemented from 1 January 2017.

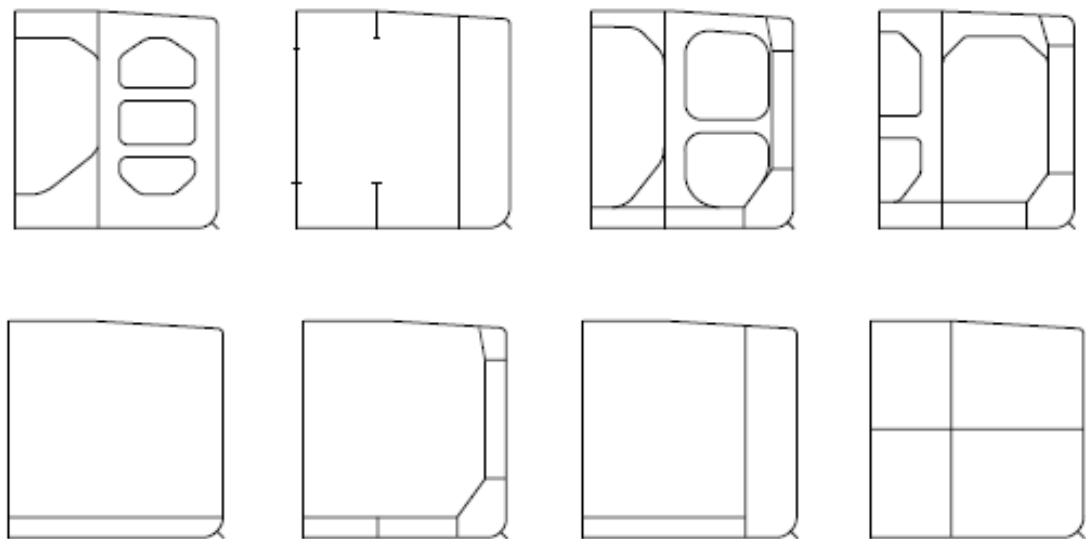


Figure 1

2.2 Bulk Carrier

The ship type notation "BULK CARRIER", or equivalent, and the notation "ESP" shall be assigned to sea going self-propelled ships² which are constructed generally with single deck, double bottom, hopper side tanks and topside tanks and with single or double side skin construction in cargo length area and intended primarily to carry dry cargoes in bulk. Typical midship sections are given in Figure 2.

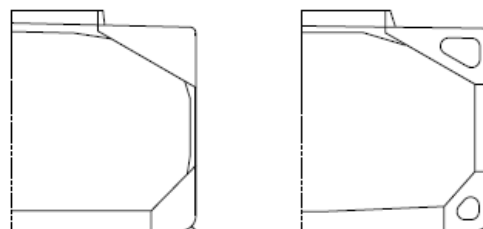


Figure 2

2.3 Ore Carrier

The ship type notation "ORE CARRIER", or equivalent, and the notation "ESP" shall be assigned to sea going self-propelled ships² which are constructed generally with single deck, two longitudinal bulkheads and a double bottom throughout the cargo length area and intended primarily to carry ore cargoes in the centre holds only. Typical midship section are given in Figure 3.

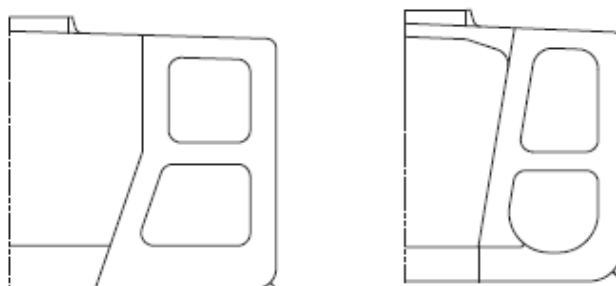


Figure 3

2.4 Combination Carrier

1 "Combination carrier" is a general term applied to ships intended for the carriage of both oil and dry cargoes in bulk; these cargoes are not carried simultaneously, with the exception of oily mixture retained in slop tanks. The ship types defined in .2 and .3 below shall be considered to be combination carriers.

2 The ship type notation 'ORE/OIL CARRIER', or equivalent, and the notation "ESP" shall be assigned to sea going self-propelled ships² which are constructed generally with single deck, two longitudinal bulkheads and a double bottom throughout the cargo length area and intended primarily to carry ore cargoes in the centre holds or of oil cargoes in centre holds and wing tanks. Typical midship sections are given in Figure 4.

Note: ORE/OIL carriers that do not comply with MARPOL I/19 may be subject to International and/or National Regulations requiring phase out.

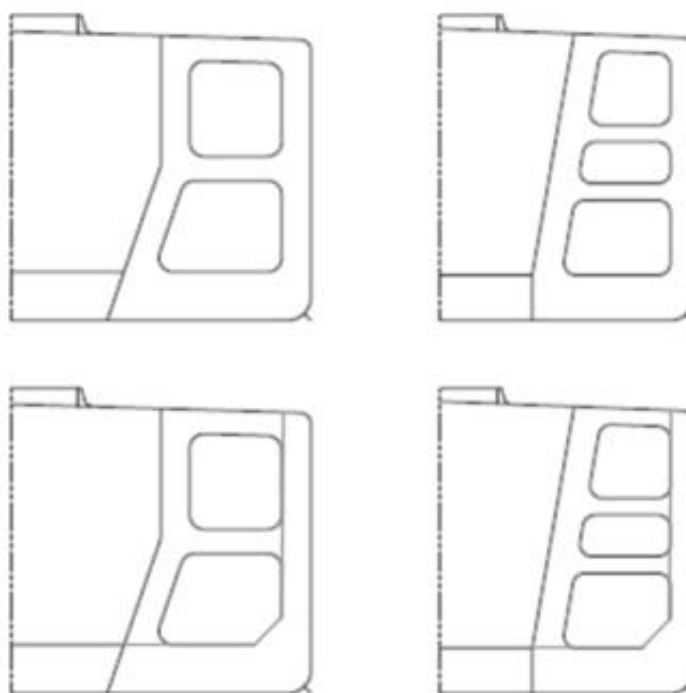


Figure 4

3 The ship type notation "OIL/BULK/ORE (OBO) CARRIER", or equivalent, and the notation "ESP" shall be assigned to sea going self-propelled ships² which are constructed generally with single deck, double bottom, hopper side tanks and topside tanks, and with single or double side skin construction in the cargo length area, and intended primarily to carry oil or dry cargoes, including ore, in bulk. Typical midship sections are given in Figure 5. Note: OIL/BULK/ORE carriers that do not comply with MARPOL I/19 may be subject to International and/or National Regulations requiring phase out.

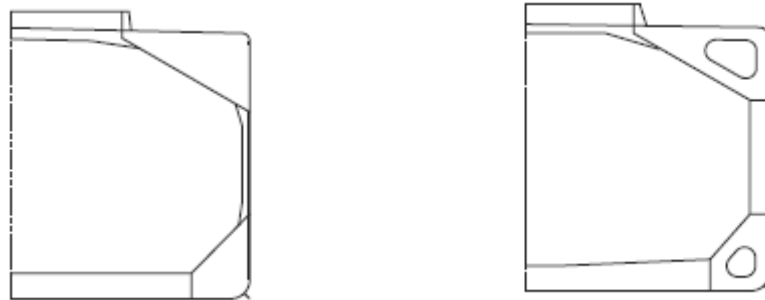


Figure 5

2.5 Self-Unloading Bulk Carriers

The ship type notation "SELF-UNLOADERS", or equivalent, and the notation "ESP" shall be assigned to sea going self-propelled ships² which are constructed generally with single deck, double bottom, hopper side tanks and topside tanks and with single or double side skin construction in cargo length area and intended to carry and self-unload dry cargoes in bulk. Typical midship sections are given in Figure 6.

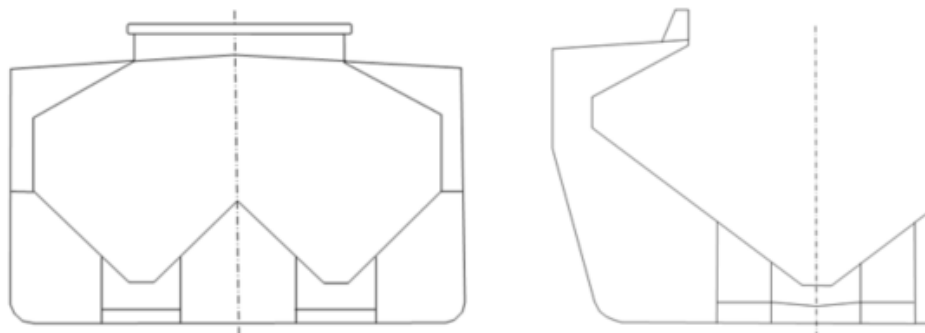


Figure 6

2.6 Chemical Tankers

The ship type notation “CHEMICAL TANKER”, or equivalent, and the notation “ESP” shall be assigned to sea going self-propelled ships² which are constructed generally with integral tanks and intended primarily to carry chemicals in bulk. This type notation shall be assigned to tankers of both single or double hull construction, as well as tankers with alternative structural arrangements. Typical midship sections are given in Figure 7.

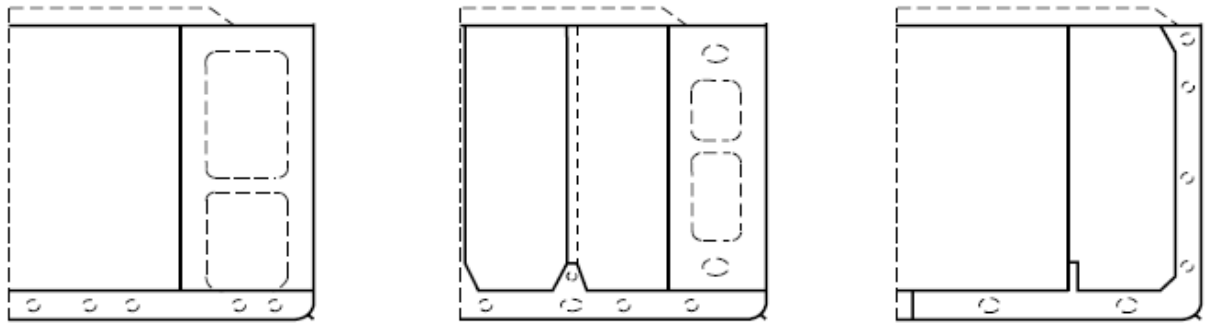


Figure 7

BCS- R Z13 Voyage Repairs and Maintenance

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

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

The above is not intended to include maintenance and overhaul to hull, machinery and equipment in accordance with manufacturer's recommended procedures and established marine practice and which does not require BCS's approval; however, any repair as a result of such maintenance and overhauls which affects or may affect classification is to be noted in the ship's log and submitted to the attending Surveyor for use in determining further survey requirements.

Note:

Annexed "Guidelines for the Survey of Voyage Repairs" is a recommendation and is not a mandatory requirement under this BCS- R Z13.

Notes:

1. This requirement is applied for surveys commenced on or after 1 July 2011.

ANNEX

GUIDELINES FOR THE SURVEY OF VOYAGE REPAIRS

The purpose of these notes is to provide guidance to the field Surveyors in dealing with voyage hull repairs and is to be considered in addition to the Rules of BCS; no part of this guide is intended to conflict with Rules of BCS.

- A. A meeting is to be held with the owners prior to commencement of hull repairs during a vessel's voyage to discuss and confirm the following:
1. It is the owner's responsibility to ensure continued effectiveness of the structure, including the longitudinal strength and the watertight/weathertight integrity of the vessel.
 2. Extent of intended repairs. All repairs to be based on BCS's recommendations and/or concurrence.
 3. Availability of pertinent drawings.
 4. Verification of new materials regarding certification, grade and scantlings. Verified mill sheets to remain on board and to be provided to attending Surveyor examining completed repairs.
 5. Verification of welding consumables regarding certification and suitability for materials involved. Check on availability of drying ovens, holding containers, etc.
 6. Verification of the qualification of welders and supervisory personnel, qualification records to remain on board and to be provided to attending Surveyor examining completed repairs.
 7. Review of intended repair.
 8. Review of the intended provisions to facilitate sound weldments, i.e. cleaning, preheating (if applicable) adherence to welding sequence principles.

Further, it might be necessary to restrict welding to certain positions and prohibit welding in more difficult positions when the ship's motions might influence the quality of the welding.
 9. Review of the application of repair coating, as appropriate.
 10. Review of intended working conditions, i.e. staging, lighting, ventilation, etc.
 11. Review of intended supervision and quality control.
 12. Completed repairs are to be examined and tested as required to the satisfaction of the attending Surveyor.

Note:

All details and results of subject meeting to be covered by a memorandum. A copy of this memorandum is to be placed on board and to be provided to the attending Surveyor examining repairs. In addition, a copy is to be sent/faxed to the arrival port where completed repairs will be examined.

-
- B. Any contemplated repairs to primary hull structures, i.e. main longitudinal and transverse members and their attachments, are to be submitted to BCS for review prior to commencing voyage repairs.

Riding repairs to primary hull structures should not be permitted except in extreme circumstances.

Any repairs to primary hull structures shall require attendance by a Surveyor riding-ship survey or at regular intervals to confirm fit-up, alignment, general workmanship and compliance with recommendations.

NDT of completed repairs to primary structure to be carried out to attending Surveyor's satisfaction.

Repairs to other hull structural parts may be accepted based on examination upon completion of repairs.

- C. No hull repairs carried out by a riding crew should be accepted unless:
1. The initial meeting had been carried out and conditions found satisfactory.
 2. A final satisfactory examination upon completion was carried out.

BCS- R Z15 Hull, Structure, Equipment and Machinery Surveys of Mobile Offshore Drilling Units

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8. OCCASIONAL SURVEYS

- 8.1. Damage Survey
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9. PREPARATION FOR SURVEY

- 9.1. Conditions for Survey
- 9.2. Access to Structures
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- 9.4. Survey Offshore or at Anchorage

APPENDIX A

Underwater Inspection in Lieu of Drydocking Survey

APPENDIX B

Minimum Requirements for Thickness Measurements for Special Survey

Note:

- 1. This requirement is applied for surveys commenced on or after 1 July 2020.

1. GENERAL

1.1. Application

1.1.1. The requirements apply to all Mobile Offshore Drilling Units after their construction.

1.1.2. The requirements apply to surveys of the hull, structure, equipment, and machinery subject to classification.

1.1.3. For Surface-Type Units the survey requirements detailed in this document replace those requirements laid out in BCS- Rs Z1, Z3, Z6, Z7, Z18 and Z21, except when noted in the text. The Thickness Measurement requirements of BCS- R Z7 have been adapted and incorporated into Appendix B Table I of this document.

1.2. Definition

1.2.1. Ballast Tank

A Ballast Tank is a tank which is used primarily for salt water ballast.

1.2.2. Preload Tank

A Preload Tank is a tank within the hull of a self-elevating unit. These tanks are periodically filled with salt water ballast and used to preload the footings of the unit prior to commencing drilling operations. Preload Tanks are considered equivalent to Ballast Tanks.

1.2.3. Spaces

Spaces are separated compartments.

1.2.4. Coating Condition

Coating Condition is defined as follows:

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

1.2.5. Close-Up Survey

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

1.2.6. Transverse Section (Girth Belt)

A Transverse Section (Girth Belt) includes all continuous longitudinal members such as plating, longitudinals and girders at a given section of the unit.

1.2.7. Representative Spaces

Representative Spaces are those which are expected to reflect the conditions of other spaces of similar type and service and with similar corrosion prevention systems. When selecting Representative Spaces, account is to be taken of the service and repair history on board and identifiable Critical Structural Areas and/or Suspect Areas.

1.2.8. Critical Structural Area

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

1.2.9. Suspect Area

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

1.2.10. Substantial Corrosion

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

1.2.11. Excessive Diminution

Excessive Diminution is an extent of corrosion beyond allowable limits.

1.2.12. Corrosion Prevention System

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

1.2.13. Prompt and Thorough Repair

A Prompt and Thorough Repair is a permanent repair completed at the time of survey to the satisfaction of the Surveyor, therein removing the need for the imposition of any associated condition of classification.

1.2.14. Special consideration

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

1.2.15. Propulsion Assist

Propulsion Assist are non-self-propelled Units fitted with thrusters intended to assist in manoeuvring or propelling while under tow.

1.2.16. Remote Inspection Techniques(RIT)

Remote Inspection Technique is a means of survey that enables examination of any part of the structure without the need for direct physical access of the surveyor (refer to BCS- G 42).

1.3. Repairs

1.3.1. Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Surveyor, will affect the Unit's structural, watertight or weathertight integrity, is to be promptly and thoroughly (see 1.2.13.) repaired.

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

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

1.3.3. Where the damage mentioned in Para. 1.3.1 is isolated and of a localised nature which does not affect the unit's structural integrity, consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weather tight integrity and impose a condition of class in accordance with BCS- PR 35, with a specific time limit.

1.4. Remote Inspection Techniques (RIT)

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

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

1.4.3. When using a RIT as an alternative to close-up survey, if not carried out by BCS itself, it is to be conducted by a firm approved as a service supplier according to BCS- R Z17 and is to be witnessed by an attending surveyor of BCS.

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

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

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

2. SPECIAL SURVEY

2.1. Schedule

2.1.1. Special Surveys (Renewal Surveys) of hull, structure, equipment, and machinery are to be carried out at 5 year intervals to renew the Classification Certificate(s).

2.1.2. The first Special Survey is to be completed within 5 years from the date of the initial classification survey and thereafter within 5 years from the credited date of the previous Special Survey. Extensions of class beyond the 5th year may be granted in exceptional circumstances (for a definition of exceptional circumstances, see BCS- PR 1C). In this case the next period of class will start from the expiry date of the Special Survey before the extension was granted.

2.1.3. For survey completed within 3 months before the expiry date of the Special Survey, the next period of class will start from the expiry date of the Special Survey. For Survey completed more than three months before the expiry date of the Special Survey, the period of class will start from the survey completion date.

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

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

2.1.6. When considered necessary by BCS the interval between Special Surveys may be reduced.

2.1.7. Special Survey requirements of units of unusual design, in lay-up or in unusual circumstances will be determined on individual basis.

2.1.8. At the request of the Owner, and upon BCS's approval of the proposed arrangements, a system of Continuous Survey may be undertaken whereby the Special Survey requirements are carried out in regular rotation in accordance with the Rules of BCS to complete all the requirements of the particular Special Survey within a five year period. Any defects that may affect classification found during the survey, are to be reported to BCS and dealt with to the satisfaction of the Surveyor.

2.2. Scope

2.2.1. The Special Surveys shall include, in addition to Annual Survey requirements per Section 3, the following examinations, tests, and checks of sufficient extent to verify that the hull, structure, equipment, and machinery are in satisfactory condition and that the Mobile Offshore Drilling Unit is in compliance with the applicable Rule requirements for the new period of class of 5 years to be assigned subject to proper maintenance and operation and the Periodical Surveys carried out at the due dates.

2.2.2. The examinations of the hull are to be supplemented by thickness measurements and testing as required, to verify the structural integrity. The aim of the examination is to discover Excessive Diminution, Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

2.2.3. The Special Survey is to include examination of underwater parts per Section 4.

2.3. Special Survey No. 1 – Hull, Structure and Equipment

2.3.1. All Units

The following parts are to be examined:

- The hull or platform structure including tanks, watertight bulkheads and deck, cofferdams, void spaces, sponsons, chain lockers, duct keels, helicopter deck and its supporting structure, machinery spaces, peak spaces, steering gear spaces, and all other internal spaces are to be examined externally and internally for damage, fractures, or excessive diminution. Thickness gauging of plating and framing may be required where wastage is evident or suspected.
- All tanks, compartments and free-flooding spaces throughout the drilling unit are to be examined externally and internally for excess wastage or damage.
- Internal examinations of spud cans and mats may be specially considered.
- Watertight integrity of tanks, bulkheads, hull, decks and other compartments is to be verified by visual inspection.
- Suspect areas and critical structural areas should be examined and may be required to be tested for tightness, non-destructive tested or thickness gauged.
- All special and primary application structures (as defined in BCS- G 11) and identified critical structural areas are to be subjected to Close up survey.
- Tanks and other normally closed compartments are to be ventilated, gas freed and cleaned as necessary to expose damages and allow meaningful examination and thickness gauged in case of excessive diminution.
- Internal examination and testing of void spaces, compartments filled with foam or corrosion inhibitors, and tanks used only for lube oil, light fuel oil, diesel oil, fresh water, drinking water or other non-corrosive products may be waived provided that upon a general examination the Surveyor considers their condition to be satisfactory. External thickness gauging may be required to confirm corrosion control.
- Structures such as derrick substructure and supporting structure, jack-houses, deck houses, superstructures, helicopter landing areas, raw water (sea water intake) towers and their respective attachments to the deck or hull.
- Windlass and attachments of anchor racks and anchor cable fairleads.
- Foundations and supporting headers, brackets, and stiffeners for drilling related apparatus, where attached to hull, deck, superstructure or deck house.
- Thickness gaugings are to be carried out where wastage is evident or suspect.
- Where provided, the condition of corrosion prevention system of ballast tanks is to be examined. Where a hard protective coating is found in POOR condition and it is not renewed, where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from time of construction, the tanks in question are to be examined at a frequency determined by BCS. Thickness measurements are to be carried out as deemed necessary by the Surveyor.

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- Thickness measurements are to be carried out in accordance with Appendix B, tables 1, 2 or 3 as applicable. The Surveyor may extend the thickness measurements as deemed necessary. When thickness measurements indicate substantial corrosion, the extent of thickness measurements is to be increased to determine areas of substantial corrosion. Table 4 of Appendix B may be used as guidance for these additional thickness measurements. These extended thickness measurements are to be carried out before the survey is credited as completed.

2.3.2. Surface-type Units

In addition to the requirements of 2.3.1 the following items are to be examined:

- Structural appendages and ducts for positioning units.

2.3.3. Self-Elevating Units

In addition to the requirements of 2.3.1 the following items are to be examined:

- All legs, including chords, diagonal and horizontal braces, gussets, racks, joints, together with leg guides. Tubular or similar type legs are to be examined externally and internally, together with internal stiffeners and pinholes as applicable.
- Structure in, around and under jack-house and leg wells. Non-destructive testing of these areas may be required.
- Leg jacking or other elevating systems externally.
- Leg connections to bottom mats or spud cans, including non-destructive testing of leg connections to mats or spud cans.
- Jetting piping systems or other external piping, particularly where penetrating mats or spud cans.
- Spud cans or mats. Where the spud cans or mat are partly or entirely obscured below the mud line where the Special Survey is otherwise being completed, consideration may be given to postponement of the examinations until the next Rig move.

2.3.4. Column-Stabilized Units

In addition to the requirements of 2.3.1 the following items are to be examined:

- Connections of columns and diagonals to upper hull, structure or platform and lower hull, structure or pontoons. Joints of supporting structure including diagonals, braces and horizontals, together with gussets and brackets. Internal continuation or back-up structure for the above. Non-destructive examination may be required of these areas.

2.4. Special Survey No. 2 and Subsequent Special Surveys - Hull, Structure and Equipment

These Surveys are to be at least as comprehensive as Special Survey No. 1, with special attention being given to the condition and thickness of material in high corrosion areas. Representative gaugings will be required as per Appendix B. Special attention should be paid to splash zones on structure, legs or related structure, and in ballast tanks, pre-load tanks, free-flooding spaces, spud cans and mats.

2.5. Special Surveys – Machinery

2.5.1. Non-Self-Propelled Units

In addition to the requirements for Annual Surveys, at each Special Survey, special attention is to be given to the following items as applicable:

- All openings to the sea, including sanitary and other overboard discharges, together with cocks and valves connected therewith are to be examined internally and externally while the Unit is in drydock, or at the time of underwater examination in lieu of drydocking, and the fastenings to the shell plating are to be renewed when considered necessary by the Surveyor.
- Pumps and pumping arrangements, including valves, cocks, pipes and strainers are to be examined. Non-metallic flexible expansion pieces in the main salt water circulating system are to be examined internally and externally. The Surveyor is to be satisfied with the operation of the bilge and ballast systems. Other systems are to be tested as considered necessary.
- The foundations of machinery are to be examined.
- Heat exchangers and other unfired pressure vessels within the scope of classification are to be examined, opened up or thickness gauged and pressure tested as considered necessary, and associated relief valves proved operable. Evaporators that operate with a vacuum on the shell need not be opened, but may be accepted on basis of satisfactory external examination and operational test or review of operating records.

2.5.2. Self-Propelled Units

In addition to the requirements for non-propelled units, the main and auxiliary propulsion machinery, including associated pressure vessels should be surveyed. In addition, examination of the steering machinery is to be carried out, including an operational test and checking or relief-valve settings. The machinery may be required to be opened for further examination as considered necessary by the Surveyor.

2.5.3. Units with Propulsion - Assist or Dynamic Position

Propulsion-assist and dynamic positioning equipment should be surveyed on the basis of Special Survey-Machinery in accordance with the requirements of BCS.

2.6. Special Survey - Electrical Equipment

In addition to the requirements for Annual Surveys, at each Special Survey, special attention is to be given to the following items as applicable:

- Fittings and connections on main switchboards and distribution panels are to be examined, and care is to be taken to see that no circuits are overfused.
- Cables are to be examined as far as practicable without undue disturbance of fixtures.
- All generators are to be run under load, either separately or in parallel. Switches and circuit breakers are to be tested.

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- All equipment and circuits are to be inspected for possible development of physical changes or deterioration. The insulation resistance of the circuits is to be measured between conductors and between conductors and ground and these values compared with those previously measured.
 - Electrical auxiliaries installed for vital purposes, generators and motors are to be examined and their prime movers opened for inspection. The insulation resistance of each generator and motor is to be measured.
 - The windings of main propulsion generators and motors are to be thoroughly examined and found or made dry and clean. Particular attention is to be paid to the ends of all windings of stators and rotors.
 - Emergency power systems are to be examined and tested.

2.7. Special Survey - Shipboard Automatic and Remote Control Systems

In addition to the requirements of Annual Surveys the following parts are to be examined:

- Control Actuators: All mechanical, hydraulic, and pneumatic control actuators and their power systems are to be examined and tested as considered necessary.
- Electrical equipments: The insulation resistance of the windings of electrical control motors or actuators is to be measured, with all circuits of different voltages above ground being tested separately to the Surveyor's satisfaction.
- Unattended Plants: Control systems for unattended machinery spaces are to be subjected to dock trials at reduced power on the propulsion engine to verify the proper performance of all automatic functions, alarms, and safety systems.

2.8. Special Survey - Special Features (All Types)

Mobile Offshore Drilling Units may have many items of machinery and electrical equipment not found on conventional vessels. Certain of these items are required for classification even if the unit is without propulsion machinery. Items to be especially examined and reported upon at all Special Surveys are as follows:

2.8.1. Hazardous Areas - Enclosed hazardous areas such as those containing open active mud tanks, shale shakers, degassers and desanders are to be examined and doors and closures in boundary bulkheads verified as effective. Electric lighting, electrical fixtures, and instrumentation are to be examined, proven satisfactory and verified as explosion-proof or intrinsically safe. Ventilating systems including ductwork, fans, intake and exhaust locations for enclosed restricted areas are to be examined, tested and proven satisfactory. Ventilating air alarm systems to be proven satisfactory. Electrical motors are to be examined including closed-loop ventilating systems for large D-C motors. Automatic power disconnect to motors in case of loss of ventilating air is to be proved satisfactory.

2.8.2. Remote Shutdown Arrangements - Remote shutdown for fuel-oil transfer service pumps and ventilating equipment, together with oil tank outlet valves where required to be capable of being remotely closed are to be proved satisfactory. Emergency switch(s) for all electrical equipment including main and emergency generators, except alarm and communication systems and lighting in vital areas such as escape routes and landing platforms, are to be proved satisfactory.

2.8.3. Fire Fighting Systems where included in BCS's Rules - A general examination of the fire detection and extinguishing systems is to be made in order that the Surveyor may be satisfied with its efficient state. The following items are to be especially examined:

- Fire hoses, nozzles, and spanners at each fire station.
- Servicing of all portable extinguishers.
- Weighing and re-charging as necessary of all dry chemical and CO₂ extinguishers.
- Fire pumps and piping including operation and capacity.
- Alarm systems including fire and gas detection.

2.8.4. Self Elevating Systems - On self elevating type Mobile Offshore Drilling Units, the elevating systems are to be examined and reported on. Pinions and gears of the climbing pinion gear train of rack and pinion systems are to be examined, as far as practicable, to the Surveyor's satisfaction by an effective crack detection method.

2.8.5. Piping Systems - Piping systems used solely for drilling operations and complying either with the Society's requirements or a recognized standard are to be examined, as far as practical, operationally or hydrostatically tested to working pressure, to the satisfaction of the Surveyor.

2.8.6. Miscellaneous - Bilge alarm systems, if fitted, to be tested.

3. ANNUAL SURVEY

3.1. Schedule

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

3.2. Scope

The survey consists of an examination for the purpose of verifying, as far as practicable, that the hull, structure, equipment, and machinery are maintained in accordance with the applicable Rule requirements.

3.3. Annual Survey - Hull, Structure and Equipment

3.3.1. At each Annual Survey the exposed parts of the hull, deck, deck house, structures attached to the deck, derrick substructure, including supporting structure, accessible internal spaces, and the applicable parts listed below are to be generally examined and placed in satisfactory condition as found necessary.

3.3.2. The Surveyors are to be satisfied at each Annual Survey that no material alterations have been made to the unit, its structural arrangements, subdivision, superstructure, fittings, and closing appliances upon which the stability calculations or the load line assignment is based.

3.3.3. Suspect Areas identified at previous surveys are to be examined. Thickness measurements are to be taken of the areas of substantial corrosion and the extent of thickness measurements is to be increased to determine areas of substantial corrosion. Appendix B, Table 4 may be used as guidance for these additional thickness measurements. These extended thickness measurements are to be carried out before the annual survey is credited as completed.

3.3.4. All Units

The following items are to be examined:

- Accessible hatchways, manholes and other openings.
- Machinery casings and covers, companionways, and deck houses protecting openings.
- Portlights together with deadcovers, cargo ports and similar openings in hull sides, ends, or in enclosed superstructures.
- Ventilators, tank vent pipes together with flame screens, and overboard discharges from enclosed spaces.
- Watertight bulkheads and end bulkheads of enclosed superstructures.
- Closing appliances for all the above, including hatchcovers, doors, together with their respective securing devices, dogs, sill, coamings and supports.
- Freeing ports together with bars, shutters and hinges.
- Windlass and attachment of anchor racks and anchor cables.

-
- Protection of the crew, guard rails, lifelines, gangways, and deck houses accommodating crew.

3.3.5. Surface-Type Units

In addition to the requirements of 3.3.4 the following items are to be examined:

The hull and deck structure around the drilling well (moon-pool) and in vicinity of any other structural changes in section, slots, steps, or openings in the deck or hull and the back-up structure in way of structural members or sponsons connecting to the hull.

3.3.6. Self-Elevating Units

In addition to the requirements of 3.3.4 the following items are to be examined:

Jack-house structures and attachments to upper hull or platform. Jacking or other elevating systems and leg guides, externally. Legs as accessible above the waterline, Plating and supporting structure in way of leg wells.

3.3.7. Column-Stabilized Units

In addition to the requirements of 3.3.4 the following items are to be examined:

Columns, diagonal and horizontal braces together with any other parts of the upper hull supporting structure as accessible above the waterline.

Note: At the 1st Annual Survey after construction, Column Stabilized and Self Elevating Units may be subject to examination of major structural components including non-destructive testing, as deemed necessary by BCS. If BCS deems such survey to be necessary, the extent should be agreed to by BCS and the Owner or operator prior to commencement of the Survey.

3.4. Annual Survey - Machinery

3.4.1. Self-Propelled Units

A general examination of main and auxiliary engines, boilers, steering machinery, pumps, pipings, electrical installation including those in hazardous areas, and fire extinguishing systems is to be carried out.

3.4.2. Non-Self Propelled Units

A general examination of items required for classification such as auxiliary machinery, pumps, piping, electrical installation in hazardous areas and fire extinguishing systems is to be carried out.

3.4.3. Units with Propulsion-Assist or Dynamic Positioning

Propulsion-assist and dynamic positioning equipment should be surveyed on the basis of Annual Survey-Machinery in accordance with the requirements of BCS.

3.5. Annual Survey - Electrical Equipment

A general examination of electrical machinery, the emergency sources of electrical power, the switchgear, and other electrical equipment, including operation of same is to be carried out. The operation of the emergency sources of power, including their automatic operation, is to be confirmed as far as practicable.

3.6. Annual Survey - Shipboard Automatic and Remote Control Systems

A general examination of the automatic and remote-control system is to be made to the Surveyor's satisfaction. The machinery-space fire-detection and bilge water-level alarms are to be tested to confirm satisfactory operation.

3.7. Annual Survey - Special Features

A general examination of hazardous areas, remote shutdown arrangements, fire fighting systems where included in BCS's Rules, self-elevating systems, piping systems, and bilge systems is to be made.

4. SURVEY OF THE OUTSIDE OF UNIT'S BOTTOM AND RELATED ITEMS

4.1. Schedule

4.1.1. There is to be a minimum of two examinations of the outside of the unit's bottom and related items during each five-year special survey period. One such examination is to be carried out in conjunction with the special survey. In all cases the interval between any two such examinations is not to exceed 36 months. For units operating in salt water for less than six (6) months each year, the survey interval may be increased by BCS.

4.1.2. Consideration may be given at the discretion of BCS, to any special circumstances justifying an extension of the interval.

4.1.3. Proposals for alternative means of examining the unit's bottom and related items while afloat may be considered, provided they are in general agreement with Appendix A.

4.2. Parts to be Examined

4.2.1. Surface-type Units (ship or barge type units)

- External surfaces of the hull, keel, stem, stern frame, rudder, nozzles, and sea strainers are to be selectively cleaned to the satisfaction of the attending Surveyor and examined together with appendages, the propeller, exposed parts of stern bearing assembly, rudder pintle and gudgeon securing arrangements, sea chest and strainers, and their fastenings.
- Propeller shaft bearing, rudder bearing, and steering nozzle clearances are to be ascertained and recorded.

4.2.2. Self-Elevating Units

- External surfaces of the upper hull or platform, spud cans, mat, underwater areas of legs, together with their connections as applicable, are to be selectively cleaned to the satisfaction of the attending Surveyor and examined.
- At each Drydocking Survey or equivalent, after Special Survey No. 2, the Surveyor is to be satisfied with the condition of the internal structure of the mat or spud cans. Leg connections to mat and spud cans are to be examined at each Drydock Survey or equivalent. Non-destructive testing may be required of areas considered to be critical by BCS or found to be suspect by the Surveyor.

4.2.3. Column-Stabilized Units

- External surfaces of the upper hull or platform, footings, pontoons or lower hulls, underwater areas of columns, bracing and their connections, sea chests, and propulsion units as applicable, are to be selectively cleaned and examined to the satisfaction of the attending Surveyor. Non-destructive testing may be required of areas considered to be critical by BCS or found to be suspect by the Surveyor.

4.3. Ballast Spaces

In conjunction with Drydocking Surveys (or equivalent) after Special Survey No. 1 and between subsequent Special Surveys, the following ballast spaces are to be internally examined, thickness gauged, placed in satisfactory condition as found necessary, and

reported upon. If such examination reveals no visible structural defects, the examination may be limited to a verification that the corrosion prevention arrangements remain effective.

4.3.1. All Units

Particular attention is to be given to corrosion prevention systems in ballast spaces, free-flooding areas and other locations subjected to sea water from both sides.

4.3.2. Surface type units

One peak tank and at least two other representative ballast tanks between the peak bulkheads used primarily for water ballast.

4.3.3. Self elevating units

Representative ballast tanks or free-flooding compartments in mat or spud cans, if accessible, and at least two representative hull pre-load tanks.

4.3.4. Column stabilized units

Representative ballast tanks in footings, lower hulls, or free-flooding compartments as accessible, and at least two ballast tanks in columns or upper hull, if applicable.

5. PROPULSION SYSTEM SURVEYS

5.1. Schedule

Refer to the schedule in BCS- R Z21 for propeller shaft surveys.

5.2. Propeller Shaft surveys and extension of survey intervals

Surveys are to be carried out in accordance with the Rules of BCS, except that in the case of Mobile Offshore Drilling unit, due to low running hours on propeller shaft, extended intervals between propeller shaft surveys may be considered based on:

- Satisfactory diver's external examination of stern bearing and outboard seal area including wear-down check as far as is possible.
- Internal examination of the shaft area (inboard seals) in propulsion room(s).
- Confirmation of satisfactory lubricating oil records (oil loss rate, contamination).
- Shaft seal elements are examined/replaced in accordance with seal manufacturer's recommendations.

5.3. Other propulsion systems

Other propulsion systems shall be surveyed according to the Society's Rule.

6. BOILERS SURVEYS

6.1. Schedule

Boiler Surveys are to be carried out according to the schedule found in BCS- R Z18.2.

6.2. Scope

6.2.1. At each Boiler Survey the boilers, superheaters, and economizers are to be examined internally (water-steam side) and externally (fire side).

6.2.2. Boiler mountings and safety valves are to be examined at each Boiler Survey and opened as considered necessary by the Surveyor.

6.2.3. The proper operation of the safety valves is to be confirmed at each survey.

6.2.4. When considered necessary by the Surveyor, the boilers and superheaters are to be subjected to hydrostatic pressure test.

7. SURVEY PREPLANNING AND RECORD KEEPING

7.1. A specific Survey Program for Special Surveys and Special Continuous Surveys must be worked out in advance of the Special Survey by the Owner in cooperation with BCS. The Survey Program shall be in written format.

7.2. Plans and procedures for survey of the outside of the unit's bottom and related items are to be submitted for review in advance of the survey and made available on board. These should include drawings or forms for identifying the areas to be surveyed, the extent of hull cleaning, non-destructive testing locations (including NDT methods), nomenclature, and for the recording of any damage or deterioration found. Submitted data, after review by BCS, will be subject to revision if found to be necessary in light of experience.

8. OCCASIONAL SURVEYS

8.1. Damage Survey

8.1.1. It is the responsibility of the Owner/operator of the unit to report to BCS without delay any damage, defect or breakdown, which could invalidate the conditions for which a classification has been assigned so that it may be examined at the earliest opportunity by BCS's Surveyor(s). All repairs found necessary by the Surveyor are to be carried out to his satisfaction.

8.2. Repairs

8.2.1. Where repairs to hull, legs, columns or other structures, machinery or equipment, which affect or may affect classification, are planned in advance to be carried out, a complete repair procedure including the extent of proposed repair and the need for Surveyors attendance is to be submitted to and agreed upon by BCS reasonably in advance. Failure to notify BCS, in advance of the repairs, may result in suspension of the unit's classification until such time as the repair is redone or evidence submitted to satisfy the Surveyor that the repair was properly carried out. This applies also to repairs during voyage or on site.

8.2.2. The above is not intended to include maintenance and overhaul to hull, other structures, machinery and equipment in accordance with recommended manufacturers procedures and established marine practice and which does not require BCS approval; however, any repair as a result of such maintenance and overhauls which affects or may affect classification is to be noted in the ships log and submitted to the Surveyor.

8.3. Lay-up and Reactivation Surveys

8.3.1. When BCS is notified by the Owner that a Unit has been laid-up, this status will be noted in the vessel's survey status and surveys falling due during lay-up may then be held in abeyance until the vessel reactivates, at which time they are to be brought up-to-date.

8.3.2. Units which have been laid up and are returning to active service, regardless of whether BCS has been previously informed that the vessel has been in lay-up, a Reactivation Survey is required. The requirements for the Reactivation Survey are to be specially considered in each case, having due regard being given to the status of surveys at the time of the commencement of lay-up, the length of the lay-up period and the conditions under which the vessel has been maintained during that period.

8.4. Alterations

No alterations which may affect classification are to be made to the hull or machinery of a classed unit unless plans of proposed alterations are submitted and approved by BCS before the work of alterations is commenced. Such work is to be carried out in accordance with approved plans and tested on completion as required by the Rules and to the satisfaction of the Surveyor.

8.5. Welding and Replacement of Materials

8.5.1. Welding of steels, including high strength structural steel, is to be to the satisfaction of BCS.

8.5.2. Welding or other fabrication performed on steels of special characteristics or repairs or renewals of such steel or in areas adjacent to such steel is to be accomplished with procedures approved by BCS considering the special materials involved. Substitution of steels differing from those originally installed is not to be made without approval by BCS.

8.5.3. BCS may reference BCS- G 11 - "Materials Selection Guideline for Mobile Offshore Drilling Units" when considering suitable replacement materials.

9. PREPARATION FOR SURVEY

9.1. Conditions for Survey

9.1.1. The Owner is to provide the necessary facilities for a safe execution of the survey. For confined space entry, the requirements of BCS- PR37 should be followed.

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

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

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

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

9.2. Access to Structures

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

9.2.2. For survey in void compartments and water ballast tanks, one or more of the following means for access, acceptable to the Surveyor, is to be provided:

- permanent staging and passages through structures;
- temporary staging and passages through structures;
- lifts and movable platforms;
- boats or rafts;
- other equivalent means.

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

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

9.3. Equipment for Survey

9.3.1. Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required. Thickness measurements are to be carried out by a firm approved by BCS in accordance with BCS- R Z17.

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

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

Other acceptable NDT Techniques.

9.4. Survey Offshore or at Anchorage

9.4.1. Survey offshore or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel onboard.

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

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

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

See footnote*

* Reference is made to BCS- G 39 – Guidelines for use of Boats or Rafts for Close-up surveys.

Appendix A - Underwater Inspection in Lieu of Drydocking Survey

A1 General

Following are the procedures and conditions under which a properly conducted underwater inspection may be credited as equivalent to a Drydocking Survey.

A2 Conditions

A2.1 Limitations

Underwater Inspection in lieu of Drydocking Survey may not be acceptable where there is record of abnormal deterioration or damage to the underwater structure; or where damage affecting the fitness of the unit is found during the course of the survey.

A2.2 Thickness Gauging and Non-Destructive Testing

Underwater or internal thickness gaugings of suspect areas may be required in conjunction with the underwater inspection. Means for underwater non-destructive testing may also be required for fracture detection.

A2.3 Plans and Data

Plans and procedures for the Drydocking Survey (Underwater Inspection) are to be submitted for review in advance of the survey and made available on board. These should include drawings or forms for identifying the areas to be surveyed, the extent of underwater cleaning, non-destructive testing locations (including NDT methods), nomenclature, and for the recording of any damage or deterioration found.

A2.4 Underwater Conditions

The in-water visibility and the cleanliness of the hull below the waterline is to be clear enough to permit a meaningful examination which allows the surveyor and diver and/or ROV pilot to determine the condition of the plating, appendages and the welding. BCS is to be satisfied with the methods of orientation of the divers/ROVs on the plating, which should make use where necessary of permanent markings on the plating at selected points. Overall or spot cleaning may be required.

A3 Physical Features

The following physical features are to be incorporated into the unit's design in order to facilitate the underwater inspection. When verified they will be noted in the unit's classification for reference at subsequent surveys.

A3.1 Stern Bearing

For self-propelled units, means are to be provided for ascertaining that the seal assembly on oil-lubricated bearings is intact and for verifying that the clearance or wear-down of the stern bearing is not excessive. For use of the wear-down gauges, up-to-date records of the base depths are to be maintained on board. Whenever the stainless-steel seal sleeve is renewed or machined, the base readings for the wear-down gauge are to be re-established and noted in the vessel's records and in the survey report.

A3.2 Rudder Bearings

For self-propelled units with rudders, means and access are to be provided for determining the condition and clearance of the rudder bearings, and for verifying that all parts of the pintle and gudgeon assemblies are intact secure. This may require bolted access plates and a measuring arrangement.

A3.3 Sea Suctions

Means are to be provided to enable the diver to confirm that the sea suction openings are clear. Hinged sea suction grids would facilitate this operation.

A3.4 Sea Valves

For the Drydocking Survey (Underwater Inspection) associated with the Special Survey, means must be provided to examine any sea valve.

A4 Procedures

A4.1 Exposed Areas

An examination of the outside of the structure above the waterline is to be carried out by BCS's Surveyor. Means and access are to be provided to enable the Surveyor to accomplish visual inspection and non-destructive testing as necessary.

A4.2 Underwater Areas

An examination of the entire unit below the waterline is to be carried out by an approved firm in accordance with BCS- R Z17.

A4.3 Damage Areas

Damage areas are to be photographed. Internal examination, measurements, marking and thickness gauging of such locations may be necessary as determined by the attending Surveyor. Means are to be provided for location, orienting and identifying underwater surfaces in photographs or on video tapes.

A5 Alternatives

BCS is prepared to consider alternatives to the above guidelines including remotely operated vehicles, provided means and details for accomplishing results are not less effective.

Information Note:

Appendix A would be applicable to all drilling unit types due to contents of paragraph A2.3 - Plans and Data.

Appendix B - Minimum Requirements for Thickness Measurements for Special Survey

TABLE 1

Minimum Requirements for Thickness Measurements for Surface-Type Units at Special Survey

Special Survey No.1 Age ≤ 5	Special Survey No.2 < 5 Age ≤ 10	Special Survey No.3 10 < Age ≤ 15	Special Survey No.4 and subsequent 15 < Age
1) Suspect areas throughout the unit.	1) Suspect areas throughout the unit.	1) Suspect areas throughout the unit.	1) Suspect areas throughout the unit
	2) One transverse section of deck plating abreast the moon pool opening within the amidships 0.6L, together with internals in way as deemed necessary. Where unit is configured with side ballast tanks, the plating and internals of the tanks are also to be gauged in way of the section chosen.	2) Two Transverse Sections (Girth Belts) of deck, bottom and side plating abreast the moon pool and one hatch opening within the amidships 0.6L together with internals in way as deemed necessary. Where unit is configured with side ballast tanks, the plating and internals of the tanks to be gauged in way of the required belts, Remaining internals in ballast tanks to be gauged as deemed necessary.	2) A minimum of three Transverse Sections (Girth Belts) of deck, bottom, side, and longitudinal-bulkhead plating in way of the moon pool and other areas within the amidships 0.6L, together with internals in way (including in perimeter ballast tanks, where fitted in way of belts).
	3) Moon pool boundary bulkhead plating.	3) Moon pool boundary bulkhead plating.	3) Moon pool boundary bulkhead plating.
		4) Internals in forepeak tank and aft peak tank as deemed necessary.	4) Internals in forepeak and after peak tanks as deemed necessary.
			5) Lowest strake of all transverse bulkheads in hold spaces. Remaining bulkhead plating to be gauged as deemed necessary.
			6) All plates in two wind and water strakes, port and starboard, full length.
			7) All exposed main deck plating full length and all exposed first-tier super-structure deck plating (poop, bridge and forecastle decks).
			8) All keel plates full length plus additional bottom plating as deemed necessary by the Surveyor, particularly in way of cofferdams and machinery spaces.
			9) Duct keel or pipe tunnel plating or pipe tunnel plating and internals as deemed necessary.
			10) Plating of sea chests. Shell plating in way of overboard discharges as considered necessary by the attending surveyor.

Notes:

1. Thickness measurement locations are to be selected to provide the best representative sampling of areas likely to be most exposed to corrosion, considering ballast history and arrangement and condition of protective coatings.

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

TABLE 2**Minimum Requirements for Thickness Measurements for Self-Elevating Units
at Special Survey**

Special Survey No.1 Age ≤ 5	Special Survey No.2 <5 Age ≤ 10	Special Survey No.3 10 < Age ≤ 15	Special Survey No.4 and subsequent 15 < Age
1) Suspect areas throughout the unit (particular attention to be paid to the legs in way of the Splash Zone).	1) Suspect areas throughout the unit.	1) Suspect areas throughout the unit.	1) Suspect areas throughout the unit.
	2) Legs in way of Splash Zone.	2) Legs in way of Splash Zone.	2) Legs in way of Splash Zone.
	3) Primary application structures where wastage is evident.	3) Representative gaugings, throughout, of special and primary application structures.	3) Comprehensive gaugings, throughout, of special and primary application structures.
	4) Representative gaugings of upper hull deck and bottom plating and internals of one preload (ballast) tank.	4) Leg well structure.	4) Leg well structure.
		5) Representative gaugings of deck, bottom, and side shell plating of hull and mat.	5) Representative gaugings of deck, bottom, and side shell plating of hull and mat.
		6) Representative gaugings of upper hull deck and bottom plating and internals of at least two preload (ballast) tanks.	6) Substructure of derrick as deemed necessary.
			7) Representative gaugings of internals of all preload (ballast) tanks.

Note:

Structural application designation (Special, Primary, Secondary) are defined in BCS- G 11 .

TABLE 3**Minimum Requirements for Thickness Measurements for Column-Stabilized Units at Special Survey**

Special Survey No.1 Age ≤ 5	Special Survey No.2 <5 Age ≤ 10	Special Survey No.3 10 < Age ≤ 15	Special Survey No.4 and subsequent 15 < Age
1) Suspect areas throughout the unit.	1) Suspect areas throughout the unit.	1) Suspect areas throughout the unit.	1) Suspect areas throughout the unit.
2) Columns and bracings where wastage is evident in Splash Zone.	2) Representative gaugings of columns and bracings in Splash Zone together with internals in way as deemed necessary.	2) Representative gaugings, throughout, of special and primary application structures.	2) Comprehensive gaugings, throughout, of special and primary application structures.
	3) Special and primary application structure where wastage is evident.	3) One Transverse Section (Girth Belt) of each of 2 columns and 2 bracings in Splash Zone together with internals in way as deemed necessary.	3) One Transverse Section (Girth Belt) of each of one-half of the columns and bracings in Splash Zone and internals in way as deemed necessary (i.e., gauge half of the unit's columns and bracings in Splash Zone).
		4) Lower hulls in way of mooring lines where wastage is evident.	4) Lower hulls in way of mooring lines where wastage is evident.
		5) One Transverse Section (Girth Belt) of each lower hull between one set of columns.	5) One Transverse Section (Girth Belt) of each lower hull between one set of columns.
			6) Representative gaugings of substructure of drilling derrick.

Note:

Structural application designation (Special, Primary, Secondary) are defined in BCS- G 11 .

TABLE 4

Guidance for Additional Thickness Measurements in way of Substantial Corrosion

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

BCS- R Z16 Periodical surveys of cargo installations on ships carrying liquefied gases in bulk

General

1 Scope

The surveys required herein are relevant to ships designed for the carriage of liquefied gases in bulk. These requirements are related to cargo installations and are additional to those already specified in BCS- R Z1 and Z7.

2 Extent and methods

2.1 The surveys are intended to include all installations and equipment related to the carriage and handling of liquefied gases. These survey requirements do not cover fire protection, fire fighting installation, portable equipment, and personnel protection equipment.

2.2 The annual survey is preferably to be carried out during a loading or discharging operation. Access for cargo tanks or inerted hold spaces, necessitating gas-freeing/aerating will normally not be necessary unless required by the Rules of BCS.

2.3 The intermediate survey required in Section Z16.4, intends to supplement the annual survey by testing cargo handling installations with related automatic control, alarm and safety systems for correct functioning. The intermediate survey is preferably to be carried out with the ship in a gas-free condition. The extent of the testing required for the intermediate survey will normally be such that the survey cannot be carried out during a loading or discharging operation.

1.3 Survey intervals

Survey intervals are to be in accordance with BCS- R Z1 and Z7.

Note:

1. This requirement is applied for surveys commenced on or after 1 July 2014.

2 Special Survey

2.1 General

The requirements of Section Z16.4 apply with the following additions.

2.2 Cargo containment survey

2.2.1 All cargo tanks are to be examined internally.

2.2.2 Special attention is to be given to the cargo tank and insulation in way of chocks, supports and keys. Removal of insulation may be required in order to verify the condition of the tank or the insulation itself if found necessary by the Surveyor.

Where the arrangement is such that the insulation cannot be examined, the surrounding structures of wing tanks, double bottom tanks and cofferdams are to be examined for cold spots when the cargo tanks are in the cold condition unless voyage records together with the instrumentation give sufficient evidence of the integrity of the insulation system.

2.2.3 Non-destructive testing:

2.2.3.1 Non-destructive testing is to supplement cargo tank inspection with special attention to be given to the integrity of the main structural members, tank shell and highly stressed parts, including welded connections as deemed necessary by the surveyor. However, for type C tanks, this does not mean that non-destructive testing can be dispensed with totally. The following items are, inter alia, considered as highly stressed parts:

- cargo tanks supports and anti-rolling/anti-pitching devices,
- web frames or stiffening rings,
- swash bulkhead boundaries,
- dome and stump connections to tank shell,
- foundations for pumps, towers, ladders, etc.,
- pipe connections.

2.2.3.2 For independent tanks type B, the extent of non-destructive testing shall be as given in a programme specially prepared for the cargo tank design.

2.2.4 The tightness of all cargo tanks is to be verified by an appropriate procedure. Provided that the effectiveness of the ship's gas detection equipment has been confirmed, it will be acceptable to utilize this equipment for the tightness test of independent tanks below deck.

2.2.5 Where findings of Z16.2.2.1 to Z16.2.2.4 or an examination of the voyage records raises doubts as to the structural integrity of a cargo tank, a hydraulic or hydro-pneumatic test is to be carried out. For integral tanks and for independent tanks type A and B, the test pressure is to be in accordance with BCS- R G1.10.5 or G1.10.7 as appropriate. For independent tanks type C, the test pressure is not to be less than 1.25 times the MARVS.

2.2.6 At every other special survey (i.e., 2nd, 4th, 6th, etc.), all independent cargo tanks type C are to be either:

2.2.6.1 Hydraulically or hydro-pneumatically tested to 1.25 times MARVS, followed by non-destructive testing in accordance with Z16.2.2.3.1, or

2.2.6.2 Subjected to a thorough, planned non-destructive testing. This testing is to be carried out in accordance with a programme specially prepared for the tank design. If a special programme does not exist, the following applies:

- cargo tank supports and anti-rolling/anti-pitching devices,
- stiffening rings,
- Y-connections between tank shell and a longitudinal bulkhead of bilobe tanks,
- swash bulkhead boundaries,
- dome and sump connections to the tank shell,
- foundations for pumps, towers, ladders etc.,
- pipe connections.

At least 10% of the length of the welded connections in each of the above mentioned areas is to be tested. This testing is to be carried out internally and externally as applicable.

Insulation is to be removed as necessary for the required non-destructive testing. (The individual Societies may choose to include any one or both of the above listed two alternatives in their Rules.)

2.2.7 As far as practicable all hold spaces and hull insulation (if provided), secondary barriers and tank supporting structures are to be visually examined. The secondary barrier of all tanks is to be checked for their effectiveness by means of a pressure/vacuum test, a visual examination or another acceptable method.

2.2.8

- 1) For membrane and semi-membrane tanks systems, inspection and testing are to be carried out in accordance with programmes specially prepared in accordance with an approved method for the actual tank system.
- 2) For membrane containment systems a tightness test of the primary and secondary barrier shall be carried out in accordance with the system designers' procedures and acceptance criteria as approved by BCS. Low differential pressure tests may be used for monitoring the cargo containment system performance, but are not considered an acceptable test for the tightness of the secondary barrier.
- 3) For membrane containment systems with glued secondary barriers if the designer's threshold values are exceeded, an investigation is to be carried out and additional testing such as thermographic or acoustic emissions testing should be carried out.

2.2.9 The pressure/vacuum relief valves, rupture disc and other pressure relief devices for interbarrier spaces and hold spaces are to be opened, examined, tested and readjusted as necessary, depending on their design.

2.2.10 The pressure relief valves for the cargo tanks are to be opened for examination, adjusted, function tested, and sealed. If the cargo tanks are equipped with relief valves with non-metallic membranes in the main or pilot valves, such non-metallic membranes are to be replaced. Where a proper record of continuous overhaul and retesting of individually identifiable relief valves is maintained, consideration will be given to acceptance on the basis of opening, internal examination, and testing of a representative sampling of valves, including each size and type of liquefied gas or vapor relief valve in use, provided there is logbook evidence that the remaining valves have been overhauled and tested since crediting of the previous Special Survey.

2.3 Piping systems

2.3.1 The cargo, liquid nitrogen and process piping systems, including valves, actuators, compensators, etc. are to be opened for examination as deemed necessary. Insulation is to be removed as deemed necessary to ascertain the condition of the pipes. If the visual examination raises doubt as to the integrity of the pipelines, a pressure test at 1.25 times the MARVS for the pipeline is to be carried out. After re-assembly the complete piping systems are to be tested for leaks.

2.3.2 The pressure relief valves are to be function-tested. A random selection of valves is to be opened for examination and adjusted.

2.4 Components

Cargo pumps, compressors, process pressure vessels, liquid nitrogen tanks, heat exchangers and other components, including prime movers, used in connection with cargo handling and methane boil-off burning are to be examined as required in the Rules of BCS for periodical survey of machinery.

2.5 Miscellaneous

2.5.1 Systems for removal of water or cargo from interbarrier spaces and holds are to be examined and tested as deemed necessary.

2.5.2 All gas-tight bulkheads are to be inspected. The effectiveness of gas-tight shaft sealing is to be verified.

2.5.3 The following equipment is to be examined: hoses and spool pieces used for segregation of piping systems for cargo, inert gas and bilging.

2.5.4 It is to be verified that all cargo piping systems are electrically bonded to the hull.

3. Annual Survey

3.1 General

3.1.1 The log books are to be examined with regard to correct functioning of the cargo containment and cargo handling systems. The hours per day of the reliquefaction plants or the boil-off rate is to be considered.

3.1.2 All accessible gas-tight bulkhead penetrations including gas-tight shaft sealings are to be visually examined.

3.1.3 The means for accomplishing gas tightness of the wheelhouse doors and windows is to be examined. All windows and sidescuttles within the area required to be of the fixed type (non-opening) are to be examined for gas tightness. The closing devices for all air intakes and openings into accommodation spaces, service spaces, machinery spaces, control stations and approved openings in superstructures and deckhouses facing the cargo area or bow and stern loading/unloading arrangements, are to be examined.

3.2 Cargo handling systems

The cargo handling piping and machinery, e.g. cargo and process piping, cargo heat exchangers, vapourizers, pumps, compressors and cargo hoses are in general to be visually examined, as far as possible, during operation.

3.3 Cargo containment venting systems

Venting systems, including protection screens if provided, for the cargo tanks, interbarrier spaces and hold spaces are to be visually examined externally. It is to be verified that the cargo tank relief valves are sealed and that the certificate for the relief valves opening/closing pressures is onboard.

3.4 Instrumentation and safety systems

3.4.1 The instrumentation of the cargo installations with regard to pressure, temperature and liquid level is to be verified in good working order by one or more of the following methods:

- Visual external examination;
- Comparing of read outs from different indicators;
- Consideration of read outs with regard to the actual cargo and/or actual conditions;
- Examination of maintenance records with reference to cargo plant instrumentation maintenance manual;
- Verification of calibration status of the measuring instruments.

3.4.2 The logbooks are to be examined for confirmation that the emergency shutdown system has been tested.

3.5 Environmental control for cargo containment systems

- 1) Inert gas/dry air installations including the means for prevention of backflow of cargo vapour to gas-safe spaces are to be verified as being in satisfactory operating condition.
- 2) For membrane containment systems normal operation of the nitrogen control system for insulation and interbarrier spaces shall be confirmed to the Surveyor by the Master.

3.6 Miscellaneous

3.6.1 It is to be verified that all accessible cargo piping systems are electrically bonded to the hull.

3.6.2 Arrangements for burning methane boil-off are to be visually examined as far as practicable. The instrumentation and safety systems are to be verified as being in good working order in accordance with Z16.3.4.1.

3.6.3 The relevant instruction and information material such as cargo handling plans, filling limit information, cooling down procedures, etc. are to be verified as being onboard.

3.6.4 Mechanical ventilation fans in gas dangerous spaces and zones are to be visually examined.

4. Intermediate survey

4.1 General

The requirements of Section Z16.3 apply with the following additions:

4.2 Instrumentation and safety systems

4.2.1 The instrumentation of the cargo installation with regard to pressure, temperature and liquid level is to be visually examined and to be tested by changing the pressure, temperature and level as applicable and comparing with test instruments. Simulated testing may be accepted for sensors which are not accessible or for sensors located within cargo tanks or inerted hold spaces. The testing is to include testing of alarm and safety functions.

4.2.2 The piping of the gas detection system is to be visually inspected for corrosion and damage as far as practicable. The integrity of the suction lines between suction points and analyzing units is to be verified as far as possible. Gas Detectors are to be calibrated or verified with sample gases.

4.2.3 The emergency shutdown system is to be tested, without flow in the pipe lines, to verify that the system will cause the cargo pumps and compressors to stop.

4.3 Electrical equipment

Electrical equipment in gas-dangerous spaces and zones is to be examined as far as practicable with particular respect to the following:

- Protective earthing (Spot check).
- Integrity of enclosures.
- Damage of outer sheath of cables.
- Function testing of pressurized equipment and of associated alarms.
- Testing of systems for de-energizing non-certified safe electrical equipment located in spaces protected by air-locks, such as electrical motor-rooms, cargo control rooms, etc.
- Testing of insulation resistance of circuits. Such measurements are only to be made when the ship is in a gas-free or inerted condition. Where proper records of testing are maintained consideration may be given to accepting recent readings by the ship's crew.

Note: See also BCS-G 120 Survey of electrical equipment installed in hazardous areas on tankers.

4.4 Miscellaneous

The instrumentation and safety systems for burning cargo as fuel are to be examined in accordance with the requirements of Z16.4.2.1.

BCS-R Z17 Procedural Requirements for Service Suppliers

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Annex 1 Special Requirements for Various Categories of Service Suppliers

Notes:

1. This requirement is implemented from 1 January 2022.

1. General

1.1 To approve firms providing services, such as measurements, tests or maintenance of safety systems and equipment, **BCS** is to apply procedures in this requirement and relevant Annex 1.

2. Objective

2.1 The objective of this procedure is to set minimum requirements for approval and certification of service suppliers and is applicable to both initial and renewal audits.

3. Definitions

- Manufacturer: A company that manufactures equipment required to be periodically serviced and/or maintained.
- Service Supplier (A Service Supplier or category of Service Supplier may be referred to here after simply as 'supplier'): A person or company, not employed by **BCS** who at the request of an equipment manufacturer, shipyard, vessel's owner or other client acts in connection with inspection work and provides services for a ship or a mobile offshore unit such as measurements, tests or maintenance of safety systems and equipment, the results of which are used by surveyors in making decisions affecting classification or statutory certification and services.
- Agent: A Person or Company authorised to act for or to represent a Manufacturer or approved/recognized service supplier.
- Subsidiary: A Company partly or wholly owned by a Manufacturer or approved/recognized service supplier.
- Subcontractor: A Person or Company providing services to a Manufacturer or approved/recognized service supplier, with a formal contract defining the assumption of the obligations of the service supplier.

4. Application

4.1 This procedure applies to the approval of the following categories of service suppliers:

4.1.1 Statutory services

- Firms engaged in servicing inflatable liferafts, inflatable lifejackets, hydrostatic release units, inflatable rescue boats, marine evacuation systems
- Firms engaged in inspections and testing of radio communication equipment
- Firms engaged in inspections and maintenance of self-contained breathing apparatus
- Firms engaged in annual performance testing of Voyage Data Recorders (VDR) and simplified Voyage Data Recorders (S-VDR)
- Firms engaged in sound pressure level measurements of public address and general alarm systems on board ships
- Firms engaged in inspections of low location lighting systems using photo luminescent materials and evacuation guidance systems used as an alternative to low-location lighting systems
- Firms engaged in maintenance, thorough examination, operational testing, overhaul and repair of lifeboats and rescue boats, launching appliances and release gear
- Firms engaged in inspection, performance testing and maintenance of Automatic Identification Systems (AIS)
- Firms engaged in Commissioning Testing of Ballast Water Management System (BWMS)

4.1.2 Classification and/or Statutory services:

- Firms engaged in thickness measurements on ships or mobile offshore units except
 - (1) non-ESP ships less than 500 gross tonnage and
 - (2) all fishing vessels.
- Firms carrying out an in-water survey on ships and mobile offshore units by diver or Remotely Operated Vehicle (ROV).
- Firms engaged in inspections and maintenance of fire extinguishing equipment and systems
- Firms engaged in tightness testing of closing appliances such as hatches, doors etc. with ultrasonic equipment
- Firms engaged in measurements of noise level on board ships
- Firms engaged in examination of Ro-Ro ship's bow, stern, side and inner doors
- Firms engaged in testing of coating systems in accordance with IMO Resolution MSC.215(82), as amended, and IACS UI SC223 and/or MSC.288(87), as amended.
- Firms engaged in tightness testing of primary and secondary barriers of gas carriers with membrane cargo containment systems for vessels in service

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- Firms engaged in survey using Remote Inspection Techniques (RIT) as an alternative means for Close-up Survey of the structure of ships and mobile offshore units.
 - Firms engaged in Cable Transit Seal Systems inspection on ships and Mobile Offshore Units.

4.1.3 Where BCS accepts work of a third party (eg., service supplier) approved by itself, BCS shall verify the performance of such services. For statutory service, the flag State may increase the scope of verification to be applied to these services. The process shall be defined within BCS's quality management system. For the purpose of accountability to the flag State, the work performed by the third party (eg., service supplier) constitutes the work of BCS and shall be subject to the requirements incumbent upon BCS under the RO Code IMO MSC.349 (92) and MEPC.237(65).

4.2 Where the results of the following service providers are used by a Surveyor of BCS in making decisions affecting classification services then that service provider must be approved and verified by BCS.

- Firms engaged in thickness measurements on ships or mobile offshore units except
 - (1) non-ESP ships less than 500 gross tonnage and
 - (2) all fishing vessels.
- Firms carrying out an in-water survey on ships and mobile offshore units by diver or Remotely Operated Vehicle (ROV).
- Firms engaged in tightness testing of closing appliances such as hatches, doors etc. with ultrasonic equipment
- Firms engaged in survey using Remote Inspection Techniques (RIT) as an alternative means for Close-up Survey of the structure of ships and mobile offshore units.

4.3 Where such services are used by Surveyors in making decisions affecting statutory certification and service, the firms are subject to approval and verification by BCS where the BCS is so authorised by the relevant flag Administration (i.e. the flag of the ship on which the servicing is to be done or the service equipment is to be used). For such services BCS may accept approvals done by:

- i. the flag Administration itself,
- ii. duly authorized organizations acting on behalf of the flag Administration, or
- iii. other organizations those are acceptable to the flag Administration (e.g. other governments, etc.).

4.4 Use of the approved service suppliers is not mandatory for the following services, *unless instructed otherwise by the flag Administration* with respect to statutory certification

- Firms engaged in inspections of low location lighting systems using photo luminescent materials and evacuation guidance systems used as an alternative to low-location lighting systems
- Firms engaged in sound pressure level measurements of public address and general alarm systems on board ships
- Firms engaged in measurements of noise level onboard ships

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- Firms engaged in testing of coating systems in accordance with IMO Resolution MSC.215(82) as amended and BCS-I SC223 and/or MSC.288(87) as amended
 - Firms engaged in examination of Ro-Ro ships bow, stern, side and inner doors

4.5 Detailed requirements specific to the various categories of suppliers are given in Annex 1. National and/or international requirements may give additional requirements. References to such national and/or international requirements are given in Annex 1.

5. Procedure for Approval and Certification

5.1 Submission of documents

5.1.1 The following documents are to be submitted to the Society for review. General requirements concerning suppliers are given in 5.2, and specific requirements as relevant, in Annex 1.

- Outline of company, e.g. organisation and management structure, including subsidiaries to be included in the approval/certification
- List of nominated agents, subsidiaries and subcontractors
- Experience of the company in the specific service area
- For categories of Service Suppliers that require certification from manufacturers, manufacturer's documentary evidence that the Service Supplier has been certified or licensed to service the particular makes and models of equipment for which approval is sought shall be provided
- List of operators/technicians/inspectors documenting training and experience within the relevant service area, and qualifications according to recognised national, international or industry standards, as relevant
- Description of equipment used for the particular service for which approval is sought
- A guide for operators of such equipment
- Training programmes for operators/technicians/inspectors
- Check lists and record formats for recording results of the services referred to in Annex 1
- Quality Manual and/or documented procedures covering requirements in 5.5
- Documented procedures for communication with the crew prior to commencing work, so that it is safe to decommission the equipment being maintained, and to provide a safe system of work in place
- Evidence of approval/acceptance by other bodies, if any
- Information on the other activities which may present a conflict of interest
- Record of customer claims and of corrective actions requested by certification bodies
- Operators/technicians/inspectors documentation they have acknowledged the code of conduct

5.2 General requirements:

5.2.1 Extent of Approval – The supplier shall demonstrate, as required by 5.2.2 – 5.2.11, that it has the competence and control needed to perform the services for which approval is sought.

5.2.2 Training of personnel – The supplier is responsible for the qualification and training of its personnel to a recognised national, international or industry standard as applicable. Where such standards do not exist, the supplier is to define standards for the training and qualification of its personnel relevant to the functions each is authorised to perform. The personnel shall

also have adequate experience and be familiar with the operation of any necessary equipment. Operators/technicians/inspectors shall have had a minimum of one year tutored on-the-job training. Where it is not possible to perform internal training, a program of external training may be considered as acceptable.

5.2.3 Supervision – The supplier shall provide supervision for all services provided. The responsible supervisor shall have had a minimum of two years of experience as an operator/technician/inspector within the activity for which the supplier is approved. For a supplier consisting of one person, that person shall meet the requirements of a supervisor.

5.2.4 Personnel records – The supplier shall keep records of the approved operators/technicians/inspectors. The record shall contain information on age, formal education, training and experience for the services for which they are approved.

5.2.5 Equipment and facilities – The supplier shall have the necessary equipment and facilities for the service to be supplied. A record of the equipment used shall be kept and available. The record shall contain information on maintenance and results of calibration and verifications. **BCS** shall assess and record the validity of previous measuring results when the equipment is found not to conform to requirements. **BCS** shall take appropriate action on the equipment affected.

5.2.6 Control of data:

When computers are used for the acquisition, processing, recording, reporting, storage, measurement assessment and monitoring of data, the ability of computer software to satisfy the intended application shall be documented and confirmed by the service supplier. This shall be undertaken prior to initial use and reconfirmed as necessary.

Note: Commercial off-the-shelf software (e.g. wordprocessing, database and statistical programmes) in general use within their designed application range may be considered to be sufficiently validated and do not require any subsequent confirmation.

5.2.7 Where several servicing stations are owned by a given company, each station is to be assessed and approved except as specified in 5.5.3

5.2.8 Procedures – The supplier shall have documented work procedures covering all services supplied.

5.2.9 Subcontractors – The supplier shall give information of agreements and arrangements if any parts of the services provided are subcontracted. Particular emphasis shall be given to quality management by the supplier in following-up such subcontracts. Subcontractors providing the services of the approved service supplier shall also meet the requirements of section 5.

5.2.10 Verification – The supplier shall verify that the services provided are carried out in accordance with approved procedures.

5.2.11 Reporting – The report shall be prepared in a form acceptable to **BCS**. The report should detail the results of inspections, measurements, tests, maintenance and/or repairs carried out. Special guidelines may be given in Annex 1. The report shall include a copy of the Certificate of Approval.

5.2.12 Documented procedures and instructions should be available for the recording of damages and defects found during inspection, servicing and repair work. This documentation is to be made available upon request.

5.3 Auditing of the Supplier – Upon reviewing the submitted documents with satisfactory result, the supplier is audited in order to ascertain that the supplier is duly organised and managed in accordance with the submitted documents, and that it is considered capable of conducting the services for which approval/certification is sought.

5.4 Certification is conditional on a practical demonstration of the performance of the specific service as well as satisfactory reporting being carried out. At renewal audits, evidence of performance, verified by class surveyor, since the previous audit is sufficient to satisfy this requirement.

5.5 Quality System

5.5.1 The supplier shall have a documented system covering at least the following:

- code of conduct for the relevant activity
- maintenance and calibration of equipment
- training programmes for operators/technicians/inspectors
- supervision and verification to ensure compliance with operational procedures
- recording and reporting of information
- quality management of subsidiaries, agents and subcontractors
- job preparation
- periodic review of work process procedures, complaints, corrective actions, and issuance, maintenance and control of documents

5.5.2 A documented Quality system complying with the most current version of ISO 9000 series and including the above items, would be considered acceptable.

5.5.3 If a manufacturer of equipment (and/or its service supplier) applies to BCS for inclusion of its nominated agents and/or subsidiaries (excluding any subcontractor), in the approval, then it must have implemented a quality system certified in accordance with the most current version of ISO 9000 series. The quality system must contain effective controls of the manufacturer's (and/ or service supplier's) agents and/or subsidiaries. The nominated agents/subsidiaries must also have in place an equally effective quality system complying with the most current version of ISO 9000 series. Such approvals shall be based upon an evaluation of the quality system implemented by the parent company against the most current version of ISO 9000 series. BCS may require follow-up audits on such agents or subsidiaries against the most current version of ISO 9000 series to confirm adherence to this quality system.

5.6 Service Suppliers Relations with the Equipment Manufacturer

5.6.1 A company which works as a service station for manufacturer(s) of equipment (and as a service supplier in this field), shall be assessed by the manufacturer(s) and nominated as their agent. The manufacturer shall ensure that appropriate instruction manuals, material etc. are available for the agent as well as proper training of the agent's technicians. Such suppliers shall be approved either on a case by case basis, or in accordance with 5.5.3.

6. Certification

6.1 Upon satisfactory completion of both the audit of the supplier and the demonstration test, as applicable, BCS may issue a Certificate of Approval stating that the supplier's service operation system has been found to be satisfactory and that the results of services performed in accordance with that system may be accepted and utilised by BCS's Surveyors in making decisions affecting classification or statutory certification, as relevant. The Certificate shall clearly state the type and scope of services and any limitations or restrictions imposed including type of equipment and/or names of Manufacturers of equipment where this is a limiting restraint. The supplier may also be included in BCS's record of approved service suppliers.

6.2 Renewal or endorsement of the Certificate is to be made at intervals not exceeding five (5) years by verification through audits that approved conditions are maintained or, where applicable, on expiry of the supplier's approval received from an equipment Manufacturer, whichever comes first. In the latter case, BCS is to be informed in due course by the Service Supplier. BCS may require renewal or endorsement of the Certificate at intervals shorter than five (5) years and may require intermediate audits. For firms engaged in thickness measurements, renewal/endorsement of the Certificate is to be made at intervals not exceeding 3 years by verification that original conditions are maintained.

7. Information Regarding Alterations to the Certified Service Operating System

7.1 When any alteration to the certified service operating system of the supplier is made, such alteration is to be immediately informed to BCS. Re-audit may be required when deemed necessary by BCS.

8. Cancellation of Approval

8.1 BCS reserves the right to cancel the approval (For Firms engaged in thickness measurements refer to BCS-PR23).

8.2 Approval may be cancelled in the following cases:

8.2.1 Where the service was improperly carried out or the results were improperly reported.

8.2.2 Where a Surveyor finds deficiencies in the approval service operating system of the supplier and appropriate corrective action is not taken.

8.2.3 Where alterations have been made to the Company's Quality System relevant to the service supplier certificates, without written notification to BCS.

8.2.4 Where the intermediate audit, if requested as per 6.2, has not been carried out.

8.2.5 Where wilful acts or omissions are ascertained.

8.2.6 Where any deliberate misrepresentation has been made by the Service Supplier.

8.3 A supplier whose approval was cancelled, may apply for re-approval provided it has corrected the non-conformities which resulted in cancellation, and BCS is able to confirm it has effectively implemented the corrective action.

8.4 Expiration or cancellation of the Supplier's parent company approval automatically invalidates approval of all agents and subsidiaries if these are certified according to 5.5.3.

9. Existing Approvals

Approvals for the categories of service suppliers granted before the date of implementation of BCS-R Z17 by BCS may remain valid as stated in the respective certificates for a period up to but not exceeding 3 years. Renewals of such certificates must be carried out in accordance with BCS-R Z17.

ANNEX 1

Special Requirements for Various Categories of Service Suppliers

1. Firms engaged in thickness measurements on ships or mobile offshore units

1.1 Extent of engagement – Thickness measurement of structural material of ships or mobile offshore units except

- (1) non-ESP ships less than 500 gross tonnage and
- (2) all fishing vessels.

1.2 Supervisor – The responsible supervisor shall be qualified according to a recognised national or international industrial NDT standard (e.g. EN 473 level II as amended or ISO 9712 level II as amended).

1.3 Operators – The operators carrying out the measurements shall be certified to a recognised national or international industrial standard (e.g. EN 473 level I as amended or ISO 9712 level I as amended) and shall have adequate knowledge of ship structures sufficient to elect a representative position for each measurement.

1.4 Equipment – On coated surfaces, instruments using pulsed echo technique (either with oscilloscope or digital instruments using multiple echoes, single crystal technique) are required. Single echo instruments may be used on uncoated surfaces, which have been cleaned and ground.

1.5 Procedures – Documented work procedures are at least to contain information on inspection preparation, selection and identification of test locations, surface preparation, protective coating preservation, calibration checks, and report preparation and content.

1.6 Reporting – The report shall be based on the guidelines given in BCS-R Z7, BCS-R Z7.1, BCS-R Z7.2, Z10.1, Z10.2, Z10.3, Z10.4 and Z10.5, as relevant.

1.7 Verification – The supplier must have the Surveyor's verification of each separate job, documented in the report by the attending Surveyor(s) signature.

2. Firms engaged in tightness testing of closing appliances such as hatches, doors etc. with ultrasonic equipment

2.1 Extent of engagement – Ultrasonic tightness testing of closing appliances such as hatches, doors etc.

2.2 Operators – The operator is to have the following qualifications:

- Have knowledge of different closing appliances such as hatches, doors etc. including their design, functioning and sealing features
- Have experience with the operation and maintenance of different closing appliances such as hatches, doors etc.
- Be able to document theoretical and practical training onboard in using the ultrasonic equipment specified

2.3 It shall be demonstrated to the Surveyor that the ultrasonic equipment is fit for the purpose of detecting leakages in closing appliances.

2.4 Procedures – The supplier shall have documented work procedures which shall include the manual for the ultrasonic equipment specified, its adjustment, its maintenance, its operation and approval criteria.

3. Firms carrying out an in-water survey on ships and mobile offshore units by diver or Remotely Operated Vehicle (ROV).

3.1 Extent of engagement – In-water survey in lieu of a docking survey and/or the internal hull survey of compartments filled with water on ships and mobile offshore units by diver or Remotely Operated Vehicle (ROV).

3.2 Training of personnel – The supplier is responsible for the qualification of its divers, Remotely Operated Vehicle (ROV) operators and supervisors and for their training in the use of the equipment utilised when carrying out inspection. Knowledge of the following shall be documented:

- Ship's underwater structure and appendages, propeller shaft, propeller, rudder and its bearings, etc.
- Non-destructive testing in accordance with a recognised national or international industrial NDT standard. This requirement only applies if an in-water survey company performs non-destructive testing
- Certification as a thickness measurement firm when conducting thickness measurements under water
- Bearing clearance measurements on rudders and propeller shaft
- Under-water video monitoring with TV-monitors on deck, as well as still picture work
- Operation of under-water communication system
- Any special equipment necessary for the work carried out.

3.3 A plan for training of personnel in the reporting system, minimum Rule requirements for relevant ship or unit types, ship's or unit's underwater structure, measuring of bearing clearances, the recognition of corrosion damage, buckling and deteriorated coatings, etc. shall be included.

3.4 Supervisor

3.4.1 Diving Supervisor – Diving supervisor shall be qualified according to the supplier's general requirements and shall have a minimum of two years' experience as a diver carrying out inspection.

3.4.2 ROV Supervisor – ROV supervisor shall have a minimum of two (2) years of experience conducting inspections with ROVs.

3.5 Diver and Operators

3.5.1 Divers carrying out inspection – The diver carrying out the inspection shall have had at least one year's experience as an assistant diver carrying out inspections (including participation in a minimum of 10 different assignments).

3.5.2 ROV operators- ROV operators shall have at least one year of experience working with ROVs conducting inspections on vessels.

3.6 Equipment

3.6.1 The following shall be available:

- Closed circuit colour television with sufficient illumination equipment
- Two-way communication between diver and surface staff
- Video recording device connected to the closed circuit television
- Still photography camera
- Equipment for carrying out thickness gauging, non-destructive testing and measurements, e.g. clearances, indents, etc., as relevant to the work to be performed
- Equipment for cleaning of the hull

3.6.2 In addition to above 3.6.1, the following shall be available for firms carrying out survey by ROV:

- Remotely Operated Vehicle (ROV)
- Adequate controls or programming for the ROV functions required

3.7 Procedures and guidelines

3.7.1 The supplier shall have documented operational procedures and guidelines for how to carry out the inspection and how to handle the equipment. These shall include:

- Two-way communication between diver and surface
- Video recording and closed circuit television operation
- Guidance of the diver along the hull to provide complete coverage of the parts to be inspected

3.7.2 In addition to above 3.7.1, documented operational procedures and guidelines for firms carrying out in-water survey by ROV shall also include:

- Guidance for the operation and maintenance of the Remotely Operated Vehicle, if applicable
- Methods and equipment to ensure the ROV operator can determine the ROV's location and orientation in relation to the vessel.

3.8 Verification – The supplier must have the Surveyor's verification of each separate job, documented in the report by the attending Surveyor(s) signature.

4. Firms engaged in inspection and maintenance of fire extinguishing equipment and systems

4.1 Extent of engagement – inspections and maintenance of fire-extinguishing equipment and systems such as fixed fire extinguishing systems, portable fire extinguishers and fire detection and alarm systems.

4.2 Extent of Approval

- Service Suppliers are to have professional knowledge of fire theory, fire-fighting and fire-extinguishing appliances sufficient to carry out the maintenance and/or inspections, and to make the necessary evaluations of the condition of the equipment
- In demonstrating professional knowledge, Service Suppliers are to have an understanding of the various types of fires and the extinguishing media to be used on them
- For fixed fire-extinguishing systems, Service Suppliers are to demonstrate an understanding of the principles involved with gas, foam, deluge, sprinkler and water-mist systems, as relevant for the approval being sought

4.3 Procedures

- Service Suppliers are to have documented procedures and instructions on how to carry out the servicing of the equipment and/or system. These are to either contain or make reference to the Manufacturer's servicing manuals, servicing bulletins, instructions and training manuals, as appropriate, and to international requirements
- Additionally they are to make reference to any requirements (e.g. what markings should be appended to the equipment/system)

4.4 Reference Documents - The Service Supplier is to have access to the following documents:

- Manufacturer's servicing manuals, servicing bulletins, instructions and training manuals, as appropriate
- Type Approval certificates showing any conditions that may be appropriate during the servicing and/or maintenance of fire-extinguishing equipment and systems
- SOLAS, MSC.1/Circular.1318 (Guidelines for the Maintenance and Inspections of Fixed Carbon Dioxide Fire-Extinguishing Systems), International Code for Fire Safety Systems (FSS Code), ISO 6406 (Periodic inspection and testing of seamless steel gas cylinders), and any documentation specified in the authorisation or license from the equipment manufacturer
- MSC/Circ.670 (Guidelines for the Performance and Testing Criteria and Surveys of High Expansion Foam Concentrates for fixed Fire-Extinguishing Systems)
- MSC/Circ.798 (Guidelines for the Performance and Testing Criteria and Surveys of Medium Expansion Foam Concentrates for fixed Fire-Extinguishing Systems)
- MSC/Circ.799 ((Guidelines for the Performance and Testing Criteria and Surveys of Expansion Foam Concentrates for fixed Fire-Extinguishing Systems of Chemical Tankers)

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- MSC.1/Circ.1312 (Revised Guidelines for the Performance and Testing Criteria and Surveys of Foam Concentrates for fixed Fire-Extinguishing Systems as corrected by MSC/Circ.1312/Corr.1)
 - MSC.1/Circ.1432 (Revised Guidelines for the maintenance and Inspection of Fire Protection Systems and Appliances)
 - IMO Res. A. 951(23) – Improved guidelines for marine portable fire extinguishers
 - MSC.1/Circ.1370 – Guidelines for the design, construction and testing of fixed hydrocarbon gas detection systems
 - Guidelines adopted by IMO for fire extinguishing equipment and systems specifically intended for service by service suppliers

4.5 Equipment and Facilities

4.5.1 General Requirements

- If Service Suppliers undertake shore-based inspecting and maintenance, they should maintain and implement procedures for workshop cleanliness, ventilation and arrangement, with due cognisance of the spares and extinguishing media being stored, to ensure safe and effective working procedures
- Service Suppliers undertaking inspecting and maintenance of equipment and systems onboard are to provide the appropriate facilities to either complete the work onboard or remove the necessary items to their workshops

4.5.2 Equipment

Sufficient and appropriate spares and tools are to be available as applicable, which should include:

- Various scales to weigh items
- Means to hydrostatically pressure test components/systems/storage bottles
- Liquid/gas, flow meters, as appropriate
- Pressure gauges or manometers
- In the cases of foam concentrates and portable fire-extinguishers, chemical analysis equipment and a testing bay, respectively; and
- Specific equipment/spares as may be specified by Manufacturer
- Level measuring equipment for bottles
- Recharging facilities for pressurized bottles, extinguishers and cartridges

5. Firms engaged in servicing inflatable liferafts, inflatable lifejackets, hydrostatic release units, inflatable rescue boats, marine evacuation systems

5.1 Extent of engagement

- Servicing of inflatable liferafts, inflatable lifejackets, hydrostatic release units and/or inflatable rescue boats
- Servicing of marine evacuation systems

5.2 Equipment and facilities – IMO Res. A.761(18) as amended by MSC.55(66) gives recommendations on conditions for the approval of servicing stations for inflatable liferafts which shall be observed as relevant. Where inflatable liferafts are subject to extended service intervals, MSC.1/Circ.1328 should also be followed.

5.3 Procedures and instructions – The supplier shall have documented procedures and instructions for how to carry out service of equipment. Where inflatable liferafts are subject to extended service intervals in accordance with the requirements of SOLAS Regulation III/20.8.3, MSC.1/Circ.1328 should be followed in addition to Resolution A.761(18) as amended by MSC.55(66).

5.4 The supplier shall provide evidence that it has been authorised or licensed to service the particular makes and models of equipment for which approval is sought by the equipment's manufacturer.

5.5 Reference Documents - The Service Supplier is to have access to the following documents:

- IMO - Resolution A.761(18) - Recommendation on Conditions for the Approval of Servicing Stations for Inflatable Liferafts - (adopted on 4 November 1993), amended by Resolution MSC.55(66)
- IMO - Resolution MSC.55(66)
- IMO – MSC.1/Circ.1328 – Guidelines for the Approval of Inflatable Liferafts Subject to Extended Service Intervals Not Exceeding 30 Months
- Manufacturer's servicing manuals, servicing bulletins, instructions and training manuals, as appropriate
- Type Approval certificates, showing any conditions that may be appropriate during the servicing and/or maintenance of inflatable liferafts, inflatable rescue boats, inflatable lifejackets, and hydrostatic release units
- LSA code/Chap.IV, 1995 SOLAS Conference Resolution 4 regarding marine evacuation systems

6. Firms engaged in inspections and testing of radio communication equipment

6.1 Extent of engagement

- Surveys, inspection, testing, and/or measurement of radio equipment aboard ships or mobile offshore units for compliance with SOLAS regulations
- Annual testing of 406 MHz satellite EPIRBs for compliance with SOLAS Regulation IV/15.9
- The principles of this section also apply to Service Suppliers involved in inspection, performance testing and maintenance of Automatic Identification Systems (AIS). The Service Supplier is to be familiar with the equipment with which it will be involved, such as being a service agent for the equipment manufacturer

6.2 Reference documents – The supplier shall have access to the following documents:

- SOLAS 1974 as amended
- IMO Res.MSC.349(92): Code for Recognized Organizations (RO Code).
- MSC/Circ.1040/Rev.2 – Guidelines on Annual Testing of 406 MHZ Satellite EPIRBs
- MSC.1/Circ.1252 – Guidelines on Annual Testing of the Automatic Identification System (AIS)
- SN/Circ.227, SN/Circ.227/Corr.1 and 245 – Guidelines for the Installation of a Shipborne Automatic Identification System (AIS) and amendments thereto
- ITU Radio Regulations
- IMO Performance Standards for the equipment for which the Service Supplier is approved
- Flag State Administration requirements
- Relevant parts, if any, of the Society's Rules and Guidelines

6.3 Supervisor – The supervisor shall have a minimum two years education from a technical school, experience as inspector, and should preferably hold a General Operator's Certificate (GOC) or a GMDSS Radioelectronic Certificate (REC), recognised by the ITU, to operate or test radio transmitters. He should be aware of any local conditions for radio signal propagation, of regional radio stations and their facilities, and of the GMDSS infrastructure.

6.4 Radio inspector – The inspector carrying out the inspection shall have passed the internal training of the supplier in Radiotelephony, GMDSS, and initial and renewal surveys, as applicable. The inspector shall also have at least one year's technical school training or as alternative hold evidence that he followed a technical course approved by the relevant Administration, at least one year's experience as an assistant radio inspector and should preferably hold an appropriate National Radio Operators Certificate, recognised by the ITU, such as a GMDSS General Operator's Certificate (GOC) or a GMDSS Radioelectronic Certificate (REC). He should be aware of any local conditions for radio signal propagation, of regional radio stations and their facilities, and of the GMDSS infrastructure.

6.5 Equipment and facilities

6.5.1 The supplier shall have the major and auxiliary equipment required for correctly performing the inspection. A record of the equipment used shall be kept. The record shall contain information on manufacturer and type of equipment, and a log of maintenance and calibrations.

6.5.2 A standard which is relevant to the radio equipment to be tested shall be available for the equipment and shall be cited in the inspection report.

6.5.3 For equipment employing software in conjunction with the testing/examination, this software shall be fully described and verified.

6.6 Minimum required instruments:

- Equipment for measuring frequency, voltage, current and resistance
- Equipment for measuring output and reflect effect on VHF and MF/HF
- Equipment for measuring modulation on MF/HF and VHF (AM, FM, PM)
- Acid tester for checking specific gravity of lead batteries
- Tester for checking of correct output from Free-Float Satellite EPIRB
- Equipment for testing the performance of Automatic Identification Systems (AIS)

6.7 Procedures and instructions – The supplier shall have documented procedures and instructions for how to carry out testing and examination of radio equipment. Procedures and instructions for operating each item of the testing/inspection equipment shall also be kept and be available at all times.

7. Firms engaged in inspections and maintenance of self contained breathing apparatus

7.1 Extent of Engagement - inspections and maintenance of self-contained breathing apparatus, Emergency Escape Breathing Devices (EEBD)

7.2 Extent of Approval

- The supplier shall document and demonstrate that it has knowledge of the equipment and systems sufficient to carry out the inspections and testing of self-contained breathing apparatus to identify standards and to make the necessary evaluation of the condition of the equipment
- In demonstrating professional knowledge, Service Suppliers are to have an understanding of the operational requirements involved with self-contained breathing apparatus and how these are to be maintained
- Additionally, Service Suppliers are to demonstrate the necessary safety requirements applicable to such equipment

7.3 Procedures

- Service Suppliers are to have documented procedures and instructions on how to carry out the servicing of the equipment and/or system. These are to either contain or make reference to the Manufacturer's servicing manuals, servicing bulletins, instructions and training manuals, as appropriate
- Additionally they are to make reference to any requirements (e.g. what markings should be appended to the equipment/system) and how they should be applied

7.4 Reference Documents - The Service Supplier is to have access to the following documents:

- Manufacturers' servicing manuals, servicing bulletins, instructions and training manuals, as appropriate
- Type Approval certificates showing any conditions which may be appropriate during the servicing and/or maintenance of self-contained breathing apparatus

7.5 Equipment and Facilities

7.5.1 General Requirements

- If Service Suppliers undertake shore-based inspecting and maintenance, they should maintain and implement procedures for workshop cleanliness, ventilation and arrangement, with due cognisance of the spares and pressurised bottles being stored, to ensure safe and effective working procedures
- Service Suppliers undertaking inspecting and maintenance of equipment and systems onboard are to provide the appropriate facilities to either complete the work onboard or remove the necessary items to their workshops

7.5.2 Equipment

- Sufficient and appropriate spares and tools are to be available for repair, maintenance and servicing of self-contained breathing apparatus in accordance with the requirements of the Manufacturers
- These are to include, as required by the self-contained breathing apparatus equipment and/or systems:
 - Various scales to weigh items
 - Means to hydrostatically pressure test components/systems/storage bottles
 - Flow meters; and
 - Pressure gauges or manometers
 - Equipment for checking air quality
 - Recharging facilities for breathing apparatus

8. Firms engaged in examination of Ro-Ro ships bow, stern, side and inner doors

8.1 Extent of engagement - inspection of securing and locking devices, hydraulic operating system, electric control system for the hydraulics, electric indicator systems, and supporting, securing and locking devices and tightness testing.

8.2 The supplier is to be certified to the most current version of ISO 9000 series.

8.3 Supervision - In addition to 5.2.3, the requirement to have had a minimum of two years experience as operator/technician/inspector within the activity, a Supervisor is to have a minimum two years related education from a technical school.

8.4 Training of personnel - Operators carrying out Non-Destructive Test (NDT) are to be qualified to a recognised National or International Standard for the methods used.

8.5 Reference documents - The supplier shall have access to the following reference documents:

- IMO - International Convention on the Safety of Life at Sea (SOLAS) 74/78, as amended
- ISO 9002:1994 - Quality systems - Model for quality assurance in production, installation and servicing
- UR Z24 - Survey Requirements for Shell and Inner Doors of Ro-Ro ships, or its equivalent, by the relevant class society

8.6 Required Equipment

8.6.1 For Inspection of Supporting Securing and Locking Devices, Hinges and Bearings:

- Equipment for measuring clearances (i.e. feeler gauges, vernier calipers, micrometers).
- Non-destructive test (i.e. dye penetrant, magnetic particle inspection)

8.6.2 For Tightness Testing:

- Ultrasonic leak detector or equivalent

8.6.3 For Inspection of Hydraulic Operating System:

- Pressure gauges
- Particle counter for analysing the quality of hydraulic fluid

8.6.4 For Inspection of Electric Control System and Indication System:

- Digital multi-meter
- Earth fault detector

8.7 Procedures and Instructions

8.7.1 The supplier shall have access to drawings and documents, including the Operating and Inspection Manual.

8.7.2 The supplier shall have access to the service history of the doors.

8.7.3 The supplier should use, complete and sign a checklist which has been found acceptable by BCS.

9. Firms engaged in annual performance testing of Voyage Data Recorders (VDR) and simplified Voyage Data Recorders (S-VDR)

9.1 Extent of engagement – Testing and servicing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR) in accordance with SOLAS Chapter V Regulation 18.8 and IMO - MSC.1/Circular.1222/Rev.1 - Guidelines on Annual Testing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR), as applicable.

9.2 Extent of Approval

9.2.1 The supplier shall provide evidence that he has been authorised or licensed by the equipment's manufacturer to service the particular makes and models of equipment for which approval is sought.

9.2.2 Where the Service Supplier is also the Manufacturer of the Voyage Data Recorder (VDR) or Simplified Voyage Data Recorder (S-VDR) and has elected to apply IMO - MSC.1/Circular.1222/Rev.1 - Guidelines on Annual Testing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR) in its entirety for the purpose of acting as a Service Supplier engaged in annual performance testing, the following is to apply:

- The Manufacturer is responsible for appointing Manufacturer's Authorised Service Stations to carry out annual performance testing
- The Manufacturer is required to be an Approved Service Supplier and is to satisfy the requirements for Service Suppliers engaged in annual performance testing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR), as applicable
- The Manufacturer's Authorised Service Station is not required to be an Approved Service Supplier
- The Manufacturer is to demonstrate that IMO - MSC.1/Circular.1222/Rev.1 - Guidelines on Annual Testing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR) is applied in its entirety

9.3 Procedures

9.3.1 The Service Supplier shall have documented procedures and instructions.

9.3.2 Where the Service Supplier is also the Manufacturer of the Voyage Data Recorder (VDR) or Simplified Voyage Data Recorder (S-VDR) and has selected to apply IMO - MSC.1/Circular.1222/Rev.1 - Guidelines on Annual Testing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR) in its entirety for the purpose of acting as a Service Supplier engaged in annual performance testing, the following is to apply:

- The Manufacturer is to have documented procedures for the assessment and authorisation of Manufacturer's Authorised Service Stations who carry out annual performance testing
- The Manufacturer is to have documented procedures for the review of Manufacturer's Authorised Service Stations annual performance test reports, analysis of the Voyage Data Recorder (VDR) and Simplified Voyage Data Recorder (S-VDR) 12 hour log and the issue of annual performance test certificates to the Owner/Operator

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- The Manufacturer is to maintain a list of Manufacturer's Authorised Service Stations that can be accessed (by any available means, e.g. via a nominated contact point or from the Manufacturer's website) upon request

9.4 Reference Documents

9.4.1 The Service Supplier is to have access to the following documents:

- IMO - International Convention on the Safety of Life at Sea (SOLAS), 74/78, Ch V, Reg 18.8. – Approval, surveys and performance standards of navigational systems and equipment and voyage data recorder
- IMO - MSC.1/Circular.1222/Rev.1 - Guidelines on Annual Testing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR) - (11 December 2006)
- IMO - Resolution A.861(20) (adopted on 27 November 1997) as amended by IMO Res. MSC.214(81) and revised by IMO Res.MSC.333(90) - Performance Standards for Shipborne Voyage Data Recorders (VDRs), **as amended by MSC.494(104)**
- IMO - Resolution MSC.163(78) - Performance Standards for Shipborne Simplified Voyage Data Recorders (S-VDRs) - (adopted on 17 May 2004), as amended by IMO Resolution 214(81) **and IMO Resolution MSC.493(104)**

9.4.2 The Service Supplier is to have access to applicable industry performance standards, e.g.:

- IEC 61996 - Maritime navigation and radiocommunication equipment and systems - Shipborne voyage data recorder (VDR)
- IEC 61996–2 - Maritime navigation and radio communication equipment and systems – Shipborne voyage data recorder (VDR) – Part 2: Simplified voyage data recorded (S-VDR) – Performance requirements, method of testing and required test results

9.4.3 The Service Supplier is also to have access to any documentation specified in the authorisation or license from the equipment manufacturer.

9.5 Equipment and Facilities - In addition, the Service Supplier shall have equipment as specified in the authorisation or license from the equipment Manufacturer.

9.6 Reporting - Test Report

9.6.1 The Service Supplier shall issue a certificate of compliance as specified in the International Convention on Safety of Life at Sea (SOLAS 1974), as amended, Ch V, Reg 18.8.

9.6.2 Annual Performance Test of VDR and S-VDR should be recorded in the form of the model test report given in the Appendix to MSC.1/Circular.1222/Rev.1, signed and stamped by the Service Supplier and attached to the annual performance test certificate.

9.6.3 Where the Service Supplier is also the Manufacturer of the Voyage Data Recorder (VDR) or Simplified Voyage Data Recorder (S-VDR) and has selected to apply IMO - MSC.1/Circular.1222/Rev.1 - Guidelines on Annual Testing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR) in its entirety for the purpose of acting as a Service Supplier engaged in annual performance testing, the Manufacturer is to make arrangements for the following:

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- Review of the Manufacturer's Authorised Service Station annual performance test report
 - Analysis of the recorder's 12 hour log
 - Checking of the master record/database for the recorder

9.6.4 Issue of the annual performance test certificate to the Owner/Operator within 45 days of completion of the annual performance test.

10. Firms engaged in inspections of low location lighting systems using photo luminescent materials and evacuation guidance systems used as an alternative to low-location lighting systems

10.1 Extent of engagement – Luminance measurements on board ships of low location lighting systems using photo luminescent materials.

10.2 Operators – The operator is to have the following qualifications:

- Have adequate knowledge of the applicable international requirements (namely SOLAS reg. II-2/13.3.2.5, IMO Res. A.752(18) - Guidelines for the Evaluation, Testing and Application of Low-Location Lighting on Passenger Ships, ISO 15370-2010, FSSS Code Chapter 11)
- Be able to document theoretical and practical training onboard in using equipment specified

10.3 Equipment – The measuring instrument shall incorporate a fast-response photometer head with CIE (International Commission on Illumination) photopic correction and have a measurement range of at least 10^{-4} cd/m² to 10 cd/m².

10.4 Procedures – Documented work procedures are at least to contain information on inspection preparation, selection and identification of test locations.

10.5 Reporting – The report shall conform to Annex C of ISO 15370-2010.

10.6 Verification – The supplier must have the Surveyor's verification of each separate job, documented in the report by the attending Surveyor's signature.

10.7 Reference Documents

The Service Supplier is to have access to the following documents:

- IMO - International Convention on the Safety of Life at Sea (SOLAS), 74/78 Ch II-2, Pt D, Reg 13.3.2.5 – Marking of escape routes
- IMO – Fire Safety Systems (FSS Code), Ch 11 – Low-location lighting systems
- IMO - Resolution A.752(18) - Guidelines for the Evaluation, Testing and Application of Low-Location Lighting on Passenger Ships - (adopted on 4 November 1993)
- ISO 15370:2010 - Ships and marine technology - Low-location lighting on passenger ships – Arrangement
- MSC/Circ.1168 – Interim guidelines for the testing, approval and maintenance of evacuation guidance systems used as an alternative to low-location lighting systems

11. Firms engaged in sound pressure level measurements of public address and general alarm systems on board ships

11.1 Extent of engagement – Sound pressure level measurements of public address and general alarm systems on board ships.

11.2 Operators – The operator is to have the following qualifications:

- Have adequate knowledge of the applicable international requirements (SOLAS Reg. III/4 and III/6, LSA CODE Chapter VII/7.2, IMO Code on alarms and indicators, 1995)
- Be able to document theoretical and practical training onboard in using equipment specified

11.3 Equipment – The measuring instrument shall be an integrating sound level meter with frequency analyser capabilities complying with IEC (International Electrotechnical Commission) 60651 and IEC 61672, type 1 precision class with, at least an A-weighting frequency response curve and 1/3 octave and 1 octave band filters, complying to IEC 61260, as appropriate for the measurements to be carried out. In addition microphones shall be of the random incidence type, complying with IEC 60651.

11.4 Procedures – Documented work procedures are at least to contain information on inspection preparation, calibration, selection and identification of test locations.

11.5 Reporting – The report shall describe, as a minimum, the environmental conditions of the tests and, for each test location, the ambient noise level or the speech interference level, as appropriate for the measurements to be carried out. The report shall conform to any other specific requirement of BCS.

11.6 Verification – The supplier must have the Surveyor's verification of each separate job, documented in the report by his signature.

11.7 Reference documents

The Service Supplier is to have access to the following documents:

- SOLAS 74/78, Ch III, Pt A, Reg 4 – Evaluation, testing and approval of life-saving appliances and arrangements
- SOLAS 74/78, Ch III, Pt B, Reg 6 – Communications
- International Life-Saving Appliance (LSA) Code, Ch VII, Reg 7.2 – General alarm and public address system
- IMO - Code on Alarms and Indicators, 1995 as amended
- IEC 60651 (2001-10) - Sound level meters
- IEC 61672 - Electroacoustics - Sound level meters
- IEC 61260 - Electroacoustics - Octave-band and fractional-octave-band filters

12. Firms engaged in testing of coating systems in accordance with IMO Resolution MSC.215(82) as amended and BCS-I SC223 and/or MSC.288(87) as amended

12.1 Laboratories

12.1.1 Extent of Engagement - Testing of coatings systems according to IMO Resolution MSC.215(82), as corrected by IMO MSC.1/Circ.1381 and amended by IMO Resolution 341(91) and BCS-I SC223 and/or MSC.288(87), as corrected by IMO MSC.1/Circ.1381 and amended by IMO Resolution 341(91).

12.1.2 The laboratory is to provide to **BCS** the following information:

- A detailed list of the Laboratory test equipment for the coating approval according to the IMO Resolution MSC.215(82) as amended and/or MSC.288(87) as amended.
- A detailed list of reference documents comprising a minimum those referred to in IMO Resolution MSC.215(82) as amended and/or MSC.288(87) as amended for the coating approval.
- Details of test panel preparation, procedure of test panel identification, coating application, test procedures and a sample test report.
- Details of exposure method and site for weathering primed test panels.
- A sample daily or weekly log/form for recording test conditions and observations including unforeseen interruption of the exposure cycle with corrective actions.
- Details of any sub-contracting agreements (if applicable).
- Comparison test report with an approved coating system or laboratory if available.

12.1.3 Reporting – Reference is made to the following BCS-Gs:

- BCS-G 101: Model Report for IMO Resolution MSC.215(82) Annex 1 “Test Procedures for Coating Qualification”
- BCS-G 102: Model Report for IMO Resolution MSC.215(82) Annex 1 “Test Procedures for Coating Qualification”, Section 1.7 – Crossover Test

12.1.4 Audit of the test laboratory is to be based on this procedure and the standards listed in the IMO Resolution MSC.215(82) as amended and/or MSC.288(87) as amended for the coating approval.

13. Firms engaged in maintenance, thorough examination, operational testing, overhaul and repair of lifeboats and rescue boats, launching appliances and release gear

13.1 Extent of engagement – Maintenance, thorough examination, operational testing, overhaul and repair of:

- .1 lifeboats (including free-fall lifeboats), rescue boats and fast rescue boats; and
- .2 launching appliances and on-load and off-load release gear for lifeboats (including primary and secondary means of launching appliances for free-fall lifeboats), rescue boats, fast rescue boats and davit-launched liferafts.

13.2 Extent of Approval

13.2.1 The contents of this procedure apply equally to manufacturers or ship's operator when they are acting as Service Suppliers.

13.2.2 Any Service Supplier engaged in maintenance, thorough examination, operational testing, overhaul and repair of lifeboats and rescue boats, launching appliances and release gear carried out in accordance with SOLAS regulation III/20 shall be approved for these operations for each make and type of equipment for which they provide the service in accordance with IMO Resolution MSC.402(96)/Corr.1 (annex, section 7).

Such approval shall include, as a minimum:

- employment and documentation of personnel certified in accordance with a recognized national, international or industry standard as applicable, or an equipment manufacturer's established certification program. In either case, the certification program shall be based on the paragraph 13.3 for each make and type of equipment for which service is to be provided; and,
- compliance with provisions of paragraphs 13.4, 13.5 and 13.6

13.2.3 In cases where an equipment manufacturer is no longer in business or no longer provides technical support, Service Suppliers may be approved for the equipment on the basis of prior approval for the equipment and/or long term experience and demonstrated expertise as an approved service provider.

13.3 Certification of Personnel

13.3.1 Personnel for the work specified in 13.1 shall be certified by the manufacturer or the Service Supplier for each make and type of the equipment to be worked on. Approved Service Supplier is allowed to certify its own personnel (i.e. employed by the same service supplier) only.

13.3.2 The education for initial certification of personnel should be documented and address, as a minimum:

- Causes of lifeboat and rescue boat accidents
- Relevant rules and regulations, including International Conventions
- Design and construction of lifeboats (including free-fall lifeboats), rescue boats and fast rescue boats, including on load release gear and launching appliances

-
- Education and practical training in the procedures specified in section 6 of the Annex to IMO Resolution MSC.402(96) /Corr.1 for which certification is sought
 - Detailed procedures for thorough examination, operational testing, repair and overhaul of lifeboats (including free-fall lifeboats), rescue boats and fast rescue boats, launching appliances and on load release gear, as applicable;
 - Procedures for issuing a report of service and statement of fitness for purpose based on IMO Resolution MSC.402(96) /Corr.1 (annex, paragraph 5.3); and
 - Work, health and safety issues while conducting activities on board.

13.3.3 The training for the personnel shall include practical technical training on thorough examination, operational testing, maintenance, repair and overhaul techniques using the equipment for which the personnel are to be certified. The technical training shall include disassembly, reassembly, correct operation and adjustment of the equipment. Classroom training shall be supplemented by field experience in the operations for which certification is sought, under the supervision of a certified person.

13.3.4 Prior to issuance of personnel certification, a competency assessment shall be satisfactorily completed, using the equipment for which the personnel are to be certified.

13.3.5 Upon completion of training and competency assessment, a certificate shall be issued defining the level of qualification and the scope of the certification (i.e. makes and types of equipment and specifically state which activities (annual thorough examination and operational tests; 5-year thorough examination, overhaul; overload operational tests; repairs) are covered by the certification). The expiry date shall clearly be written on the certificate and shall be three years from the date of issue. The validity of any certificate shall be suspended in the event of any shortfall in performance and only revalidated after a further competency assessment.

13.3.6 A competency assessment shall be conducted to renew the certification. In cases where refresher training is found necessary a further assessment shall be carried out after completion.

13.4 Reference Documents - The Service Supplier is to have access to the following documents:

- IMO - Resolution MSC.402(96) /Corr.1, Requirements for Maintenance, Thorough Examination, Operational Testing, Overhaul and Repair of Lifeboats and Rescue Boats, Launching Appliances and Release Gear
- IMO - Resolution A.689(17), recommendation on testing of life-saving appliances and, for life-saving appliances installed on board on or after 1 July 1999,
- IMO - Resolution MSC.81(70), as amended, revised recommendation on testing of life- saving appliances
- Manufacturer's instructions (including updates, amendments and safety notices) for repair work involving disassembly or adjustment of on-load release mechanisms and davit winches.
- Type Approval certificate showing any conditions that may be appropriate during the servicing and/or maintenance of lifeboats, launching appliances and on-load release gear

13.5 Equipment and Facilities - The Service Supplier is to have the following:

- Sufficient tools, and in particular any specialized tools specified in the equipment manufacturer's instructions, including portable tools as needed for work to be carried out on board ship
- Access to appropriate parts and accessories as specified by the equipment manufacturer for maintenance and repair
- For servicing and repair work involving disassembly or adjustment of on-load release mechanisms, availability of genuine replacement parts as specified or supplied by the equipment manufacturer

13.6 Reporting - The report shall conform to the requirements of IMO Resolution MSC.402(96) /Corr.1 (annex, paragraph 5.3). When repairs, thorough examinations and annual servicing are completed, a statement confirming that the lifeboat arrangements remain fit for purpose should be promptly issued by the Service Supplier that conducted the work. A copy of valid documents of certification and authorization as appropriate shall be included with the statement.

14. Firms engaged in measurements of Noise level Onboard Ships

14.1 Extent of engagement

Sound pressure level measurements onboard Ship.

14.2 Supervisor

The supervisor shall have a minimum of 2 years of experience as an operator in sound pressure level measurements.

14.3 Operators

The operator is to have the following qualifications:

- Knowledge in the field of noise, sound measurements and handling of measurement equipment
- Adequate knowledge of the applicable international requirements (SOLAS Regulation II-1/3-12, as amended, and IMO Code on noise levels onboard Ships, as amended,)
- At least 1 year's experience, including participation in a minimum of 5 measurement campaigns as an assistant operator
- Training concerning the procedures specified in IMO Code on Noise Levels onboard Ships
- Be able to document theoretical and practical training onboard in using a sound level meter

14.4 Equipment

14.4.1 Sound level meters

Measurement of sound pressure levels shall be carried out using precision integrating sound level meters. Such meters shall be manufactured to IEC 61672-1(2002-05)¹, as amended, type/class¹ standard as applicable, or to an equivalent standard acceptable to the Administration².

¹ Recommendation for sound level meters.

² Sound level meters class/type 1 manufactured according to IEC 651/IEC 804 may be used until 1 July 2016.

14.4.2 Octave filter set

When used alone, or in conjunction with a sound level meter, as appropriate, an octave filter set shall conform to IEC 61260 (1995)³, as amended, or an equivalent standard acceptable to the Administration.

³ Octave-band and fractional-octave-band filters

14.4.3 Sound Calibrator

Sound calibrators shall comply with the standard IEC 60942 (2003-01), as amended, and shall be approved by the manufacturer of the sound level meter used.

14.4.4 Calibration

Sound Calibrator and sound level meter shall be verified at least every two years by a national Standard laboratory or a competent laboratory accredited according to ISO 17025 (2005), as amended. A record with a complete description of the equipment used shall be kept, including a calibration log.

14.4.5 Microphone wind screen

A microphone wind screen shall be used when taking readings outside, e.g. on navigating bridge wings or on deck, and below deck where there is any substantial air movement. The wind screen should not affect the measurement level of similar sounds by more than 0.5 dB(A) in "no wind" conditions.

14.5 Procedures and instructions

14.5.1 The supplier shall have documented procedures and instructions to carry out service of the equipment.

Documented work procedures are at least to contain information on inspection preparation, selection and identification of sound level measurement locations, calibration checks and report preparation.

14.5.2 The supplier shall have access to the following documents:

- SOLAS 1988, as amended (Reg.II-1/3-12)
- Resolution A.468(XII) and IMO Resolution MSC.337(91) code on noise levels on board ships
- Resolution A.343(IX) Recommendation on methods of measuring noise levels at listening posts
- The Society's Rules and Guidelines

14.6 Reporting

A noise inspection report shall be made for each ship. The report shall comprise information on the noise levels in the various spaces on board. The report shall show the reading at each specified measuring point. The points shall be marked on a general arrangement plan, or on accommodation drawings attached to the report, or shall otherwise be identified.

The format for noise inspection reports is set out in appendix 1 of IMO Code on Noise Levels onboard Ships and may conform to any other specific requirement of **BCS** (refer to IMO circular MSC.337(91)).

14.7 Verification

The supplier must have the Surveyor's verification of each separate job, documented in the report by his signature.

15. Firms engaged in tightness testing of primary and secondary barriers of gas carriers with membrane cargo containment systems for vessels in service

15.1 Extent of engagement

Firms carrying out the following:

- Global Vacuum Testing of Primary and Secondary Barriers
- Acoustic Emission (AE) Testing
- Thermographic Testing

15.2 Requirements for firms engaged in global testing of primary and secondary barriers

15.2.1 Testing Procedures – Testing is to be carried out in accordance with cargo containment system designer's procedures as approved by **BCS**.

15.2.2 Authorization – The supplier is to be authorized by the system designer to carry out the testing.

15.2.3 Equipment – Equipment is to be maintained and calibrated in accordance with recognized national or international industrial standards.

15.2.4 Reporting – The report is to contain the following:

- Date of testing
- Identity of test personnel
- Vacuum decay data for each tank
- Summary of test results

15.3 Requirements for firms engaged in acoustic emission (AE) testing

15.3.1 Testing procedures – The supplier is to have documented procedures based upon recognized national or international industrial standards to perform ultrasonic leak test using AE sensors for the secondary barrier of membrane cargo containment systems. The procedures are to include details of personnel responsibilities and qualification, instrumentation, test preparation, test method, signal processing, evaluation and reporting.

Note: The differential pressure during testing should not exceed the containment system designer's limitations.

15.3.2 Supervisor – The responsible supervisor shall be certified to a recognized national or international industrial standard (e.g. Level II, ISO-9712 as amended or SNT-TC-1A as amended) and have one year experience at Level II.

15.3.3 Operators – The operators carrying out the acoustic emission (AE) testing shall be certified to a recognized national or international industrial standard (e.g. Level I, ISO-9712 as amended or SNT-TC-1A as amended) and shall have adequate knowledge of ship structures sufficient to determine sensor placement.

15.3.4 Equipment – Equipment is to be maintained and calibrated in accordance with recognized national or international industrial standards or equipment manufacturer's recommendations.

15.3.5 Evaluation of acoustic emission (AE) testing – Must be carried out by the supervisor or individuals certified to a recognized national or international industrial standard (e.g. Level II, ISO-9712 as amended or SNT-TC-1A as amended) and have one year experience at Level II.

15.3.6 Reporting – The report is to contain the following:

- Date of testing
- Supervisor and operator(s) certifications
- Description of time and pressure of each cycle of test
- List and sketch detailing location of possible defects

15.4 Requirements for firms engaged in thermographic testing

15.4.1 Testing Procedures – Testing is to be carried out in accordance with the cargo containment system designer's procedures as approved by **BCS**.

15.4.2 Authorization – The supplier is to be authorized by the system designer to carry out the testing.

15.4.3 Supervisor – The responsible supervisor shall be certified to a recognised national or international industrial standard (e.g. Level II, ISO-9712 as amended or SNT-TC-1A as amended) with additional certification in infrared/thermal testing. SNT-TC-1A certified personnel must provide evidence that training on Level II or above has been administered by an independent training body centrally certified to ASNT or a comparable nationally recognized certification scheme.

15.4.4 Operators – The operators carrying out the imaging shall be certified to a recognized national or international industrial standard (e.g. Level I, ISO-9712 as amended or SNT-TC-1A as amended) with additional certification in infrared/thermal testing and shall have adequate knowledge of ship structures sufficient to determine position for each identified image, and of the containment system to understand the basis of the testing. SNT-TC-1A certified personnel must provide evidence that training on Level I or above has been administered by an independent training body centrally certified to ASNT or a comparable nationally recognized certification scheme.

15.4.5 Equipment – Thermal cameras and sensors are to be in accordance with the system designer's procedures with regards to sensitivity, accuracy and resolution.

Equipment are to be in accordance with recognized standard (IEC, etc.) with regards their safety characteristics for the use in hazardous areas (in gas explosive atmosphere), maintained and calibrated in accordance with the maker's recommendations.

15.4.6 Evaluation of thermographic images – Must be carried out by the supervisor or individuals certified to a recognized national or international industrial standard (e.g. Level II, ISO-9712 as amended or SNT-TC-1A as amended) with additional certification in infrared/thermal testing. SNT-TC-1A certified personnel must provide evidence that training on

Level II or above has been administered by an independent training body centrally certified to ASNT or a comparable nationally recognized certification scheme.

15.4.7 Reporting – The report is to contain the following:

- Date of testing
- Supervisor and operator(s) certifications
- Differential pressures of all phases
- List and sketch detailing location of thermal indications
- Thermographic images of all phases of testing for thermal indications
- Evaluation of thermal images indicating possible leaks

16. Firms engaged in survey using Remote Inspection Techniques (RIT) as an alternative means for Close-up Survey of the structure of ships and mobile offshore units.

16.1 Definitions:

- Close-Up Survey: A Close-Up Survey is a survey where the details of structural components are within the close visual inspection range of the surveyor i.e. normally within reach of hand.
- Remote Inspection Techniques (RIT): RIT is a means of survey that enables examination of any part of the structure without the need for direct physical access of the surveyor (refer to Rec.42). Remote inspection techniques may include the use of:
 - Unmanned Aerial Vehicles (UAV)
 - Drones
 - Unmanned robot arm
 - Remotely Operated Vehicles (ROV)
 - Climbers
 - Other means acceptable to the Society.

16.2 Extent of engagement – Close-up Survey of ships' structure and mobile offshore units' structure by remote inspection techniques. For in-water close-up survey of the internal compartments by Remotely Operated Vehicle (ROV), suppliers are also to hold separate approval as a "Firm carrying out an in-water survey on ships and mobile offshore units by diver or Remotely Operated Vehicle (ROV)" (see Annex 1, Section 3).

16.3 Training and qualification of operators – The supplier is responsible for the training and qualification of its operators to undertake the remote inspections. UAV Pilots are to be qualified and licenced in accordance with applicable national requirements or an equivalent industrial standard acceptable to the society.

Knowledge of the following shall be documented:

- Marine and/or offshore nomenclatures.
- The structural configuration of relevant ships types and MOUs, including internal structure.
- The remote inspection equipment and its operation.
- Survey plans for examination of hull spaces of various configurations, including appropriate flight plans if using a UAV.
- Thickness measurement (TM) and non-destructive test (NDT) in accordance with a recognised National or International Industrial NDT Standard when these are part of the service. Suppliers undertaking TMs are to hold separate approval as a 'Firm engaged in thickness measurements on ships' (see Annex 1, Section 1).

16.4 Training Plan – the supplier is to maintain a documented training plan for personnel. The plan shall include requirements for training in the minimum Rule requirements for the structure of relevant ships types and MOUs, the recognition of structural deterioration (including corrosion, buckling, cracking and deteriorated coatings) and use of the reporting system.

16.5 Supervisor – The supervisor shall be certified according to the recognized national requirements or an equivalent industrial standard (e.g. XXX Level) and shall have a minimum of two years' experience in the inspection of ship's and/or MOU's structure.

16.6 Operators – The operator carrying out the inspection shall be certified according to the recognized national requirements or an equivalent industrial standard (e.g. YYY Level) and have had at least one year's experience as an assistant carrying out inspections of ship's and/or MOU's structure (including participation in a minimum of five different assignments). The operators of those RIT which require, according to the international and national legislations, to be licensed for their use shall hold valid documentation issued by the appropriate Bodies (e.g. UAV Pilots are to be qualified and licenced in accordance with applicable national requirements).

16.7 Equipment – The following shall be available:

- Remotely operated platform with data capture devices capable of operation within an enclosed space.
- Means of powering the platforms with sufficient capacity to complete the required inspections, including spare batteries if applicable.
- Data collection devices which may include cameras capable of capturing in high definition both video images and still images.
- Illumination equipment.
- High definition display screen with live high definition feed from inspection cameras.
- (When this is part of the RIT).
- Means of communication.
- Data recording devices, as applicable.
- Equipment for carrying out thickness gauging and/or non-destructive testing, as relevant to the work to be performed (when this is part of the service).

16.8 Procedures and guidelines – The supplier shall have documented operational procedures and guidelines for how to plan, carry out and report inspections; how to handle/operate the equipment; collection and storage of data. These shall include:

- Requirements for preparation of inspection plans when UAV are part of the equipment flight plans shall be included.
- Operation of the remotely operated platforms.
- Operation of lighting.
- Calibration of the data collection equipment.
- Operation of the data collection equipment.
- Two-way communication between the operator, platform, Surveyor, other personnel such as support staff and ships officers and crew.
- Guidance of the operator to provide complete coverage of the structure to be inspected.
- Guidance for the maintenance of the remotely operated platforms, data capture and storage devices and display screens, as applicable.
- Requirements for the collection and validation of data.
- If data is to be stored, then requirements for location attribution (geo-tagging), validation and storage of data.
- Requirements for the reporting of inspections, including the recording of damages and defects found during inspection and repair work.

16.9 Documentation and records - The supplier shall maintain the following:

- Records of training.
- Operator statutory and regulatory certificates and licences.
- Equipment register for UAVs, Robots, data collection devices, data analysis devices and any associated equipment necessary to perform inspections.
- Equipment maintenance manuals and records / logbook.
- Records of calibration.
- UAV / Robot operation logbook.

16.10 Verification – The supplier must have the Surveyor's verification of each separate job, documented in the report by the attending Surveyor(s) signature.

17. Firms engaged in Watertight Cable Transit Seal Systems Inspection on Ships and Mobile Offshore Units.

17.1 Extent of engagement

17.1.1 Inspection of the Watertight Cable Transit Seal Systems for compliance with the relevant approval certificates and product installation manuals, (types of penetrating cables, dimensions, fill ratio and insulation details, as applicable).

17.2 Extent of Approval

17.2.1 The contents of this procedure apply equally to manufacturers or shipyards when they are acting as Service Suppliers.

17.2.2 Any Service Supplier engaged in the inspections of watertight cable transit seal systems shall be qualified in these inspections for each make and type of equipment for which they provide the inspection, and provide manufacturers documentary evidence that they have been so authorized or they are certified in accordance with an established system for training and authorization.

Such qualification shall include, as a minimum:

- employment and documentation of personnel certified in accordance with a recognized national, international or industry standard as applicable, or an equipment manufacturer's established certification program. In either case, the certification program shall be based on the paragraph 17.3 for each make and type of equipment for which inspection is to be provided, and
- compliance with provisions of paragraphs 17.4, 17.5 and 17.6.

17.2.3 In cases where an equipment manufacturer is no longer in business or no longer provides technical support, Service Suppliers may be authorised for the equipment on the basis of prior authorization for the equipment and/or long term experience and demonstrated expertise as an authorized service supplier.

17.3 Qualifications and Training of Personnel

17.3.1 Personnel for the work specified in 17.1.1 shall be trained and qualified in the inspection for which they are authorised, for each make and type of equipment for which they provide the inspection.

17.3.2 The education for initial certification of personnel shall be documented and addressed, as a minimum:

- Procedures and instructions for the inspection of the watertight cable transit seal systems
- Common problems found with the initial installation and in-service inspections of watertight cable transit seal systems
- Relevant rules and regulations, including International Conventions
- Procedures for reporting on initial installation and in-service inspections of watertight cable transit seal systems in the Cable Transit Seal Systems Register.

17.3.3 The education and training for the personnel shall include practical technical training on actual inspection using the watertight cable transit seal systems for which the personnel are to be certified. The technical training shall include disassembly, reassembly and adjustment of the equipment. Classroom training shall be supplemented by field experience in the inspections for which certification is sought, under the supervision of an experienced senior certified person.

17.3.4 At the time of initial certification and at each renewal of certification, the service supplier shall provide documentation to verify personnel's satisfactory completion of a competency assessment using the equipment for which the personnel are certified.

17.3.5 The Service Supplier shall require refresher training as appropriate to renew the certification.

17.4 Reference Documents

The Service Supplier is to have access to the following documents:

- Manufacturer's servicing manuals, servicing bulletins, instructions and training manuals as appropriate.
- Type Approval certificate showing any conditions that may be appropriate during the installation or maintenance of the watertight cable transit seal system.

17.5 Equipment and Facilities

The Service Supplier is to have access to the following:

- Sufficient tools, and in particular any specialized tools specified in the equipment manufacturer's instructions, including portable tools as needed for work to be carried out on board ship.

17.6 Reporting

- On completion of inspection, the Service Supplier will issue a report confirming the condition of the watertight Cable Transit Seal System. They will also record the results of their inspection in the Cable Transit Seal System Register.

18. Firms engaged in Commissioning Testing of Ballast Water Management Systems (BWMS)

18.1 Extent of engagement - Sampling and Analysis of ballast water and Verification of the self-monitoring equipment during Commissioning Testing of Ballast Water Management Systems (BWMS), for Statutory purposes.

18.2 Procedure

18.2.1 Service suppliers are to have documented procedures including:

- Procedures for sampling collection and handling, analysis, assessment of BWMS correct operations and documenting and reporting. The procedures are to outline how the ballast water sampling and analysis is conducted with respect to each size class of organisms;
- Operating procedures for the ballast water test equipment specified including calibration, adjustment and maintenance

18.2.2 Service Suppliers are to be familiar with the BWMS operation including features and limits of each treatment technology, and self-monitoring parameters.

18.2.3 Service Suppliers are to be accredited to relevant standards such as ISO/IEC 17025 or equivalent, as applicable.

18.2.4 Service Suppliers are to be independent of the BWMS manufacturer or supplier including shipyards.

18.3 Operators – Service Suppliers are expected to be able to perform both the biological sampling and assessment of self-monitoring parameters and has responsibility for document that the requirements to the operator are satisfied. Therefore, operators who conduct commissioning testing are to:

- demonstrate knowledge in the use of different ballast water testing equipment for the purpose of assessing biological efficacy;
- have documented evidence of sufficient engineering and biological knowledge to conduct the commissioning testing;
- have knowledge of IMO BWM.2/Circ.70/Rev.1, as may be amended - 'Guidance for the Commissioning Testing of Ballast Water Management Systems' and IMO BWM.2/Circ.42/Rev.2 - 'Guidance on Ballast Water Sampling and Analysis for Trial Use in accordance with the BWM Convention and Guidelines (G2)', as may be amended;
- (*) be trained in the proper use of portable indicative analysis equipment. Review of training records and/or interviews should be conducted to confirm the equipment will be properly used during testing;
- (*) be familiar with and understand the design concepts of the Guidelines G2 sampling devices installed on the vessel's water ballast system. Personnel shall understand the need to maintain the G2 sampling devices clean and free of contaminants and the importance of controlling the ballast water sample flow rates from the G2 device (to avoid organism mortality in the sample);
- (*) be familiar with the technologies utilized by the indicative sampling equipment and understand water quality issues that are both conducive to successful use of the equipment and circumstances that could challenge the use of the equipment;

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- (*) be trained in the proper disposal procedures for water samples following testing.
 - (Δ) have knowledge of the system design limitations of the BWMS (as stated in the BWMS type approval certificate) and knowledge of the BWMS self-monitoring parameters, such as flow rate, pressure, TRO concentration, UV transmittance/intensity, etc, and how the BWMS notifies the operator in case he operates BWMS outside its system design limitations. This knowledge is relevant for evaluating whether the self-monitoring equipment of the BWMS indicates correct operation of the BWMS. In case Service Supplier are not present during ballasting operations, the Service Supplier shall have knowledge of how to access the BWMS log to evaluate that the BWMS operated correctly during ballasting operations;
 - (Δ) have the procedures and knowledge to be able to assess the applicable self-monitoring parameters (e.g., flow rate, pressure, TRO, UV intensity, etc.) of the BWMS, taking into account the System Design Limitations of the BWMS;

Notes: (1) the points marked with () are qualifications for operators performing sampling and analysis of ballast water; (2) the points marked with (Δ) are the qualifications for operators performing verification of the self-monitoring equipment ;(3) the points above without symbol are the common qualifications for service supplier.*

18.4 Equipment and facilities

Equipment, procedures and methods for detailed analysis, where applicable, are to be in accordance with relevant International standard and/or accepted Industry standards. Laboratories conducting sample enumeration are to be accredited to ISO/IEC 17025 standard, or equivalent.

Testing should be conducted using indicative analysis equipment accepted by Society. information and reference to the acceptance documents for the equipment used should be submitted to the Society in the report which includes the results from the commissioning test as per IMO BWM.2/Circ.70/Rev.1, as may be amended. In case the indicative analysis equipment used has not been previously accepted by the Society, the following information is to be submitted to the Society;

- Equipment information - type, model, technology used, evidence of calibration, detection range, Organism type/size classes that can be analyzed.
- Test results conduct for the verification of accuracy, detection range and repeatability.
- Certificate of standards, if available.

For indicative analysis equipment planned to be used, the equipment OEM instruction manuals shall be available. The manuals shall include, at least, clear guidance for the proper storage, handling, operation, maintenance, repair, and calibration.

Note: Each Service Supplier applicant will present the Surveyor their confidential internal procedures for conducting the indicative testing. Not all the equipment listed in the references will be used. For all equipment planned to be used, the instruction manuals shall be available.

The Service Supplier will need to use specialty devices (e.g., sieves, screens, etc.) to separate the different organism sizes classes (i.e., $\geq 10\ \mu\text{m}$ to $< 50\ \mu\text{m}$, and $\geq 50\ \mu\text{m}$, and indicator microbes) to support analysis of each size class.

Equipment used for the analysis of other physical-chemical water parameters is to be suitable for the intended use.

Indicative analysis equipment should be properly stored or transported to avoid damage and disturbance to calibrations, etc. when transporting from the Service Suppliers facilities to the vessels.

18.5 Sampling and Analysis

Service Suppliers are to follow relevant guidelines on sampling of ballast water. A standard operating procedure is to be defined for sampling of uptake water. Discharge sampling shall follow the IMO's 'Guidelines for Ballast Water Sampling (G2)'.

The representative samples shall be analyzed as a minimum for the two size classes of organisms, namely $\geq 50\ \mu\text{m}$ and $\geq 10\ \mu\text{m}$ to $< 50\ \mu\text{m}$, specified in IMO Circular BWM.2/Circ.70/Rev.1 - Guidance for the Commissioning Testing of Ballast Water Management Systems using indicative analysis methods. Detailed analysis of all organism type/size classes or combination of detail and indicative analysis can also be performed.

Service Suppliers shall maintain a record of:

- Operation of the BWMS during test period, including any recorded data or operator observations associated with the performance deviations, alarms or abnormal/unexpected operations.
- Applicable self-monitoring parameters.

In case the commissioning testing requires the Service Supplier's personnel to work in hazardous areas (e.g., pump room for tankers, etc.), the Service Supplier shall either have equipment certified for the spaces or provide the Surveyor with a list of vessels for which they would not be able to conduct testing.

18.6 Reporting

Service Suppliers are to provide reports detailing the results of sampling and analysis of ballast water and assessment of self-monitoring parameters during commissioning testing. The format is to be acceptable to Society. The report, as a minimum, will contain the following:

- Manufacturer's name
- Model name
- BWMS Technology limiting operating conditions and system design limitations
- Operation required, e.g., ballasting, de-ballast, circulation, one pass, in tank, etc

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- Treatment rated capacity (TRC) in m³/h
 - Relevant performance parameters (e.g. TRO, UV dose, UVI, flow rate or other relevant performance parameter).
 - Alarms developed during operation.
 - Installation location.
 - Type Approval issued by and Certificate No
 - Date installed
 - Results of Sample analysis
 - Pump flow rate, ballast tanks and volume
 - Comments/Options: Filter and other major components, Process measurements.

18.7 Reference Documents

The Service Supplier is to have access to the following documents, as may be amended:

- IMO Resolution MEPC.300(72) — Code for Approval of Ballast Water Management Systems (BWMS Code)
- IMO Resolution MEPC.173(58) — Guidelines for Ballast Water Sampling (G2)
- IMO Circular BWM.2/Circ.42/Rev. 2 — Guidance on Ballast Water Sampling and Analysis for Trial Use in accordance with the BWM Convention and Guidelines (G2)
- IMO Circular BWM.2/Circ.70/Rev.1 - Guidance for the Commissioning Testing of Ballast Water Management Systems
- IMO Circular BWM.2/Circ.61 - Guidance on Methodologies that may be used for Enumerating Viable Organisms for Type Approval of Ballast Water Management Systems
- IMO Circular BWM.2/Circ.69 - Guidance on System Design Limitations of Ballast Water Management Systems and their Monitoring
- IMO Resolution MEPC.279(70) - 2016 Guidelines for Approval of Ballast Water Management Systems (G8)
- IMO Resolution A.1120(30) – Survey Guidelines under the Harmonized System of Survey and Certifications (HSSC), 2017 (for BWMS that were Type Approved to the 2016 G8)

BCS-R Z18 Survey of Machinery

1. General Requirements

- 1.1 Special Surveys
- 1.2 Annual Surveys
- 1.3 Continuous Surveys
- 1.4 Surveys of Commercial Vessels Supporting Military Use
- 1.5 Planned Maintenance Scheme
- 1.6 Condition Monitoring / Condition Based Maintenance

2. Survey of Steam Boilers

3. Propulsion Steam Turbines: Modification of First Special Survey

4. Machinery Verification Runs

5. Survey of towing winch emergency release systems subject to BCS-R M79

Note:

- 1. This requirement is applied on surveys commenced on or after 1 July 2021.

1. General Requirements

1.1 Special Surveys¹

1.1.1 Special Surveys are to be carried out at 5 years intervals to renew the Class Certificate.

1.1.2 The first Special Survey is to be completed within 5 years from the date of the initial classification survey and thereafter 5 years from the credited date of the previous Special Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances. In this case, the next period of class will start from the expiry date of the Special Survey before the extension was granted.

1.1.3 For surveys completed within 3 months before the expiry date of the Special Survey, the next period of class will start from the expiry date of the Special Survey. For surveys completed more than 3 months before the expiry date of the Special Survey, the period of class will start from the survey completion date. In cases where the vessel has been laid up or has been out of service for a considerable period because of a major repair or modification and the owner elects to only carry out the overdue surveys, the next period of class will start from the expiry date of the special survey. If the owner elects to carry out the next due special survey, the period of class will start from the survey completion date.

1.1.4 The Special Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5th anniversary date. When the Special Survey is commenced prior to the 4th Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited to the Special Survey.

1.2 Annual Surveys

Annual Surveys are to be held within 3 months before or after each anniversary date of the date of the initial classification survey or the completion of the last Special Survey. They will normally be performed at the same time as an Annual Hull or Load Line survey.

1.3 Continuous Surveys

Special Surveys of machinery may be carried out on a continuous survey basis. In this case, the interval between consecutive examinations of each item is not to exceed five (5) years.

1.4 Surveys of Commercial Vessels Supporting Military Use

Special consideration may be given in application of relevant sections of this Unified Requirement to commercial vessels owned or chartered by Governments, which are utilized in support of military operations or service.

1.5 Planned Maintenance Scheme (PMS)

Surveys of machinery may be carried out on a PMS basis (Reference to the BCS-R Z20).

1.6 Condition Monitoring (CM) and Condition Based Maintenance (CBM)

Surveys of machinery may be carried out on a CM / CBM basis (Reference to the BCS-R Z27).

¹ Some Societies use the term "Special Periodical Survey", others the term "Class Renewal Survey" instead of the terms "Special Survey".

2. Survey of Steam Boilers

2.1 Water tube boilers used for main propulsion, including reheat boilers, all other boilers of essential service, and boilers of non-essential service having working pressure exceeding 0.35 N/mm² (3.5 bar) and a heating surface exceeding 4.5 m², are to be surveyed internally. There is to be a minimum of two internal examinations during each 5-year special survey period. In all cases the interval between any two such examinations is not to exceed 36 months. An extension of examination of the boiler of up to 3 months beyond the due date can be granted in exceptional circumstances². (See 2.3)

At each survey, the boilers, superheaters, and economizers are to be examined internally **on water-steam side and fire side**. Boiler mountings and safety valves are to be examined at each survey and opened out as considered necessary by **BCS**.

When direct visual internal inspection is not feasible due to the limited size of the internal spaces, such as for small boilers and/or narrow internal spaces, this may be replaced by a hydrostatic pressure test or by alternative verifications as determined by **BCS**.

The adjustment of the safety valves is to be verified during each boiler internal survey. Boiler safety valve and its relieving gear are to be examined and tested to verify satisfactory operation. However, for exhaust gas heated economizers, if steam cannot be raised at port, the safety valves may be set by the Chief Engineer at sea, and the results recorded in the log book for review by **BCS**.

Review of the following records since the last Boiler Survey is to be carried out as part of the survey:

- Operation
- Maintenance
- Repair history
- Feedwater chemistry

2.2 External survey of boilers including test of safety and protective devices, and test of safety valve using its relieving gear, is to be carried out annually, within the window of the Annual Survey of a ship. For exhaust gas heated economizers, the safety valves are to be tested by the Chief Engineer at sea within the annual survey window. This test is to be recorded in the log book for review by the attending Surveyor prior to crediting the Annual Survey of Machinery.

2.3 An extension may be granted by **BCS**, on the basis of Para. 2.1, after the following is satisfactorily carried out:

- i) External examination of the boiler
- ii) Boiler safety valve relieving gear (easing gear) is to be examined and operationally tested

² "Exceptional circumstances" means unavailability of repair facilities, unavailability of essential materials, equipment or spare parts, or delays incurred by action taken to avoid severe weather conditions.

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- iii) Boiler protective devices operationally tested
 - iv) Review of the following records since the last Boiler Survey:
 - Operation
 - Maintenance
 - Repair history
 - Feedwater chemistry

2.4 Exhaust Gas Heated Economizers

In addition to the other requirements of 2.1 (**internal examination**) in exhaust gas heated economizers of the shell type, **all** accessible welded joints are to be subjected to a **visual** examination for cracking. Nondestructive Testing may be required for this purpose.

3. Propulsion Steam Turbines: Modification of First Special Survey

3.1 Where the propulsion steam turbines are of a well known type, and fitted with rotor position indicators and vibration indicators of an approved type, as well as measuring equipment of steam pressure at proper locations along the steam flow, and the arrangements for change over in case of emergency operation of the plant are readily operable, the first Special Survey may be limited to the examination of rotor bearings, thrust bearings and flexible couplings, provided the surveyor has been satisfied from operation service records and power trials subsequent to the survey, that the turbine plant is in good working condition.

3.2 Turbine casings should be opened at the next Special Survey and subsequent Special Surveys.

4. Machinery Verification Runs

4.1 As part of the Special Survey of Machinery, a dock trial is to be carried out to attending Surveyors' satisfaction to confirm satisfactory operation of main and auxiliary machinery. If significant repairs are carried out to main or auxiliary machinery or steering gear, consideration should be given to a sea trial to attending Surveyors' satisfaction.

4.2 If the significant repairs as stated in 4.1, is considered by classification society to have any impact on response characteristics of the propulsion systems, then the scope of sea trial shall also include a test plan for astern response characteristics based on those required for such an equipment or systems when fitted to the new ship. Refer to BCS-R M25 for astern testing requirements.

The tests are to demonstrate the satisfactory operation of the equipment or system under realistic service conditions at least over the manoeuvring range of the propulsion plant, for both ahead and astern directions.

Depending on the actual extent of the repair, **BCS** may accept a reduction of the test plan.

5. Survey of towing winch emergency release systems subject to BCS-R M79

5.1 Annual Survey

5.1.1 Operation of the towing winch emergency release system is to be confirmed with the reference to the documented instructions for surveys provided by the manufacturer. Operation of the winch emergency release system under no load condition is to be verified. Where practical, activation of the emergency release system may be confirmed by observation of the winch brake.

5.1.2 The function of the alarms associated with the emergency release system is to be verified, as far as practicable and reasonable.

5.1.3 The condition of the emergency release system is to be visually examined to confirm it remains in satisfactory condition.

5.1.4 The means of emergency release of the towline in the event of a blackout is to be examined, and where additional sources of energy are arranged for this purpose, the sources of energy are to be visually inspected and operationally tested.

5.1.5 It is to be verified that the performance capabilities and operating instructions of the emergency release system are documented and made available on board the ship on which the winch has been installed.

5.2 Special survey

5.2.1 The Annual Survey requirements are to be carried out, with the additional instructions for special survey provided by the manufacturer, as appropriate, being followed.

5.2.2 The full functionality of the emergency release system is to be tested to the satisfaction of the surveyor. Testing may be conducted either during a bollard pull test or by applying the load against a strong point on the deck of the tug or the shore that is certified to the appropriate load.

5.2.3 The emergency release system is to be tested at a towline load that is equal to the lesser of 30% of the maximum design load or 80% of vessel bollard pull in both a normal power condition and power blackout condition to the satisfaction of the surveyor.

BCS- R Z19 Calibration of Measuring Equipment

1. General

Inspection, measuring and test equipment, which Surveyors rely on to make decisions affecting classification or statutory certification, are to be individually identified and calibrated to a recognized national or international standard.

2. Simple Measuring Equipment

The Surveyor may accept simple measuring equipment (e.g. rulers, measuring tapes, weld gauges, micrometers) without individual identification or confirmation of calibration, provided they are of standard commercial design, properly maintained and periodically compared with other similar equipment or test pieces.

3. Shipboard Equipment

The Surveyor may accept equipment fitted on board a ship and used in examination of shipboard equipment (e.g. pressure, temperature or rpm gauges and meters) based either on calibration records or comparison of readings with multiple instruments.

4. Other Equipment

The Surveyor shall satisfy himself that other equipment (e.g. tensile test machines, ultrasonic thickness measurement equipment, etc) is calibrated to a recognized national or international standard.



BCS- R Z20 Planned Maintenance Scheme (PMS) for Machinery

1 General

- 1.1 Application
- 1.2 Maintenance Intervals
- 1.3 Onboard Responsibility

2 Procedures and conditions for approval of a PMS

- 2.1 System Requirements
- 2.2 Documentation and information
- 2.3 Approval validity

3 Surveys

- 3.1 Implementation Survey
- 3.2 Annual Audit
- 3.3 Damage and repairs

Note:

- 1. This requirement is applied on surveys commenced on or after 1 July 2020.

1 General

1.1 Application

1.1.1 These requirements apply to an approved Planned Maintenance Scheme for Machinery (PMS) as an alternative to the Continuous Machinery Survey (CMS).

1.1.2 It considers surveys to be carried out on the basis of intervals between overhauls recommended by manufacturers, documented operator's experience and a condition monitoring system, where fitted.

1.1.3 This scheme is limited to components and systems covered by CMS.

1.1.4 Any items not covered by PMS shall be surveyed and credited in the usual way.

1.2 Maintenance Intervals

1.2.1 In general, the intervals for PMS shall not exceed those specified for CMS. However, for components where the maintenance is based on running hours longer intervals may be accepted as long as the intervals are based on the manufacturer's recommendations.

1.3 Onboard responsibility

1.3.1 The chief engineer shall be the responsible person on board in charge of the PMS.

1.3.2 Documentation on overhauls of items covered by the PMS shall be reported and signed by the chief engineer.

1.3.3 Access to computerized systems for updating of the maintenance documentation and maintenance program shall only be permitted by the chief engineer or other authorized person.

2 Procedures and conditions for approval of a PMS

2.1 System Requirements

2.1.1 The PMS shall be programmed and maintained by a computerized system. However, this may not be applied to the current already approved schemes.

2.1.2 The system shall be approved in accordance with a procedure of BCS.

2.1.3 Computerized systems shall include back-up devices, such as disks/tapes, CDs, which are to be updated at regular intervals.

2.2 Documentation and information

2.2.1 The following documentation shall be submitted for the approval of the scheme:

- (i) organization chart identifying areas of responsibility
- (ii) documentation filling procedures
- (iii) listing of equipment to be considered by classification in PMS

-
- (iv) machinery identification procedure
 - (v) preventive maintenance sheet(s) for each machine to be considered
 - (vi) listing and schedule of preventive maintenance procedures

2.2.2 In addition to the above documentation the following information shall be available on board:

- (i) all clauses in 2.2.1 in an up-to-date fashion
- (ii) maintenance instructions (manufacturer's and shipyard's)
- (iii) reference documentation (trend investigation procedures etc.)
- (iv) records of maintenance including repairs and renewals carried out

2.3 Approval validity

2.3.1 When the PMS is approved a "Certificate of Approval for Planned Maintenance Scheme" is issued. However, other equivalent certification or class notation may be issued according to the procedure in use in BCS. In any case, the certification is to be kept on board.

2.3.2 An implementation Survey shall be carried out to confirm the validity of the certificate/class notation (see 3.1).

2.3.3 An annual report covering the year's service, including the information as required under the clauses iii and v as well as the information on changes to other clauses in 2.2.1, shall be reviewed by BCS.

2.3.4 An Annual Audit shall be carried out to maintain the validity of the PMS (see 3.2).

2.3.5 The survey arrangement for machinery under PMS can be cancelled by BCS if PMS is not being satisfactorily carried out either from the maintenance records or the general condition of the machinery, or when the agreed intervals between overhauls are exceeded.

2.3.6 The case of sale or change of management of the ship or transfer of class shall cause the approval to be reconsidered.

2.3.7 The shipowner may, at any time, cancel the survey arrangement for machinery under PMS by informing BCS in writing and for this case the items which have been inspected under the PMS since the last annual survey can be credited for class at the discretion of the attending surveyor.

3 Surveys

3.1 Implementation Survey

3.1.1 The Implementation Survey shall be carried out by BCS's surveyor within one year from the date of approval of the PMS.

3.1.2 During the implementation survey the following shall be verified by a surveyor to ensure:

-
- (i) the PMS is implemented according to the approval documentation and is adapted to the type and complexity of the components/system on board
 - (ii) the PMS is producing the documentation required for the Annual Audit and the requirements of surveys and testing for retention of class are complied with
 - (iii) the onboard personnel is familiar with the PMS

3.1.3 When this survey is carried out and the implementation is found in order, a report describing the PMS shall be submitted to BCS and the approved PMS may replace the CMS.

3.2 Annual Audit *

3.2.1 An annual audit of the PMS shall be carried out by BCS's surveyor and preferably concurrently with the annual survey of machinery.

3.2.2 The surveyor shall review the annual report or verify that it has been reviewed by BCS.

3.2.3 The purpose of this survey shall be to verify that the scheme is being correctly operated and that the machinery has been functioning satisfactorily since the previous survey. A general examination of the items concerned shall be carried out.

3.2.4 The performance and maintenance records shall be examined to verify that the machinery has functioned satisfactorily since the previous survey or action has been taken in response to machinery operating parameters exceeding acceptable tolerances and the overhaul intervals have been maintained.

3.2.5 Written details of break-down or malfunction shall be made available.

3.2.6 Description of repairs carried out shall be examined. Any machinery part, which has been replaced by a spare one, due to damage, is to be retained on board - where possible - until examined by BCS's Surveyor.

3.2.7 Upon satisfactory completion of the above requirements, BCS shall retain the PMS.

3.3 Damage and repairs

3.3.1 The damage of components /machinery shall be reported to BCS. The repairs of such damaged components / machinery shall be carried out to the satisfaction of BCS's surveyor.

3.3.2 Any repair and corrective action regarding machinery under PMS system shall be recorded in the PMS logbook and repair verified by BCS's surveyor at the Annual Audit.

3.3.3 In the case of overdue outstanding conditions of class or a record of unrepaired damage which would affect the PMS the relevant items shall be kept out of the PMS until the condition of class is fulfilled or the repair is carried out.

Note: * The term audit , in this context, is not related to ISM audit.

BCS- R Z21 Surveys of Propeller Shafts and Tube Shafts

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Note:

- 1. This requirement is implemented from 1 January 2017.

1. General

1.1 Application

1.1.1 Unless alternative means are provided to assure the condition of the propeller shaft assembly, these requirements apply to all vessels with conventional shafting fitted with a propeller as follows:

1.1.1.1 from 1 January 2016 for ships delivered on or after 1 January 2016;

1.1.1.2 after the first shaft survey scheduled on or after 1 January 2016, for ships delivered before 1 January 2016*.

*Upon the completion of the first shaft survey scheduled on or after 1 January 2016, the designation of dates for the next shaft survey is to be made based upon the requirements of this requirement.

1.2 Definitions

See also Diagram 1.

1.2.1 Shaft

For the purpose of this requirement shaft is a general definition that includes:

- Propeller shaft
- Tube shaft

The definition does not include the intermediate shaft(s) which is(are) considered part of the propulsion shafting inside the vessel.

1.2.2 Propeller Shaft

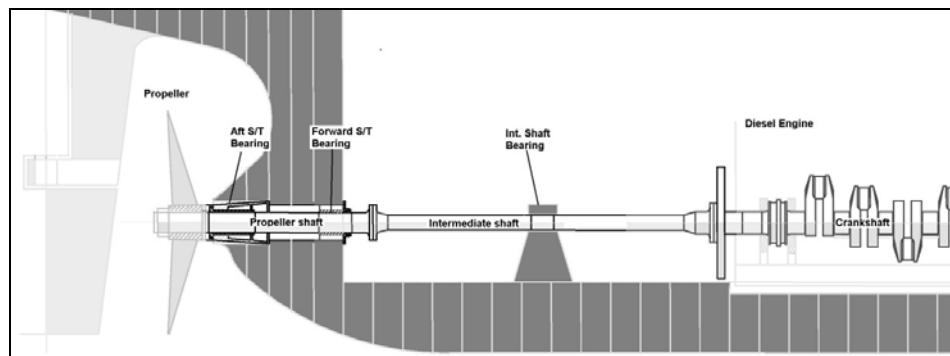
Propeller shaft is the part of the propulsion shaft to which the propeller is fitted. It may also be called screwshaft or tailshaft.

1.2.3 Tube Shaft

Tube shaft is a shaft placed between the intermediate shaft and propeller shaft, normally arranged within a stern tube or running in open water.

It may also be called **Stern Tube Shaft**.

Diagram 1: Typical Shafting Arrangement



1.2.4 Sterntube

Tube or pipe fitted in the shell of a ship at the stern (or rear part of the ship), below the water-line, through which passes the tube shaft or aftermost section of the propeller-shaft. Sterntube is the housing of the shaft bearings, generally two (one aft and one fore), that sustain the shaft and allows its rotation with less frictional resistance. The stern tube also accommodates the shaft sealing arrangement.

1.2.5 Close Loop (system) Oil Lubricated bearing

Closed loop oil lubricating systems use oil to lubricate the bearings and are sealed against the environment (seawater) by adequate sealing / gland devices.

1.2.6 Water Lubricated Bearing

Water lubricated bearings are bearings cooled / lubricated by water (fresh or salt).

1.2.7 Closed Loop System Fresh Water Lubricated Bearing

Closed loop water lubricating systems use fresh water to lubricate the bearings and are sealed against the environment (such as seawater) by adequate sealing / gland devices.

1.2.8 Open Systems (water)

Open water lubricating systems use water to lubricate the bearings and are exposed to the environment.

1.2.9 Adequate means for protection against corrosion

An adequate means for protection against corrosion is an approved means for full protection of the core shaft against sea water intrusion and subsequent corrosion attack. Such means are used for the protection of common steel material against corrosion particularly in combination with water lubricated bearings.

Typical means are for example:

- continuous metallic, corrosion resistant liners,
- continuous cladding,
- multiple layer synthetic coating,
- multiple layer of fiberglass,
- combinations of above mentioned,
- rubber / elastomer covering coating.

The means for protection against corrosion are installed / applied according to class approved procedures.

1.2.10 Corrosion Resistant Shaft

Corrosion resistant shaft is made in approved corrosion resistant steel as core material for the shaft.

1.2.11 Sterntube Sealing System

Sterntube Sealing system is the equipment installed on the inboard extremity and, for closed systems, at outboard extremity of the sterntube.

Inboard Seal is the device fitted on the fore part of the sterntube that achieve the sealing against the possible leakage of the lubricant media in to the ship internal.

Outboard seal is the device fitted on the aft part of the sterntube that achieve the sealing against the possible sea water ingress and the leakage of the lubricant media.

1.2.12 Service records

Service records are regularly recorded data showing in-service conditions of the shaft(s) and may include, as applicable: lubricating oil temperature, bearing temperature and oil consumption records (for oil lubricated bearings) or water flow, water temperature, salinity, pH, make-up water and water pressure (for closed loop fresh water lubricated bearings depending on design).

1.2.13 Oil sample examination

An oil sample examination is a visual examination of the stern tube lubricating oil taken in presence of the surveyor with a focus on water contamination.

1.2.14 Lubricating oil analysis

Lubricating oil analysis is to be carried out at regular intervals not exceeding six (6) months taking into account BCS- G 36.

The documentation on lubricating oil analysis is to be available on board.
Oil samples, to be submitted for the analysis, should be taken under service conditions.

1.2.15 Fresh Water sample test

Fresh water sample test should be carried out at regular intervals not exceeding six (6) months

Samples are to be taken under service conditions and are to be representative of the water circulating within the sterntube.

Analysis results are to be retained on board and made available to the surveyor.

At time of survey the sample for the test has to be taken at the presence of the surveyor.

Fresh water sample test shall include the following parameters:

- chlorides content,
- pH value,
- presence of bearing particles or other particles (only for laboratory analysis, not required for tests carried out in presence of the surveyor).

1.2.16 Keyless connection

Keyless connection is the forced coupling Methodology between the shaft and the propeller without a key achieved through interference fit of the propeller boss on the shaft tapered end.

1.2.17 Keyed connection

Keyed connection is the forced coupling Methodology between the shaft and the propeller with a key and keyway achieved through the interference fit of the propeller boss on the shaft tapered end.

1.2.18 Flanged connection

Flanged connection is the coupling Methodology, between the shaft and the propeller, achieved by a flange, built in at the shaft aft end, bolted to propeller boss.

1.2.19 Alternative means

Shafting arrangements such as, but not limited to, an approved Condition Monitoring Scheme and / or other reliable approved means for assessing and monitoring the condition of the tail shaft, bearings, sealing devices and the stern tube lubricant system capable to assure the condition of the propeller shaft assembly with an equivalent level of safety as obtained by survey methods as applicable in BCS- R Z21.

2. Oil Lubricated shafts or Closed Loop System Fresh Water Lubricated Shafts (closed system)

2.1 Shaft Survey Methods

2.1.1 METHOD 1

The survey is to consist of:

- Drawing the shaft and examining the entire shaft, seals system and bearings
- For keyed and keyless connections:
 - Removing the propeller to expose the forward end of the taper,
 - Performing a non-destructive examination (NDE) by an approved surface crack-detection method all around the shaft in way of the forward portion of the taper section, including the keyway (if fitted). For shaft provided with liners the NDE shall extended to the after edge of the liner.
- For flanged connection:
 - Whenever the coupling bolts of any type of flange-connected shaft are removed or the flange radius is made accessible in connection with overhaul, repairs or when deemed necessary by the surveyor, the coupling bolts and flange radius are to be examined by means of an approved surface crack detection method.

-
- Checking and recording the bearing clearances.
 - Verification that the propeller is free of damages which may cause the propeller to be out of balance.
 - Verification of the satisfactory conditions of inboard and outboard seals during the re-installation of the shaft and propeller.
 - Recording the bearing wear-down measurements (after re-installation)

2.1.2 METHOD 2

The survey is to consist of:

- For keyed and keyless connections:
 - Removing the propeller to expose the forward end of the taper,
 - Performing a non-destructive examination (NDE) by an approved surface crack-detection Method all around the shaft in way of the forward portion of the taper section, including the keyway (if fitted).
- For flanged connection:
 - Whenever the coupling bolts of any type of flange-connected shaft are removed or the flange radius is made accessible in connection with overhaul, repairs or when deemed necessary by the surveyor, the coupling bolts and flange radius are to be examined by means of an approved surface crack detection Method.
- Checking and recording the bearing wear-down measurements.
- Visual Inspection of all accessible parts of the shafting system.
- Verification that the propeller is free of damages which may cause the propeller to be out of balance.
- Seal liner found to be or placed in a satisfactory condition.
- Verification of the satisfactory re-installation of the propeller including verification of satisfactory conditions of inboard and outboard seals.

Pre-requisites to satisfactorily verify in order to apply METHOD 2:

- Review of service records.
- Review of test records of:
 - Lubricating Oil analysis (for oil lubricated shafts), or
 - Fresh Water Sample test (for closed system fresh water lubricated shafts).
- Oil sample Examination (for oil lubricated shafts), or Fresh Water Sample test (for closed system fresh water lubricated).
- Verification of no reported repairs by grinding or welding of shaft and/or propeller.

2.1.3 METHOD 3

The survey is to consist of:

- Checking and recording the bearing wear down measurements.
- Visual Inspection of all accessible parts of the shafting system.
- Verification that the propeller is free of damages which may cause the propeller to be out of balance.
- Seal liner found to be or placed in a satisfactory condition.
- Verification of the satisfactory conditions of inboard and outboard seals.

Pre-requisites to satisfactorily verify in order to apply METHOD 3:

- Review of service records.
- Review of test records of
 - Lubricating Oil analysis (for oil lubricated shafts), or
 - Fresh Water Sample test (for closed system fresh water lubricated shafts).
- Oil sample Examination (for oil lubricated shafts), or Fresh Water Sample test (for closed system fresh water lubricated).
- Verification of no reported repairs by grinding or welding of shaft and/or propeller.

2.2 Shaft extension surveys - Extension types

2.2.1 Extension up to 2.5 years

The survey is to consist of:

- Checking and recording the bearing wear down measurements, as far as practicable.
- Visual Inspection of all accessible parts of the shafting system.
- Verification that the propeller is free of damages which may cause the propeller to be out of balance.
- Verification of the effectiveness of the inboard seal and outboard seals.

Pre-requisites to satisfactorily verify in order to apply EXTENSION UP TO 2.5 YEARS:

- Review of service records.
- Review of test records of
 - Lubricating Oil analysis (for oil lubricated shafts), or
 - Fresh Water Sample test (for closed system fresh water lubricated shafts).

-
- Oil sample Examination (for oil lubricated shafts), or Fresh Water Sample test (for closed system fresh water lubricated).
 - Verification of no reported repairs by grinding or welding of shaft and/or propeller.
 - Confirmation from the Chief Engineer that the shafting arrangement is in good working condition.

2.2.2 Extension up to 1 year

The survey is to consist of:

- Visual Inspection of all accessible parts of the shafting system.
- Verification that the propeller is free of damages which may cause the propeller to be out of balance.
- Verification of the effectiveness of the inboard seal and outboard seals.

Pre-requisites to satisfactorily verify in order to apply EXTENSION UP TO 1YEAR:

- Review of the previous wear-down and/or clearance recordings.
- Review of service records.
- Review of test records of
 - Lubricating Oil analysis (for oil lubricated shafts), or
 - Fresh Water Sample test (for closed system fresh water lubricated shafts).
- Oil sample Examination (for oil lubricated shafts), or Fresh Water Sample test (for closed system fresh water lubricated).
- Verification of no reported repairs by grinding or welding of shaft and/or propeller.
- Confirmation from the Chief Engineer that the shafting arrangement is in good working condition.

2.2.3 Extension up to 3 months

The survey is to consist of:

- Visual Inspection of all accessible parts of the shafting system.
- Verification of the effectiveness of the inboard seal.

Pre-requisites to satisfactorily verify in order to apply EXTENSION UP TO 3 MONTHS:

- Review of the previous wear-down and/or clearance recordings.
- Review of service records.
- Review of test records of.

-
- Lubricating Oil analysis (for oil lubricated shafts), or
 - Fresh Water Sample test (for closed system fresh water lubricated shafts).
 - Oil sample Examination (for oil lubricated shafts), or Fresh Water Sample test (for closed system fresh water lubricated).
 - Verification of no reported repairs by grinding or welding of shaft and/or propeller.
 - Confirmation from the Chief Engineer that the shafting arrangement is in good working condition.

2.3 Oil lubricated shafts

2.3.1 Survey intervals

For surveys completed within 3 months before the shaft survey due date, the next period will start from the shaft survey due date.

2.3.1.1 Flanged propeller connection

The following Methods are applicable:

- A) Method 1 every 5 years, or
- B) Method 2 every 5 years (pre- requisites have to be fulfilled), or
- C) Method 3 every 5 years (pre-requisites have to be fulfilled).

2.3.1.2 Keyless propeller connection

The following Methods are applicable:

- A) Method 1 every 5 years, or
- B) Method 2 every 5 years (pre-requisites have to be fulfilled), or
- C) Method 3 every 5 years (pre-requisites have to be fulfilled). The maximum interval between two surveys carried out according to Method 1 or Method 2 shall not exceed 15 years, except in the case when one extension for no more than three months is granted.

2.3.1.3 Keyed propeller connection

The following Methods are applicable:

- A) Method 1 every 5 years, or
- B) Method 2 every 5 years (pre-requisites have to be fulfilled).

2.3.2 Survey extensions

For all types of propeller connections, the interval between two consecutive surveys may be extended after the execution of extension survey as follows:

- A) **Extension up to a maximum of 2.5 years:** no more than one extension can be granted. No further extension, of other type, can be granted.
- B) **Extension up to a maximum of 1 year:** no more than two consecutive “one year extensions” can be granted. In the event an additional extension is requested the requirements of the “2.5 year extension” are to be carried out and the shaft survey due date, prior to the previous extension(s), is extended for a maximum of 2.5 years.
- C) **Extension up to a maximum of 3 months:** no more than one “three months extension” can be granted. In the event an additional extension is requested the requirements of the “one year extension” or “2.5 years extension” are to be carried out and the shaft survey due date, prior to the previous extension, is extended for a maximum of one year or 2.5 years.

The extension survey should normally be carried out within 1 month of the shaft survey due date and the extension counts from the shaft survey due date.

If the extension survey is carried out more than 1 month prior to the shaft survey due date, then the period of extension counts from the date of the extension survey was completed.

2.4 Closed loop system fresh water lubricated shafts

The maximum interval between two surveys carried out according to Method 1 shall not exceed 15 years. An extension for no more than three months can be granted.

2.4.1 Survey intervals

For surveys completed within 3 months before the shaft survey due date, the next period will start from the shaft survey due date.

2.4.1.1 Flanged propeller connection

The following Methods are applicable:

- A) Method 1 every 5 years, or
- B) Method 2 every 5 years (pre-requisites have to be fulfilled), or
- C) Method 3 every 5 years (pre-requisites have to be fulfilled).

2.4.1.2 Keyless propeller connection

The following Methods are applicable:

- A) Method 1 every 5 years, or
- B) Method 2 every 5 years (pre-requisites have to be fulfilled), or
- C) Method 3 every 5 years (pre-requisites have to be fulfilled).

2.4.1.3 Keyed propeller connection

The following Methods are applicable:

- A) Method 1 every 5 years, or
- B) Method 2 every 5 years (pre-requisites have to be fulfilled).

2.4.2 Survey extensions

For all types of propeller connections, the interval between two consecutive surveys may be extended after the execution of extension survey as follows:

- A) Extension up to a maximum of 2.5 years, no more than one extension can be granted. No further extension, of other type, can be granted.
- B) Extension up to a maximum of 1 year, no more than two consecutive extensions can be granted. In the event an additional extension is requested the requirements of the “2.5 year extension” are to be carried out and the shaft survey due date, prior to the previous extension(s), is extended for a maximum of 2.5 years.
- C) Extension up to a maximum of 3 months, no more than one “three months extension” can be granted. In the event an additional extension is requested the requirements of the “one year extension” or “2.5 years extension” are to be carried out and the shaft survey due date, prior to the previous extension, is extended for a maximum of one year or 2.5 years.

The extension survey should normally be carried out within 1 month of the shaft survey due date and the extension counts from the shaft survey due date.

If the extension survey is carried out more than 1 month prior to the shaft survey due date, then the period of extension counts from the date of the extension survey was completed.

The maximum interval between two surveys carried out according to Method 1 shall not exceed 15 years, except in the case when one extension for no more than three months is granted.

2.5 TABLE of Survey Intervals (closed systems)

SURVEY INTERVALS (closed systems)			
Oil Lubricated			
	Flanged Propeller Coupling	Keyless Propeller Coupling	Keyed Propeller Coupling ^b
Every five years ^a	Method 1 or Method 2 or Method 3	Method 1 or Method 2 or Method 3 ^c	Method 1 or Method 2
Extension 2.5 Y	Yes ^d	Yes ^d	Yes ^d
Extension 1 Y	Yes ^e	Yes ^e	Yes ^e
Extension 3 M	Yes ^f	Yes ^f	Yes ^f
Closed Loop System Fresh Water Lubricated			
	Flanged Propeller Coupling	Keyless Propeller Coupling	Keyed Propeller Coupling ^b
Every five years ^a	Method 1 ^g or Method 2 or Method 3	Method 1 ^g or Method 2 or Method 3	Method 1 ^g or Method 2
Extension 2.5 Y	Yes ^d	Yes ^d	Yes ^d
Extension 1 Y	Yes ^e	Yes ^e	Yes ^e
Extension 3 M	Yes ^f	Yes ^f	Yes ^f
General notes: For surveys (Method 1, or Method 2, or Method 3) completed within 3 months before the shaft survey due date, the next period will start from the shaft survey due date. The extension survey should normally be carried out within 1 month of the shaft survey due date and the extension counts from the shaft survey due date. If the extension survey is carried out more than 1 month prior to the shaft survey due date, then the period of extension counts from the date of the extension survey was completed.			
Notes: a: unless an Extension type (Extension 2.5 Y, Extension 1 Y, Extension 3 M) is applied in between. b: Method 3 not allowed. c: The maximum interval between two surveys carried out according to Method 1 or Method 2 shall not exceed 15 years, except in the case when one extension for no more than three months is granted. d: no more than one extension can be granted. No further extension of other type can be granted. e: no more than two consecutive extensions can be granted. In the event an additional extension is requested the requirements of the "2.5 year extension" are to be carried out and the shaft survey due date, prior to the previous extension(s), is extended for a maximum of 2.5 years. f: no more than one three months extension can be granted. In the event an additional extension is requested the requirements of the "one year extension" or "2.5 years extension" are to be carried out and the shaft survey due date, prior to the previous extension, is extended for a maximum of one year or 2.5 years. g: The maximum interval between two surveys carried out according to Method 1 shall not be more than 15 years.			

3. Water Lubricated shafts (open systems)

3.1 Shaft Survey Methods

3.1.1 METHOD 4

The survey is to consist of:

- Drawing the shaft and examining the entire shaft (including liners, corrosion protection system and stress reducing features, where provided), inboard seal system and bearings.
- For keyed and keyless connections:
 - removing the propeller to expose the forward end of the taper,
 - performing a non-destructive examination (NDE) by an approved surface crack-detection Method all around the shaft in way of the forward portion of the taper section, including the keyway (if fitted). For shaft provided with liners the NDE shall be extended to the after edge of the liner
- For flanged connection:
 - Whenever the coupling bolts of any type of flange-connected shaft are removed or the flange radius is made accessible in connection with overhaul, repairs or when deemed necessary by the surveyor, the coupling bolts and flange radius are to be examined by means of an approved surface crack detection method.
- Checking and recording the bearing clearances.
- Verification that the propeller is free of damages which may cause the propeller to be out of balance.
- Verification of the satisfactory conditions of inboard seal during re-installation of the shaft and propeller.

3.2 Shaft extension surveys - Extension types

3.2.1 Extension up to 1 year

The survey is to consist of:

- Visual Inspection of all accessible parts of the shafting system.
- Verification that the propeller is free of damages which may cause the propeller to be out of balance.
- Checking and recording the clearances of bearing.
- Verification of the effectiveness of the inboard seal.

Pre-requisites to satisfactorily verify in order to apply EXTENSION UP TO 1YEAR:

- Review of the previous clearance recordings.

-
- Service records.
 - Verification of no reported repairs by grinding or welding of shaft and/or propeller.
 - Confirmation from the Chief Engineer that the shafting arrangement is in good working condition.

3.2.2 Extension up to 3 months

The survey is to consist of:

- Visual Inspection of all accessible parts of the shafting system.
- Verification that the propeller is free of damages which may cause the propeller to be out of balance.
- Verification of the effectiveness of the inboard seal.

Pre-requisites to satisfactorily verify in order to apply EXTENSION UP TO 3 MONTHS:

- Review of the previous clearance recordings.
- Service records.
- Verification of no reported repairs by grinding or welding of shaft and/or propeller.
- Confirmation from the Chief Engineer that the shafting arrangement is in good working condition.

3.3 Shaft Survey Intervals

3.3.1 Survey Intervals

The following survey intervals between surveys according to Method 4 are applicable to all types of propeller connections.

- For keyless propeller connections the maximum interval between two consecutive dismantling and verifications of the shaft cone by means of non-destructive examination (NDE) shall not exceed 15 years.
- For surveys completed within 3 months before the shaft survey due date, the next period will start from the shaft survey due date.

3.3.1.1 Configurations allowing 5 year intervals

- Single shaft operating exclusively in fresh water.
- Single shaft provided with adequate means of corrosion protection, single corrosion resistant shaft.
- All kinds of multiple shafts arrangements.

3.3.1.2 Other systems

Shaft not belonging in one of the configurations listed in **3.3.1.1** has to be surveyed according to Method 4 every 3 years.

3.3.2 Survey extensions

For all types of propeller connections, the interval between two consecutive surveys may be extended after the execution of extension survey as follows:

- A) **Extension up to a maximum of 1 year:** no more than one extension can be granted. No further extension, of other type, can be granted.
- B) **Extension up to a maximum of 3 months:** no more than one “three months extension” can be granted. In the event an additional extension is requested the requirements of the “one year extension” are to be carried out and the shaft survey due date prior to the previous extension is extended for a maximum of one year.

The extension survey should normally be carried out within 1 month of the shaft survey due date and the extension counts from the shaft survey due date.

If the extension survey is carried out more than 1 month prior to the shaft survey due date, then the period of extension counts from the date of the extension survey was completed.

3.4 TABLE of Survey Intervals (open systems)

SURVEY INTERVALS (open systems)			
- Single Shaft operating exclusively in Fresh Water. - Single Shaft provided with adequate means of corrosion protection, Single corrosion resistant shaft. - All kinds of Multiple shafts arrangements.		Other shaft configuration.	
All kinds of Propeller Coupling ^d		All kinds of Propeller Coupling ^d	
Every five years ^a	Method 4	Every three years ^a	Method 4
Extension 1 Y	Yes ^b	Extension 1 Y	Yes ^b
Extension 3 M	Yes ^c	Extension 3 M	Yes ^c
<p>General notes: For surveys (Method 4) completed within 3 months before the shaft survey due date, the next period will start from the shaft survey due date. The extension survey should normally be carried out within 1 month of the shaft survey due date and the extension counts from the shaft survey due date. If the extension survey is carried out more than 1 month prior to the shaft survey due date, then the period of extension counts from the date of the extension survey was completed.</p> <p>Notes: a: unless an Extension type (Extension 1 Y, Extension 3 M) is applied in between. b: no more than one extension can be granted. No further extension, of other type, can be granted. c: no more than one extension can be granted. In the event an additional extension is requested the requirements of the one year extension are to be carried out and the shaft survey due date prior to the previous extension is extended for a maximum of one year. d: For keyless propeller connections the maximum interval between two consecutive dismantling and verifications of the shaft cone by means of non-destructive examination (NDE) shall not exceed 15 years</p>			

BCS-R Z23 Hull Survey for New Construction

1. Scope

The scope of this Requirement includes the following main activities:

1.1 Examination of the parts of the ship covered by classification rules and by applicable statutory regulations for hull construction, to obtain appropriate evidence that they have been built in compliance with the rules and regulations, taking account of the relevant approved drawings.

1.2 Appraisal of the manufacturing, construction, control and qualification procedures, including welding consumables, weld procedures, weld connections and assemblies, with indication of relevant approval tests.

1.3 Witnessing inspections and tests as required in the classification rules used for ship construction including materials, welding and assembling, specifying the items to be examined and/or tested and how (e.g. by hydrostatic, hose or leak testing, non destructive examination, verification of geometry) and by whom.

Note:

1. This Requirement is implemented on ships contracted for construction (as defined in BCS-PR 29) from 1 July 2021.

1.4 Appraisal of material and equipment used for ship construction and their inspection at works is not included in this Requirement. Details of requirements for hull and machinery steel forgings and castings and for normal and higher strength hull structural steel are given in W7, W8 and W11 respectively. Acceptance of these items is verified through the survey process carried out at the manufacturer's works and the issuing of the appropriate certificates.

1.5 In addition to above, for Tankers and Bulk Carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10 (Goal-based ship construction standards for bulk carriers and oil tankers), see also Appendix 2 to this document.

2. Definitions*

2.1 The hull structure is defined as follows:

- a) hull envelope including all internal and external structures;
- b) superstructures, deckhouses and casings;
- c) welded foundations, e.g. main engine seatings;
- d) hatch coamings, bulwarks;
- e) all penetrations fitted and welded into bulkheads, decks and shell;
- f) the fittings of all connections to decks, bulkheads and shell, such as air pipes and ship side valves – all ILLC 1966, as amended, items;
- g) welded attachments to shell, decks and primary members, e.g. crane pedestals, bitts and bollards, but only as regards their interaction on the hull structure.

2.2 Reference to documents also includes electronic transmission or storage.

2.3 Definition of survey methods which the surveyor is directly involved in: Patrol, Review, Witness.

2.3.1 Patrol, the act of checking on an independent and unscheduled basis that the applicable processes, activities and associated documentation of the shipbuilding functions identified in Table 1 continue to conform to classification and statutory requirements.

2.3.2 Review, the act of examining documents in order to determine traceability, identification and to confirm that processes continue to conform to classification and statutory requirements.

2.3.3 Witness is the attendance at scheduled inspections in accordance with the agreed Inspection and Test Plans to the extent necessary to check compliance with the survey requirements.

*Footnote: Terminology for hull terms and hull survey terms can be found in Recommendation 82.

3. Applications

3.1 This Requirement covers the survey of all new construction of steel ships intended for classification and for international voyages except for:

- a) those defined in SOLAS I/3;
- b) high speed craft as defined in I/1.3.1 of the 2000 High Speed Craft Code;
- c) Mobile Offshore Drilling Units as defined in I/1.2.1 of the MODU Code.

3.2 This Requirement covers all statutory items, relevant to the hull structure and coating, i.e. Load Line and SOLAS Safety Construction.

3.3 This Requirement does not cover the manufacture of equipment, fittings and appendages regardless whether they are made inside or outside of the shipyard, examples being as follows. Evidence of acceptance shall be provided by accompanying documentation from class surveyor at manufacturer and verified at the shipyard:

- a) hatch covers;
- b) doors and ramps integral with the shell and bulkheads;
- c) rudders and rudder stock;
- d) all forgings and castings integral to the hull.

3.4 This Requirement applies to the installation into the ship, welding and testing of:

3.4.1 the items listed in 3.3 above;

3.4.2 equipment forming part of the watertight and weather tight integrity of the ship.

3.5 This Requirement applies to the hull structures and coating constructed at any of the following:

3.5.1 shipbuilder's facilities;

3.5.2 sub-contractors at the shipbuilder's facilities;

3.5.3 sub-contractors at their own facilities or at other remote locations.

4. Qualification and monitoring of personnel

4.1 Exclusive surveyors of the classification society, as defined in PR5, are to confirm through patrol, review and witness as defined in para. 2.3, that the ships are built using approved plans in accordance with the relevant rules and statutory requirements. The surveyors are to be qualified to be able to carry out the tasks and procedures are to be in place to ensure that their activities are monitored. Details are specified in PR6 and PR7.

5. Survey of the hull structure

5.1 Table 1 provides a list of surveyable items for the hull structure and coating covered by this Requirement, including:

5.1.1 description of the shipbuilding functions;

5.1.2 classification and statutory survey requirements;

5.1.3 survey method required for classification;

5.1.4 relevant BCS and statutory requirement references;

5.1.5 documentation to be available for the classification surveyor during construction.

5.1.5.1 The shipbuilder is to provide the classification surveyors access to documentation required by classification, this includes documentation retained by the shipbuilder or other third parties.

5.1.5.2 The list of documents approved or reviewed by BCS for the specific new construction are as follows:

- a) plans and supporting documents
- b) examination and testing plans
- c) NDE plans
- d) welding consumable details
- e) welding procedure specifications
- f) welding plan or details
- g) welder's qualification records
- h) NDE operator's qualification records

5.1.6 Documents to be inserted into the ship construction file. Refer to paragraph 10 for details.

5.1.7 A list of specific activities which are relevant to the shipbuilding functions. This list is not exhaustive and can be modified to reflect the construction facilities or specific ship type.

5.2 Evidence is also to be made available, as required, by the shipbuilder, to the surveyor whilst the construction process proceeds to prove that the material and equipment supplied to the ship has been built or manufactured under survey relevant to the classification rules and statutory requirements.

6. Review of the construction facility*

6.1 The society is to familiarize themselves with the yard's production facilities, management processes, and Safety for consideration in complying with the requirements of Table 1 prior to any steelwork or construction taking place in the following circumstances:

6.1.1 where the society has none or no recent experience of the construction facilities – typically after a one year lapse - or when significant new infrastructure has been added;

6.1.2 where there has been a significant management or personnel re-structuring having an impact on the ship construction process;

6.1.3 or where the shipbuilder contracts to construct a vessel of a different type or substantially different in design.

*Footnote: Reference is made to Appendix 1 "Shipyard review record", as an example.

7. Newbuilding survey planning

7.1 Prior to commencement of surveys for any newbuilding project, the society is to discuss with the shipbuilder at a kick off meeting the items listed in Table 1. The purpose of the meeting is to review and agree how the list of specific activities shown in Table 1 is to be addressed. The meeting is to take into account the shipbuilder's construction facilities and ship type including the list of proposed subcontractors. A record of the meeting is to be made, based upon the contents of the Table 1 – the Table can be used as the record with comments made into the appropriate column. If the society has nominated a surveyor for a specific newbuilding project then the surveyor is to attend the kick off meeting.

The builder should agree to undertake ad hoc investigations during construction as may be requested by Class where areas of concern arise and the builder to agree to keep the classification society advised of the progress of any investigation. Whenever an investigation is undertaken, the builder is to be requested, in principle, to agree to suspend relevant construction activities if warranted by the severity of the problem.

7.2 The records are to take note of specific published Administration requirements and interpretations of statutory requirements.

7.3 The shipyard shall be requested to advise of any changes to the activities agreed at the kick off meeting and these are to be documented in the survey plan. E.g. if the shipbuilder chooses to use or change sub-contractors, or to incorporate any modifications necessitated by changes in production or inspection methods, rules and regulations, structural modifications, or in the event where increased inspection requirements are deemed necessary as a result of a substantial non-conformance or otherwise.

7.4 Shipbuilding quality standards for the hull structure during new construction are to be reviewed and agreed during the kick-off meeting. Structural fabrication is to be carried out in accordance with BCS-G 47, "Shipbuilding and Repair Quality Standard", or a Recognized Fabrication Standard(RFS) which has been accepted by the Classification Society prior to the commencement of fabrication/construction. The work is to be carried out in accordance with the Rules and under survey of the classification society.

BCS may accept an RFS as an alternative to BCS-G 47 provided that 7.4.1 or 7.4.2 is complied with as applicable.

7.4.1 Where a RFS is well established and has well documented history (3 or more years prior to the new vessel contract) of successful application to similar designs as the new vessel and that history is for the same Shipyard as the new vessel. Then the Shipyard is to create a summary document referencing the RFS to be used in construction and highlighting any limitations to usage of the selected RFS. This summary document is to be included with the "record of kick-off meeting" for the vessel.

The summary document is also to be included in the SCF, (for Tankers and Bulk Carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10 per App 2, Table A Tier II Item 11), as applicable.

7.4.2 Where a RFS is new or revised or otherwise not as per 7.4.1 the following steps are to be carried out:

- (a) The tolerances and fabrications standards of the RFS are to be compared with those of BCS-G 47. Any that are less stringent than those of BCS-G 47 are to be identified.

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(b) The tolerances and fabrication standards of the RFS identified in 7.4.2 (a) are to be assessed to determine the acceptability for use and/or any restrictions for usage for the subject (or proposed) design. Details of how the acceptability for use and/or restrictions are to be recorded, and,

(c) A summary document including the outcomes of 7.4.2(a) and 7.4.2(b) is to be compiled. This document is to also include a reference to the RFS, details of the tolerance and fabrication standards not analysed as part of 7.4.2(b) and any limitations to the usage of the RFS.

The summary document is to be included with the “record of the kick-off meeting” of the vessel. The summary document is also to be included in the SCF, (for Tankers and Bulk Carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10 per App 2, Table A Tier II Item 11), as applicable.

7.5 The kick-off meeting may be attended by other parties as defined in PR3 (owner, administrations, etc.) subject to agreement by the shipbuilder.

7.6 In the event of series ship production*, the requirement for a kick off meeting in paragraph 7.1 may be waived for the second and subsequent ships provided that no changes to the specific activities agreed in the kick off meeting for the first ship are introduced. If any changes are introduced, these are to be agreed in a new dedicated meeting and documented in a record of such meeting.

*Series Ship Production: vessels in the series subsequent to the first one (prototype), i.e. sister ships built in the same shipyard.

8. Examination and test plan for newbuilding activities

8.1 The shipbuilder is to provide plans of the items which are intended to be examined and tested. These plans need not be submitted for approval and examination at the time of the kick off meeting. They are to include:

8.1.1 proposals for the examination of completed steelwork - generally referred to as the block plan and are to include details of joining blocks together at the pre-erection and erection stages or at other relevant stages;

8.1.2 proposals for fit up examinations where necessary;

8.1.3 proposals for testing of the structure (leak and hydrostatic) as well as for all watertight and weathertight closing appliances;

8.1.4 proposals for non-destructive examination;

8.1.5 any other proposals specific to the ship type or to the statutory requirements.

8.2 The plans and any modifications to them are to be submitted to the surveyors in sufficient time to allow review before the relevant survey activity commences.

8.3 In addition to above, for Tankers and Bulk Carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10 see also Appendix 2 to this Unified Requirement.

9. Proof of the consistency of surveys

9.1 The classification society is to be able to provide evidence, e.g. through records, check lists, inspection and test records, etc. that its surveyors have complied with the

requirements of the newbuilding survey planning and duly participated in the relevant activities shown in the shipbuilder's examination and test plans.

9.2 In addition, the classification society is to maintain records of deficiencies found during the patrolling activities required in Table 1 and described in paragraph 2.3.1. Records shall include the date when deficiency was found, description of the deficiency and the date the deficiency was cleared.

10. Ship Construction File

The purposes of this paragraph are applicable to all ships except the Tankers and Bulk Carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10 for which the paragraph 3 of Appendix 2 to this Requirement is to be applied.

10.1 The shipbuilder is to deliver documents for the Ship Construction File. In the event that items have been provided by another party such as the shipowner and where separate arrangements have been made for document delivery which excludes the shipbuilder, that party has the responsibility.

The Ship Construction File shall be reviewed for content in accordance with the requirements of para 10.2.

10.2 It is recognised that the purpose of documents held in the Ship Construction File on board the ship, is to facilitate inspection (survey) and repair and maintenance, and, therefore, is to include in addition to documents listed in Table 1, but not be limited to:

10.2.1 as-built structural drawings including scantling details, material details, and, as applicable, wastage allowances, location of butts and seams, cross section details and locations of all partial and full penetration welds, areas identified for close attention and rudders (Z7.1, Z7.2, Z10.1, Z10.2, Z10.3, Z10.4, Z10.5);

10.2.2 manuals required for classification and statutory requirements, e.g. loading and stability, bow doors and inner doors and side shell doors and stern doors – operations and maintenance manuals (S8 and S9);

10.2.3 ship structure access manual, as applicable;

10.2.4 copies of certificates of forgings and castings welded into the hull (W7 and W8);

10.2.5 details of equipment forming part of the watertight and weather tight integrity of the ship;

10.2.5.1 a Cable Transit Seal Systems Register, to be prepared by the shipbuilder for watertight cable transits. The Register can be in either a hard copy or digitized media. For an example of a register see Appendix 3 - Recommendatory Sample - Cable Transit Seal Systems Register. It is to include a marking / identification system, documentation referencing manufacturer manual(s) for each type of cable transit installed, the Type Approval certification for each type of transit system, applicable installation drawings, and a recording of each installed transit documenting the as built condition after final inspection in the shipyard. This is to include sections to record any inspection, modification, repair and maintenance.

10.2.6 tank testing plan including details of the test requirements (S14);

10.2.7 corrosion protection specifications (Z8 and Z9);

10.2.8 details for the in-water survey, if applicable, information for divers, clearances measurements instructions etc., tank and compartment boundaries;

10.2.9 docking plan and details of all penetrations normally examined at drydocking;

10.2.10 Coating Technical File, for ships subject to compliance with the IMO Performance Standard for Protective Coatings (PSPC) as a class requirement under the IACS Common Structural Rules.

- Enclosures:**
- A. Table 1 - Hull Surveyable Items Activities Table**
 - B. Appendix 1 - Shipyard Review Record**
 - C. Appendix 2 - Requirements for Tankers and Bulk Carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10 *Goal-based ship construction standards for bulk carriers and oil tankers***
 - D. Appendix 3 - Recommendatory Sample - Cable Transit Seal Systems Register**

Table 1, Hull Surveyable Items Activities Table, Rev.7

Reference	Shipbuilding function	Survey Requirements for Classification	Survey Method required for Classification	BCS reference	statutory requirements and relevant reference	Documentation available to classification surveyor during construction	Documentation for ship construction file	Specific activities	Classification society proposals for the project
	shipbuilding quality control function								
1	welding								
1.1	welding consumables	Classification approved separately at the manufacturer	review approval status and patrol, verify storage, handling and treatment in accordance with manufacturer's requirements	BCS-R W 17		consumable specification and approval status	not required	Identify consumables against approved list	
								verify temporary and permanent storage facilities	e.g. kept dry, covered, where applicable heated
								verify traceability	e.g. random batch number checking
1.2	welder qualification	Qualified welders	review of welder certification and patrol	BCS-G 47		shipyards records with individual's identification	not required	verify welder qualification standard, e.g. class or recognised standard approval	
								verify welder approved for weld position	
								verify validity of qualification certificate	

Table 1, Hull Surveyable Items Activities Table, Rev.7

Reference	Shipbuilding function	Survey Requirements for Classification	Survey Method required for Classification	BCS reference *	statutory requirements and relevant reference	Documentation available to classification surveyor during construction	Documentation for ship construction file	Specific activities	Classification society proposals for the project
1.3	Welding - mechanical properties (welding procedures)	All weld joint configurations, positions and materials to be covered by weld procedures approved by the classification society or by another IACS member available	review and patrol	BCS-R W28		Approved weld procedure specification and welding plan relevant to the ship project or process	not required	verify procedures are available at relevant workstations	
		the classification society witnesses all new weld procedure qualification tests carried out in the shipyard whenever the classification society is surveying in the shipyard	witness					verify weld procedures records have been approved and cover all weld processes and positions in accordance with classification or recognised standards and are available for the surveyors reference	
1.3a	welding equipment	correctly calibrated and maintained	patrol and review			shipbuilders maintenance and calibration records	not required	verify condition of machinery and equipment.	
								verify machines are calibrated by appropriate staff	
								verify calibration carried out in accordance with manufacturer's recommendations	
								verify calibration in accordance with maintenance schedule	

Table 1, Hull Surveyable Items Activities Table, Rev.7

Reference	Shipbuilding function	Survey Requirements for Classification	Survey Method required for Classification	BCS reference *	statutory requirements and relevant reference	Documentation available to classification surveyor during construction	Documentation for ship construction file	Specific activities	Classification society proposals for the project
1.3b	welding environment	satisfactory environment	patrol	BCS-G 47			not required	Verify welding areas clean, dry, well lit.	
								Confirm relevant measures taken for any pre or post heat treatment, drying of surfaces prior to welding	
								Confirm shielding gases, fluxes protected	
1.3c	welding supervision	sufficient number of skilled supervisors	Review and patrol	BCS-R W33 BCS-G 47				verify supervision is effective	
1.4	welding- surface discontinuities	Substantially free from significant indications, satisfactory profile and size	visual examination, surface detection techniques, review of documents and patrol of operator	BCS-R W33, BCS-G 47		Shipbuilders and recognised standards and Rules as applicable, welding and NDE plans, NDE reports, operator qualifications	not required	Identify workstations where NDE is carried out, e.g. panel line butt welds, castings into hull structure	
								Verify NDE carried out in accordance with approved plans where applicable	
								Verify suitability of NDE methods	
								Verify operators suitably qualified particularly where sub-contractors have been employed	
								Verify NDE is carried out according to the acceptable process	
								Review NDE records	

Table 1, Hull Surveyable Items Activities Table, Rev.7

Reference	Shipbuilding function	Survey Requirements for Classification	Survey Method required for Classification	BCS reference *	statutory requirements and relevant reference	Documentation available to classification surveyor during construction	Documentation for ship construction file	Specific activities	Classification society proposals for the project
1.5	Welding - embedded discontinuities	NDE is to be carried out by qualified operators capable of ensuring that welds are substantially free from significant indications	Radiography and ultrasonic testing, review of documents and patrol of operator, examination of films	BCS-R W 33, BCS-G 47		Shipbuilders and recognised standards and Rules as applicable, welding and NDE plans, NDE reports, operator qualifications	not required	Identify workstations where NDE is carried out, e.g. panel line butt welds, castings into hull structure	
								Verify NDE carried out in accordance with approved plans where applicable	
								Verify suitability of NDE methods	
								Verify operators suitably qualified particularly where sub-contractors have been employed	
								Verify that records have been completed and in accordance with recognised standards, e.g. IQI and sensitivity recorded	
								Verify that reports and radiographs have been evaluated correctly by the shipbuilder. Systematic review of radiographs carried out by the surveyor	
								Verify equipment calibration satisfactory and in accordance with manufacturers and recognised standards requirements	
								Verify NDE is carried out according to the acceptable process	

Table 1, Hull Surveyable Items Activities Table, Rev.7

Reference	Shipbuilding function	Survey Requirements for Classification	Survey Method required for Classification	BCS reference *	statutory requirements and relevant reference	Documentation available to classification surveyor during construction	Documentation for ship construction file	Specific activities	Classification society proposals for the project
2	Steel preparation and fit up:								
2.1	surface preparation, marking and cutting	traceability and acceptability of material, check of steel plates & profiles materials type, scantling identification, testing marks	patrol	BCS-G 47		material certificates, shipbuilder's marking/cutting production documents at the workstage - documents retained at the facility	not required	Verify stockyard storage satisfactory	
								Verify material traceability, e.g. stamping identification against material certification, archiving of records	
								Verify transfer marking after treatment line	
								Verify standard of shotblasting and priming	
								Verify suitability of primer	
								Verify that steel grades can be identified	
								Verify machinery adjusted to maintain within IACS or manufacturers recommendations.	
								Verify accuracy of marking and cutting	
								Verify storage of piece parts.	
2.2	straightening	Approval of straightening methods/ procedures against deformation	patrol and review	BCS-G 47		recognised standards, approved procedures	not required	Verify that straightening processes are approved for the grade and type of steel, e.g. tmcp, z plate.	
								Verify that plates and sections are within recognised tolerances	

Table 1, Hull Surveyable Items Activities Table, Rev.7

Reference	Shipbuilding function	Survey Requirements for Classification	Survey Method required for Classification	BCS reference *	statutory requirements and relevant reference	Documentation available to classification surveyor during construction	Documentation for ship construction file	Specific activities	Classification society proposals for the project
2.3	forming	Maintain material properties. Acceptance of forming method against unproper deformations	patrol	BCS-G 47		Shipbuilders procedure for hot forming	not required	Verify that temperature control is exercised by the operator.	
								Verify that suitable methods of temperature control are available when forming special steels and materials	
								Verify that forming processes are acceptable	
2.4	conformity with alignment/fit up/gap criteria	Check alignment/fit up/gap against reference standards	patrol	BCS-G 47		Shipbuilders and recognised standards and Rules as applicable,	not required	Verify the processes to ensure satisfactory fit up and alignment at all workstations	
								Verify that edge preparations are re-instated where lost during fitting operations	
								Verify remedial procedures are in place to compensate for wide gaps and alignment deviations	

Table 1, Hull Surveyable Items Activities Table, Rev.7

Reference	Shipbuilding function	Survey Requirements for Classification	Survey Method required for Classification	BCS reference *	statutory requirements and relevant reference	Documentation available to classification surveyor during construction	Documentation for ship construction file	Specific activities	Classification society proposals for the project
2.5	conformity for critical areas, when defined, with alignment/fit up or weld configuration	Check alignment/fit up/gap against approved drawings	witness and review	BCS-G 47		Shipbuilders and recognised standards and Rules as applicable, approved plan or standard, builder's records	Approved plans of critical areas if applicable	Verify that the information relevant to the latest approved drawings is available at the workstations	
								Verify the processes to ensure satisfactory fit up and alignment at all workstations	
								Verify that edge preparations are re-instated where lost during fitting operations	
								Verify remedial procedures are in place to compensate for wide gaps and alignment deviations	

Table 1, Hull Surveyable Items Activities Table, Rev.7

Reference	Shipbuilding function	Survey Requirements for Classification	Survey Method required for Classification	BCS reference *	statutory requirements and relevant reference	Documentation available to classification surveyor during construction	Documentation for ship construction file	Specific activities	Classification society proposals for the project
3	Steelwork process, e.g. sub assembly, block, grand and mega block assembly, pre-erection and erection, closing plates	compliance with approved drawings, visual examination of welding and material, check alignment and deformations	patrol of the process and witness of the completed item	BCS-G 47		approved plans, shipbuilders inspection records, Shipbuilders and recognised standards and Rules as applicable, construction plan (steelwork sub-division)		Verify that the information relevant to the latest approved drawings is available at the workstations	
								Verify that correct weld sizes have been adopted	
								Verify operation of the welding processes at the different work stages is satisfactory	
								Verify that piece parts are identifiable	
								Verify that fit ups are within recognised tolerances	
								Verify that correct welding requirements specified in reference 1 of this table have been adopted	
								Verify processes for closing plates etc. are acceptable	
								Confirm that steelwork is in accordance with the approved plan	
4	Remedial work and alteration	welding, check against deformation, alignment	review records and witness	BCS-G 47		permanent record of shipyard surveyable item		Verify that records have been maintained of significant deviations from the approved plans, for situations such as mis cut openings, re-routing outfit items	

Table 1, Hull Surveyable Items Activities Table, Rev.7

Reference	Shipbuilding function	Survey Requirements for Classification	Survey Method required for Classification	BCS reference *	statutory requirements and relevant reference	Documentation available to classification surveyor during construction	Documentation for ship construction file	Specific activities	Classification society proposals for the project
								Verify that all deviations brought to the attention of the classification society by the shipbuilder are acceptable	
5	Tightness testing, including leak and hose testing, hydropneumatic testing	Absence of leaks	Review and witness of the test	BCS-R S14	Reg. II-1/11 of SOLAS as amended;	approved tank testing plan, shipbuilders inspection records	approved tank testing plan	Confirm that tank testing is carried out in accordance with the approved plan	
								Confirm the methods used to carry out leak testing	
								Confirm that correct test pressures maintained for leak, hose and hydro and hydropneumatic testing is satisfactory	
								Verify that adequate records of the tank testing have been maintained	
6	Structural testing	structural adequacy of the design	Review and witness of the test	BCS-R S14	Reg. II-1/11 of SOLAS as amended;	approved tank testing plan, shipbuilders inspection records	approved tank testing plan	Confirm that tank testing is carried out in accordance with the approved plan	
								Confirm that correct test pressures maintained for testing is satisfactory	
								Verify that adequate records of the tank testing have been maintained	

Table 1, Hull Surveyable Items Activities Table, Rev.7

Reference	Shipbuilding function	Survey Requirements for Classification	Survey Method required for Classification	BCS reference *	statutory requirements and relevant reference	Documentation available to classification surveyor during construction	Documentation for ship construction file	Specific activities	Classification society proposals for the project
7	corrosion protection systems, e.g. coatings, cathodic protection, impressed current except for coating system subject to PSPC	Salt water ballast tanks with boundaries formed by the hull envelope, and also bulk carrier hold internal surfaces, coamings and hatch covers shall have an efficient protective coating. Safety aspects of cathodic systems to be dealt with separately.	Review and report on builder's & manufacturer's documentation	BCS-R Z 8 and Z 9, BCS-I SC 122 BCS-R F1	Reg. II-1/3-2 of SOLAS as amended;	manufacturer's and builder's specification	corrosion protection specifications	Verify that applied coatings are approved and review records of application	
								Verify that adequate records have been maintained and copied to the ship construction file	
	Application Antifouling Systems		Review		AFS Convention	Painting Specification	Paint Specification and Mfg Declaration	Verify that adequate records have been maintained and copied to the ship construction file	
7.1	Application of Protective Coatings for Dedicated Seawater Ballast Tanks in all Types of Ships and Double-Side Skin Spaces of Bulk Carriers subject to PSPC	monitor implementation of the coating inspection requirements	Patrolling and Review	BCS-I SC22	Reg. II-1/3-2 of SOLAS as amended;	Signed and Verified Tripartite Agreement	Coating Technical File	Verify that applied coatings are approved and review records of application in accordance with Chapter 7 of Annex to MSC.215(82).	
8	Installation, welding and testing of the following:								
8.1	hatch covers	tightness and securing	witness	BCS-R S14 & BCS-G 14	Reg. 13-14-15 and 16 of ILLC '66	approved tank testing plan, shipbuilders inspection records	details required, structural drawings	Confirm leak test of hatch covers	
								Confirm operation and securing test	

Table 1, Hull Surveyable Items Activities Table, Rev.7

Reference	Shipbuilding function	Survey Requirements for Classification	Survey Method required for Classification	BCS reference *	statutory requirements and relevant reference	Documentation available to classification surveyor during construction	Documentation for ship construction file	Specific activities	Classification society proposals for the project
8.2	doors and ramps integral with the shell and bulkheads	tightness and securing	witness	BCS-R S14	Reg. II-1/18 of SOLAS as amended; Reg. 12 and 21 of ILLC '66	approved tank testing plan, shipbuilders inspection records	details required	Confirm leak test	
								Confirm operation and securing test	
								Confirm safety device operation	
								Ensure correct maintenance logs/manuals supplied with the ship construction file	
8.3	rudders	fitting	witness	BCS-R S14		approved plan, shipbuilders inspection records	details required, structural drawings	Confirm alignment and mounting and fitting up to the connection to the tiller	
								Confirm function test	
								Verify fitting of pintles and all securing bolts	
								Verify all fit up records including all clearances maintained and placed into ship construction file	

Table 1, Hull Surveyable Items Activities Table, Rev.7

Reference	Shipbuilding function	Survey Requirements for Classification	Survey Method required for Classification	BCS reference *	statutory requirements and relevant reference	Documentation available to classification surveyor during construction	Documentation for ship construction file	Specific activities	Classification society proposals for the project
8.4	forgings and castings	compliance with approved drawings, visual examination of welding and material, check alignment and deformations	patrol of the process and witness of the completed item	BCS-R W7 & W8		approved plans, shipbuilders inspection records, Shipbuilders and recognised standards and Rules as applicable, construction plan (steelwork sub-division)	copies of certificates of forgings and castings	Verify casting and forgings against material certificate	
								Verify that correct welding and fit up requirements specified in reference 1, 2.4 and 2.5 of this table have been adopted	
								Verify that material certificates are included in the ship construction file	
	appendages							Verify that correct welding and fit up requirements specified in reference 1, 2.4 and 2.5 of this table have been adopted	

Table 1, Hull Surveyable Items Activities Table, Rev.7

Reference	Shipbuilding function	Survey Requirements for Classification	Survey Method required for Classification	BCS reference *	statutory requirements and relevant reference	Documentation available to classification surveyor during construction	Documentation for ship construction file	Specific activities	Classification society proposals for the project
8.5	equipment forming the watertight and weathertight integrity of the ship, e.g. overboard discharges, air pipes, ventilators	tightness and securing	witness		Reg. II-1/16 and Reg. II-1/16-1 of SOLAS as amended; Reg. 17-18-19-20-22-23 of ILLC '66	approved tank testing plan, shipbuilders inspection records	details required	Verify that correct welding and fit up requirements specified in reference 1, 2.4 and 2.5 of this table have been adopted	
								Verify Compliance with Load line Convention 1966 as amended - i.e. all fittings in accordance with the record of freeboard assignment	
				BCS-R P3				Verify air pipes, vents etc closing device are approved type	
								Verify material certificates for overboard discharges where applicable	
								Verify record of freeboard assignment and all material certificates included in the ship construction file	
	Freeboard marks and draft marks	within allowable tolerances and in accordance with the freeboard assignment	witness	BCS-I LL4	Reg. 4- 5- 6- 7 and 8 of ILLC '66		details required	Verify freeboard marks in accordance with load line assignment	
								Verify draft marks in accordance with the agreed tolerances specified by the builder unless more onerous flag state requirements	

Table 1, Hull Surveyable Items Activities Table, Rev.7

Reference	Shipbuilding function	Survey Requirements for Classification	Survey Method required for Classification	BCS reference *	statutory requirements and relevant reference	Documentation available to classification surveyor during construction	Documentation for ship construction file	Specific activities	Classification society proposals for the project
	Principal dimensions	within allowable tolerances	review and witness	BCS-G 47			details required	Verify principal dimensions in accordance with recognised standard	
								Verify dimensions included in ship construction file	
	Safety Construction certification	no outstanding imperfections or defects	witness		Reg. I/7 or Reg. I/10 of SOLAS as amended, as appropriate			Verify that Administration requirements have been incorporated into the hull structure	
8.6	watertight cable transit seal systems	compliance with approved drawings, visual examination of fitting, check alignment and securing	patrol of the process and witness of the completed item		Reg. II-1/13 and 13-1 of SOLAS as amended	shipbuilder's inspection records, manufacturer's specification	Cable Transit Seal Systems Register	Verify that correct welding and fit up requirements, including as specified in reference 1, 2.4 and 2.5 of this table have been adopted	
								Verify watertight cable transit seal systems are type approved	
								Verify the format and content of the Register	

Shipbuilder's name	
project	
project duration	
kick off meeting date	
representing builder	
representing class society	

* BCS-Gs are not mandatory requirements.

Appendix 1

Shipyard Review Record

Name of Shipyard	Date

1. Details of any Management Systems

Obtained approval	Certified by	Expiry Date	Remarks (scope, etc.)
ISO-9001			
ISO 14001			
ISO 18001			
Other:			

2. Construction Facilities: (Documents such as a brochure of shipyard can be attached in lieu of completing this section.)

2.1 Building Berth (B) or Dock (D)

*In case of berth, Depth is not applicable.

B / D	Name	Length (m)	Width (m)	Depth* (m)	Building Capacity (Gross Tonnage)	Crane (Ton x No.)

2.2 Outfitting Quays

Name	Length (m)	Width (m)	Depth (m)	Berthing Capacity (Gross Tonnage)	Crane (Ton x No.)

2.3 Main Fabrication and Erection Facilities

(1) Marking and cutting of steel plates (including internal members)	
- Marking method	(Manual, Photo x ____, EPM x ____, NC x ____ others ____)
- NC cutting machine	(Gas x ____, Plasma x ____, Laser x ____)
	Control procedure of NC (On-line, other)
- Cutting equipment	(Edge planer x ____, Roll-shear x ____)
(2) Marking and cutting of section bar	
- Marking method	(Manual, NC)
- Marking of reference curved line	(Manual, NC)
- Cutting method	(Manual, NC)
- In case of NC	(Gas x ____, Plasma x ____)
(3) One-side automatic welding machine (Yes, No)	
- Type of welding machine	(Flux Backing x ____, Flux and Copper Backing x ____ other ____)
- Existence of special surface plate for plate welding	(Yes, No)
(4) Fillet welding machine (Gravity, Automatic) Percentage of automatization except gravity: about ____%	
- Line Welder	(No, Yes: submerged arc x ____ heads, CO ₂ x ____ heads)
- Small automatic fillet welding machine	(No, Yes: Name: _____ x ____)
- Welding robot	(No, Yes: Portal x ____, Rectangular x ____, Articulated x ____)
(5) Painting equipment	
- Plate shot blasting/primer coating machine	(No, Yes: Max. Width ____ m, Length ____ m)
- Section bar shot blasting/primer coating machine	(No, Yes: Max. Length ____ m)
- Special coating factory	(No, Yes: ____ m x ____ m x ____ sections)
(6) Vertical automatic welding machine (No, Yes: EG x ____, SEG x ____, ES x ____)	
EG: Electrogas SEG: Simplified Electrogas ES: Electroslag	
(7) Other main fabrication facilities	

3. Shipyard Control of Qualified Welders

(1) Normal steel

		certification	traceability	supervision	maintenance of qualification
Shipyard workers	confirm system in place	Yes / No	Yes / No	Yes / No	Yes / No
Subcontracted workers	confirm system in place	Yes / No	Yes / No	Yes / No	Yes / No

4. Feature of Construction Procedure

(1) Subcontract of hull blocks (weight) <ul style="list-style-type: none">- Sub members (No, Yes: Ratio of subcontracted works ____ %, No., of subcontractors ____)- Blocks (No, Yes: Ratio of subcontracted works ____ %, No., of subcontractors ____)
(2) Method of plate block assembly <ul style="list-style-type: none">- Method fitting and welding longitudinals and transverse webs on jointed panels- Method welding longitudinals on jointed panels prior to fitting and welding transverse webs- Method fitting and welding a frame consists of longitudinals and transverse webs on jointed panels- Method joining panels with pre-assembled longitudinals by welding prior to fitting and welding transverse webs- Other (please specify in (5) below)
(3) - pre-erection outfitting carried out grand block/mega block adopted Method of erection at building berth/dock <ul style="list-style-type: none">- Max. weight of loading block: ton- Construction method in building dock/berth/land construction etc. (1 ship, 1.5 ships: Semi-tandem, dual entrance)- Block loading process (single starting block, multi starting blocks, inserting block: No, Yes)
(4) Final dock (No, Yes: In-house, Other place of the same company, Use other company)
(5) Other feature of construction procedure

5. Quality Control System: (Refer to Quality Manual, if available.)

Item and description	Result	Remarks
(1) Existence of the organization chart including the departments of design, purchasing, manufacturing and quality assurance - Are the function, responsibility and competence of the organization clear?		
(2) Quality control organization - Existence of quality control organization - Number of employees in this organization - Existence of procedures or plans related to tests and inspections	_____ persons including the chief	
(3) Pre-inspection system of shipyard - Is pre-inspection carried out prior to Class inspection? - Are pre-inspectors assigned? (Check the list.) - Number of pre-inspectors (related to hull only) - Are inspection results marked on the object and/or recorded in the checklist?	_____ persons	
(4) Records of inspections and tests - Are records made and kept properly? - Does the responsible person verify the records? - Can the adoption of necessary corrective actions against non-conformity happened be checked?		
(5) Condition at the time of the surveys in the presence of class surveyors - Is the schedule of the surveys changed often? - Are pre-inspection, shipyard inspection and repairs completed beforehand? - Are the sufficient preparations for surveys such as scaffoldings, lighting, cleaning made?		
Note: Above-mentioned (3) and (4) include the acceptance inspection of subcontracted items.		

6. Measures for Safety and Health

Item and description	Result	Remarks
(1) Are conditions of scaffolding, nets, safety belt, lighting and ventilation good?		
(2) Does sufficient attention paid for radiographic examination and operation of cherry picker?		
Note:		

7. Control System of Non-Destructive Examination (NDE)

Item and description	Result	Remarks
(1) Number of NDE supervisors in shipyard (including persons responsible for judging results)	_____ persons	
(2) Dependence on subcontracted NDE work <ul style="list-style-type: none"> - Number of shipyard employees - Number of sub-contractors 	_____ persons _____ persons	
(3) NDE sub-contractor company's name and official technical qualifications	Name _____ (approved by) _____ Name _____ (approved by) _____	
(4) Grade and number of NDE employees with official technical qualifications in shipyard <ul style="list-style-type: none"> Specialized in radiography Specialized in ultrasonic Specialized in surface detection 	_____ Grade _____ persons _____ Grade _____ persons _____ Grade _____ persons	
(5) If non-destructive examinations are subcontracted, the grade and number of officially qualified persons <ul style="list-style-type: none"> Specialized in radiography Specialized in ultrasonic Specialized in surface detection 	_____ Grade _____ persons _____ Grade _____ persons _____ Grade _____ persons	
(6) Non-destructive examination equipment (in house) <ul style="list-style-type: none"> - Number of radiographic equipment - Number of ultrasonic equipment 	_____ _____	
Note: Even if all works are subcontracted, it is recommendable to attach the qualified person(s) who can verify the works.		

8. Quality Control on Production Line

Item and description	Result	Remarks
8.1 Preventative measures for misuse of materials		
(1) Job title of supervisor and person in charge of collating ordered steel and received steel, and checking of mill sheet	Title of supervisor: _____ Title of person in charge: _____	
(2) Are means for checking the material grade in hand prescribed for high-grade steels		
(3) Are regulations prescribed for checking the material grade for high-tensile steel for low-temperature applications? Are there regulations for inscribing high tensile steel on the surface of the high tensile steel and special indication for steel for low temperature applications?		
(4) Are procedures for re-using of remaining cut-off mild steel?		
(5) Are there procedures for re-using of remaining cut-off high-tensile steel?		
(6) In the case of (4) and (5) above, can a collation be made with the mill sheet?		
(7) Section of controlling the lists of remaining cut-off steel	Name of section: _____	
Note: - In case of high tensile steel, are means identifying different grades - In the case of (3) and (4) above, are the materials approved by other classes controlled similarly?		
8.2 Shot blasting/Primer coating		
(1) Existence of surface preparation standards		
(2) Existence of coating thickness control standards - Existence of thickness measurement records		
Note: - The standard is to include the description related traceability after shot blasting and primer coating.		
8.3 Marking and cutting (Assembly work)		
(1) Existence of standards for accuracy and periodical inspection of tape measures, tapes, stencils, etc.		
(2) Existence of standards for accuracy of cut dimensions and edge preparation		
(3) Existence of standards for finish of cutting face		
(4) What is the frequency and extent of maintenance and inspection carried out for ensuring accuracy of NC cutter and/or flame planer?		

Item and description	Result	Remarks
(5) In case of NC, are the disks, tapes etc. maintained in good condition?		
(6) What are the measures adopted and guidance given to make the worker fully conversant with cutting work standards for maintaining accuracy?		
Note: - In case of (2) and (3) above, check items are to include confirmation of edge preparations free from piercing hole. - NC for section bars is also to be in accordance with the above.		
8.4 Bending and strain free		
(1) Existence of standards for maximum heating temperatures during water cooling and at the time of bending and distortion removal of steel by quick heating and cooling		
(2) Existence of regulations for plate thickness and bending radius for flange processing		
(3) What are the measures adopted and guidance given to make the worker fully conversant with maintaining quality and accuracy during the bending process?		
Note:		
8.5 Control of welding procedure		
(1) Are all welding procedures applied to the ships approved by the Society or other IACS members?		
Note:		
8.6 Treatment of serious non-conformities		
(1) Are repair plans submitted to the Society when serious non-conformities happened?		
(2) Were the NDE (RT/UT) plans submitted at appropriate timing?		
(3) Was the extent of tests extended considering the results of the test?		
Note:		
8.7 Hydrostatic and watertight tests		
(1) Is the test plan submitted to the Society?		
(2) Are vacuum tests applied to?		
(3) Are local air injection tests during sub-assembly works applied to?		

Item and description	Result	Remarks
(4) If (2) or (3) above is applied to, are the test procedures approved by the Society?		
Note:		

Appendix 2

Requirements for Tankers and Bulk Carriers subject to
SOLAS Chapter II-1 Part A-1 Regulation 3-10
Goal-based ship construction standards for bulk carriers and oil tankers

1. Examination and test plan for newbuilding activities

1.1 The shipbuilder is to provide plans of the items which are intended to be examined and tested in accordance with the Society's Rules in a document known as the Survey Plan, taking into account the ship type and design. This Survey Plan shall be reviewed at the time of the kick off meeting, and must include:

1.1.1 a set of requirements, including specifying the extent and scope of the construction survey(s) and identifying areas that need special attention during the survey(s), to ensure compliance of construction with mandatory ship construction standards including

- .1. Types of surveys (visual, non-destructive examination, etc.) depending on location, materials, welding, casting, coatings, etc.
- .2. Establishment of a construction survey schedule for all assembly stages from the kick-off meeting, through all major construction phases, up to delivery.
- .3. Inspection/survey plan, including provisions for critical areas identified during design approval.
- .4. Inspection criteria for acceptance.
- .5. Interaction with shipyard, including notification and documentation of survey results.
- .6. Correction procedures to remedy construction defects.
- .7. List of items that would require scheduling or formal surveys.
- .8. Determination and documentation of areas that need special attention throughout ship's life, including criteria used in making the determination.

1.1.2 a description of the requirements for all types of testing during survey, including test criteria.

2. Design Transparency

2.1 For ships subject to compliance with IMO Res. MSC.287(87), IMO Res. MSC.290(87), IMO Res. MSC.296(87) and IMO MSC.1/Circ.1343, readily available documentation is to include the main goal-based parameters and all relevant design parameters that may limit the operation of the ship.

3. Ship Construction File (SCF)

3.1 A Ship Construction File (SCF) with specific information on how the functional requirements of the Goal-based Ship Construction Standards for Bulk Carriers and Oil Tankers have been applied in the ship design and construction is to be provided upon delivery of a new ship, and kept on board the ship and/or ashore and updated as appropriate throughout the ship's service. The contents of the Ship Construction File are to conform to the requirements below.

3.1.1 The following design specific information is to be included in the Ship Construction File (SCF):

- .1. Areas requiring special attention throughout the ship's life. (including critical structural areas).
- .2. All design parameters limiting the operation of a ship.
- .3. Any alternatives to the rules, including structural details and equivalency calculations.
- .4. "As built" drawings and information which are verified to incorporate all alterations approved by the recognized organization or flag State during the construction process including scantling details, material details, location of butts and seams, cross section details and locations of all partial and full penetration welds.
- .5. Net (renewal) scantlings for all the structural constituent parts, as built scantlings and voluntary addition thicknesses.
- .6. Minimum hull girder section modulus along the length of the ship which has to be maintained throughout the ship's life, including cross section details such as the value of the area of the deck zone and bottom zone, the renewal value for the neutral axis zone.
- .7. A listing of materials used for the construction of the hull structure, and provisions for documenting changes to any of the above during the ship's service life.
- .8. Copies of certificates of forgings and castings welded into the hull (BCS-R W7 and BCS-R W8).
- .9. Details of equipment forming part of the watertight and weather tight integrity of the ship.
- .9.1 A Cable Transit Seal Systems Register, to be prepared by the shipbuilder for watertight cable transits. The Register can be in either a hard copy or digitized media. For an example of a register see Appendix 3 - Recommendatory Sample - Cable Transit Seal Systems Register. It is to include a marking / identification system, documentation referencing manufacturer manual(s) for each type of cable transit installed, the Type Approval certification for each type of transit system, applicable installation drawings, and a recording of each installed transit documenting the as built condition after final inspection in the shipyard. This is to include sections to record any inspection, modification, repair and maintenance.
- .10. Tank testing plan including details of the test requirements (BCS-R S14).
- .11. Details for the in-water survey, when applicable, information for divers, clearances measurements instructions etc., tank and compartment boundaries.
- .12. Docking plan and details of all penetrations normally examined at drydocking.
- .13. Coating Technical File, for ships subject to compliance with the IMO Performance Standard for Protective Coatings (PSPC²).

3.1.2 Refer to Table A of this Appendix for details of information to be further included. This information has to be kept on board the ship and/or ashore and updated as appropriate

throughout the ship's life in order to facilitate safe operation, maintenance, survey, repair and emergency measures.

3.1.3 It is to be noted that parts of the content of the SCF may be subject to various degrees of restricted access and that such documentation may be appropriately kept ashore.

3.1.4 The SCF has to include the list of documents constituting the SCF and all information listed in Table A of this Appendix, which is required for a ship's safe operation, maintenance, survey, repair and in emergency situations. Details of specific information that is not considered to be critical to safety might be included directly or by reference to other documents.

3.1.5 When developing an SCF, all of the columns in Table A of this Appendix have to be reviewed to ensure that all necessary information has been provided.

3.1.6 It may be possible to provide information listed in the annex under more than one Tier II¹ functional requirement as a single item within the SCF, for example, the Coating Technical File required by the PSPC² is relevant for both "Coating life" and "Survey during construction".

3.1.7 The SCF has to remain with the ship and, in addition, be available to its classification society and flag State throughout the ship's life. Where information not considered necessary to be on board is stored ashore, procedures to access this information should be specified in the onboard SCF. The intellectual property provisions within the SCF should be duly complied with.

3.1.8 The SCF should be updated throughout the ship's life at any major event, including, but not limited to, substantial repair and conversion, or any modification to the ship structure.

3.2 The SCF shall be reviewed³, at the time of new building, in accordance with the requirements of paragraphs 3.1.1 and 3.1.2 and the normal storage location shall be distinguished.

3.2.1 For the SCF stored on board ship, the surveyor is to verify that the information is placed on board the ship, upon completion of ship construction.

3.2.2 For the SCF stored on shore archive, the surveyor is to verify that the information is stored on shore archive by examining the list of information included on shore archive, upon completion of ship construction.

¹ Tier II items means the functional requirements included in the International Goal-based Ship Construction Standards for Bulk Carriers and Oil Tankers (GBS), adopted by IMO Res. MSC 287(87)

² Performance standard for protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers, adopted by IMO Res. MSC 215(82), as amended and Performance standard for protective coatings for cargo oil tanks of crude oil tankers, adopted by IMO Res. MSC 288(87), as amended

³ "Review" means the examination of the SCF that is carried out by the surveyor, at the end of the newbuilding process, in order to confirm that:

- drawings and documents required under the paragraph 3 of the appendix 2 to the BCS-R Z23, plus
- the possible additional drawings/documents provided by the shipyard, as per the Ship Constructional File (SCF) list of drawings/documents

are present in the copies of the SCF stored on board and in the ashore archive.

The "review" is not to be intended as an assessment of the drawings/documents in order to verify their compliances with the applicable Rules/Regulations

4. Determination of number of Surveyor(s)

BCS will assign adequate number of suitable qualified surveyor(s) for new building projects according to the construction progress of each ship to meet appropriate coverage of the examination and testing activities as agreed in the Survey Plan.

Table A - List of Information to be Included in the Ship Construction File (SCF)

Tier II items		Information to be included	Further explanation of the content	Example documents	Normal storage location
DESIGN					
1	Design life	• assumed design life in years	• statement or note on midship section	• SCF-specific	on board ship
				• midship section plan	on board ship
2	Environmental conditions	• assumed environmental conditions	• statement referencing data source or Rule (specific rule and data) or; • in accordance with Rule (date and revision)	• SCF-specific	on board ship
3	Structural strength				
3.1	General design	• applied Rule (date and revision) • applied alternative to Rule	• applied design method alternative to Rule and subject structure(s)	• SCF-specific • capacity plan	on board ship on board ship
3.2	Deformation and failure modes	• calculating conditions and results;	• allowable loading pattern	• loading manual	on board ship
		• assumed loading conditions	• maximum allowable hull girder bending moment and shear force	• trim and stability booklet	on board ship
3.3	Ultimate strength	• operational restrictions due to structural strength	• maximum allowable cargo density or storage factor	• loading instrument instruction manual • operation and maintenance manuals	on board ship on board ship
3.4	Safety margins	• strength calculation results	• bulky output of strength calculation	• strength calculation	on shore archive
			• plan showing highly stressed areas (e.g. critical structural areas) prone to yielding and/or buckling	• areas prone to yielding and/or buckling	on board ship
		• gross hull girder section modulus • minimum hull girder section modulus along the length of the ship to be maintained throughout the ship's life, including cross section details such as the value of the area of the deck zone and		• general arrangement plan	on board ship

Tier II items		Information to be included	Further explanation of the content	Example documents	Normal storage location
CONSTRUCTION					
11	Construction quality procedures	<ul style="list-style-type: none">• applied construction quality standard	<ul style="list-style-type: none">• recognized national or international construction quality standard	<ul style="list-style-type: none">• SCF-specific	on board ship
12	Survey during construction	<ul style="list-style-type: none">• survey regime applied during construction (to include all owner and class scheduled inspections during construction)	<ul style="list-style-type: none">• applied Rules (date and revision)• copies of certificates of forgings and castings welded into the hull	<ul style="list-style-type: none">• SCF-specific• tank testing plan	on board ship on board ship
		<ul style="list-style-type: none">• information on non-destructive examination		<ul style="list-style-type: none">• non-destructive testing plan• Coating Technical File required by PSPC	on board ship on board ship
IN-SERVICE CONSIDERATIONS					
13	Survey and maintenance	<ul style="list-style-type: none">• maintenance plans specific to the structure of the ship where higher attention is called for• preparations for survey• gross hull girder section modulus• minimum hull girder section modulus along the length of the ship to be maintained throughout the ship's life, including cross section details such as the value of the area of the deck zone and bottom zone, the renewal value for the neutral axis zone• gross scantlings of structural constituent parts• net scantlings of structural constituent parts, as built	<ul style="list-style-type: none">• plan showing highly stressed areas (e.g. critical structural areas) prone to yielding, buckling, fatigue and/or excessive corrosion• arrangement and details of all penetrations normally examined at dry-docking• details for dry-docking• details for in-water survey	<ul style="list-style-type: none">• SCF-specific• operation and maintenance manuals (e.g. hatch covers and doors)• docking plan• dangerous area plan• Ship Structure Access Manual• Means of access to other structure-integrated deep tanks• Coating Technical File required by PSPC• key construction plans• rudder and rudder stock	on board ship on board ship on board ship on board ship on board ship on board ship on board ship on board ship

Tier II items		Information to be included	Further explanation of the content	Example documents	Normal storage location
		scantlings and voluntary addition thicknesses • hull form	 • hull form information indicated in key construction plans	• structural details • yard plans • lines plan or equivalent	on board ship on shore archive on shore archive on board ship
14	Structural accessibility	• means of access to holds, cargo and ballast tanks and other structure-integrated deep tanks	• plans showing arrangement and details of means of access	• Ship Structure Access Manual • means of access to other structure-integrated deep tanks	on board ship on board ship
RECYCLING CONSIDERATIONS					
15	Recycling	• identification of all materials that were used in construction and may need special handling due to environmental and safety concerns	• list of materials used for the construction of the hull structure	• SCF-specific	on board ship

Notes:

- 1 "SCF-specific" means documents to be developed especially to meet the requirements of these GBS guidelines (MSC.1/Circ.1343).
- 2 "Key construction plans" means plans such as midship section, main O.T. and W.T. transverse bulkheads, construction profiles/plans, shell expansions, forward and aft sections in cargo tank (or hold) region, engine-room construction, forward construction and stern construction drawings.
- 3 "Yard plans" means a full set of structural drawings, which include scantling information of all structural members.
- 4 "Hull form" means a graphical or numerical representation of the geometry of the hull. Examples would include the graphical description provided by a lines plan and the numerical description provided by the hull form data stored within an onboard computer.
- 5 "Lines plan" means a special drawing which is dedicated to show the entire hull form of a ship.

-
- 6 "Equivalent (to Lines plan)" means a set of information of hull form to be indicated in key construction plans for SCF purposes. Sufficient information should be included in the drawings to provide the geometric definition to facilitate the repair of any part of the hull structure.
 - 7 "Normal storage location" means a standard location where each SCF information item should be stored. However, those items listed as being on board in the table above should be on board as a minimum to ensure that they are transferred with the ship on a change of owner.
 - 8 "Shore archive" is to be operated in accordance with applicable international standards.

Appendix 3 - Recommendatory Sample - Cable Transit Seal System Register

Name of Ship: Sample
IMO No: 12345
Place: Hamburg
Date: XX/XX/2017

Inspected by: Smith

Transits 4
 Total Openings 4

TRANSIT			Inspected side		BRAND	FRAME		Type Approved	CONDITION(G,F,P)	INSPECTED	REPAIRED	MODIFIED	MAINTAINED	NOTES:	Checked by	DATE
Drawing number	ID	Location	F	B		Type	Opening number									
GIA-07-1047-000-883	TT-MCT-011				C	d= 50	x							NVD	PTO	26/02/2015
GIA-07-1047-000-883	TT-MCT-012				C	450x200	x							NVD	PTO	26/02/2015
GIA-07-1047-000-883	TT-MCT-013				C	550x200	x							NVD	PTO	26/02/2015
GIA-07-1047-000-883	TT-MCT-014				C	750x200	x							Open, drilled hole not closed	PTO	26/02/2015

BCS- R Z24 Survey Requirements for Shell and Inner Doors of Ro-Ro Ships

CONTENTS

- 1. Application**
- 2. Definitions**
- 3. Special Survey**
- 4. Annual Survey**

TABLE 1

Minimum Requirements for Close-Up Surveys of Doors, Locking, Securing and Supporting Devices and Fittings

Note:

This requirement is implemented for surveys commenced on or after 1 January 2012.

1. Application

1.1 These requirements are applicable to the survey of bow, inner, side shell and stern doors of Ro-Ro passenger (Ro-Pax) and Ro-Ro cargo ships, to the extent appropriate to the arrangement and equipment of each ship.

The requirements are additional to the classification requirements applicable to the remainder of the ship. Refer to BCS- R Z7.

1.2 Special consideration may be given in application of relevant sections of this Unified Requirement to commercial vessels owned or chartered by Governments, which are utilized in support of military operations or service.

2. Definitions

2.1 Ro-Ro Ship

Ro-Ro ship - For the purpose of this requirement, a Ro-Ro ship is a ship which utilizes a loading ramp to enable wheeled vehicles to be rolled-on and rolled-off the ship.

2.2 Ro-Ro passenger ship (Ro-Pax)

Ro-Ro passenger ship - a passenger ship with Ro-Ro spaces or special category spaces.

2.3 Ro-Ro spaces

Ro-Ro spaces - spaces not normally sub-divided in any way and normally extending to either a substantial length or the entire length of the ship, in which motor vehicles with fuel in their tanks for their own propulsion and / or goods (packaged or in bulk, in or on rail or road cars, vehicles (including road or rail tankers), trailers, containers, pallets, demountable tanks or in or on similar stowage units or, other receptacles) can be loaded and unloaded normally in a horizontal direction.

2.4 Special category spaces

Special category spaces - those enclosed vehicle spaces above or below the bulkhead deck, into and from which vehicles can be driven and to which passengers have access. Special category spaces may be accommodated on more than one deck provided that the total overall clear height for vehicles does not exceed 10m.

2.5 Securing device

Securing device - a device used to keep the door closed by preventing it from rotating about its hinges.

2.6 Supporting device

Supporting device - a device used to transmit external or internal loads from the door to a securing device and from the securing device to the ship's structure, or a device other than a securing device, such as a hinge, stopper or other fixed device, that transmits loads from the door to the ship's structure.

2.7 Locking device

Locking device - a device that locks a securing device in the closed position.

2.8 Close-Up Survey

Close-Up Survey - a survey where the details of structural components are within the close visual inspection range of the surveyor, i.e. normally within reach of hand.

3. Special Survey

3.1 The Special Survey is to include, in addition to the requirements of the Annual Survey as required in 4.1, examination, tests and checks of sufficient extent to verify that the bow, inner, side shell and stern doors, are in satisfactory condition and considered able to remain in compliance with applicable requirements, subject to proper maintenance and operation in accordance with the Operation and Maintenance Manual (OMM) or manufacturer's recommendations and the periodical surveys being carried out at the due dates for the five year period until the next Special Survey.

3.2 The examinations of the doors are to be supplemented by thickness measurements and testing to verify compliance with applicable requirements so that the structural and weathertight integrity remain effective. The aim of the examination is to identify corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

3.3 The bow, inner, side shell and stern doors are to be surveyed as follows:

3.3.1 A survey of the items listed in 4.4, including close-up survey of securing, supporting and locking devices, together with welding, is to be carried out, refer to Table 1.

3.3.2 Non-destructive testing and thickness measurements are to be carried out on securing, supporting and locking devices, including welding, to the extent considered necessary by the surveyor. Whenever a crack is found, an examination with NDT is to be carried out in the surrounding area and for similar items as considered necessary by the surveyor.

3.3.3 The maximum thickness diminution of hinging arms, securing, supporting and locking devices is to be treated according to the normal procedure for BCS for primary structures, but is not to be more than 15% of the as-built thickness or the maximum corrosion allowance of BCS, whichever is less. Certain designs may be subject to BCS's special consideration.

3.3.4 Checking the effectiveness of sealing arrangements by hose testing or equivalent is to be carried out.

3.3.5 Clearances of hinges, bearings and thrust bearings are to be taken. Unless otherwise specified in the OMM or by manufacturer's recommendation, the measurement of clearances on Ro-Ro cargo ships may be limited to representative bearings where dismantling is needed in order to measure the clearances.

If dismantling is carried out, a visual examination of hinge pins and bearings together with NDT of the hinge pin is to be carried out.

3.3.6 The non-return valves of the drainage system are to be dismantled and examined.

4. Annual Survey

4.1 The survey is to consist of an examination to verify, as far as is practicable, that the bow, inner, side shell and stern doors are maintained in a satisfactory condition.

4.2 Confirmation is to be obtained that no unapproved changes have been made to the bow, inner, side shell and stern doors since the last survey.

4.3 Documents

If an Operating and Maintenance Manual (OMM) is required, it is to be verified that an approved copy is on board and any possible modifications are included.

It is to be verified that documented operating procedures for closing and securing doors are kept on board and posted at an appropriate place.

The surveyor shall examine the OMM with special attention to the register of inspections and its contents as a basis for the survey.

4.4 Structural examination

Bow, inner, side shell and stern doors are to be examined with particular attention paid to:

- Structural arrangement of doors including plating, secondary stiffeners, primary structure, hinging arms and welding;
- Shell structure surrounding the opening of the doors and the securing, supporting and locking devices including shell plating, secondary stiffeners, primary structure, and welding;
- Hinges and bearings, thrust bearings;
- Hull and door side supports for securing, supporting and locking devices;
- Close-up survey of securing, supporting and locking devices including welding, refer to Table 1.

Whenever a crack is found, an examination with NDT is to be carried out in the surrounding area and for similar items as considered necessary by the surveyor.

4.5 Measurement of clearances

Clearances of hinges, bearings and thrust bearings are to be taken, where no dismantling is required. Where the function test is not satisfactory, dismantling may be required to measure the clearances. If dismantling is carried out, a visual examination of hinge pins and bearings together with NDT of the hinge pin is to be carried out. Clearances of securing, supporting and locking devices are to be measured, where indicated in the OMM.

4.6 Sealing arrangement

An examination of packing material / rubber gaskets and retaining bars or channels, including welding is to be carried out.

4.7 Drainage arrangement

An examination of drainage arrangement, including bilge wells and drain pipes is to be carried out, where fitted. A test of the bilge system between the inner and outer doors is to be carried out.

4.8 Function test of doors

Checking of the satisfactory operation of the bow, inner, side shell and stern doors during a complete opening and closing operation is to be made, as applicable, including:

-
- Proper working of the hinging arms and hinges;
 - Proper engagement of the thrust bearings;
 - Device for locking the door in the open position;
 - Securing, supporting and locking devices;
 - Proper sequence of the interlock system for the opening / closing system and the securing and locking devices;
 - Mechanical lock of the securing devices;
 - Proper locking of hydraulic securing devices in the event of a loss of the hydraulic fluid, according to the procedure provided by the OMM;
 - Correct indication of open / closed position of doors and securing / locking devices at navigation bridge and other control stations;
 - Isolation of the hydraulic securing / locking devices from other hydraulic systems;
 - Confirmation that the operating panels are inaccessible to unauthorized persons;
 - Verification that a notice plate giving instructions to the effect that all securing devices are to be closed and locked before leaving harbour is placed at each operating panel and supplemented by warning indicator lights;
 - Examination of electrical equipment for opening, closing and securing the doors.

4.9 Function test of the indicator system

Checking of the satisfactory operation of the indicator system, where fitted, is to be carried out, as applicable, including:

- Proper visible indication and audible alarm on the navigation bridge panel, according to the selected function "harbour / sea voyage" and on the operating panel;
- Lamp test function on both panels;
- Verification that it is not possible to turn off the indicator light on both panels;
- Verification of fail safe performance, according to the procedure provided by the OMM;
- Confirmation that power supply for indicator system is supplied by the emergency source or other secure power supply and independent of the power supply for operating the doors;
- Proper condition of sensors and protection from water, ice formation and mechanical damage.

4.10 Test of water leakage detection system

Where fitted, the water leakage detection system is to be tested including proper audible alarm on the navigation bridge panel and on the engine control room panel, according to the procedure provided by the OMM.

4.11 Test of television surveillance system

Where fitted, the television surveillance system is to be tested including proper indication on the navigation bridge monitor and on the engine control room monitor.

4.12 Tightness test

A hose test or equivalent is to be carried out. If the visual examination and function test have shown satisfactory results, the tightness test of shell doors on Ro-Ro cargo ships need not be carried out unless considered necessary by the attending surveyor.

4.13 NDT and Thickness Measurements

When considered necessary by the surveyor, NDT and thickness measurements may be required after visual examination and function test.

Table 1

Minimum Requirements for Close-Up Surveys of Doors, Locking, Securing and Supporting Devices and Fittings

The following is a list of the devices and fittings and associated welding to be subject to close-up survey by the attending Surveyor.

- Cylinder securing pins, supporting brackets, back-up brackets (where fitted) and their welded connections;
- Hinge pins, supporting brackets, back-up brackets (where fitted) and their welded connections;
- Locking hooks, securing pins, supporting brackets, back-up brackets (where fitted) and their welded connections;
- Locking pins, supporting brackets, back-up brackets (where fitted) and their welded connections;
- Locating and stopper devices and their welded connections.

Inner Bow Doors – double leaf side hinged

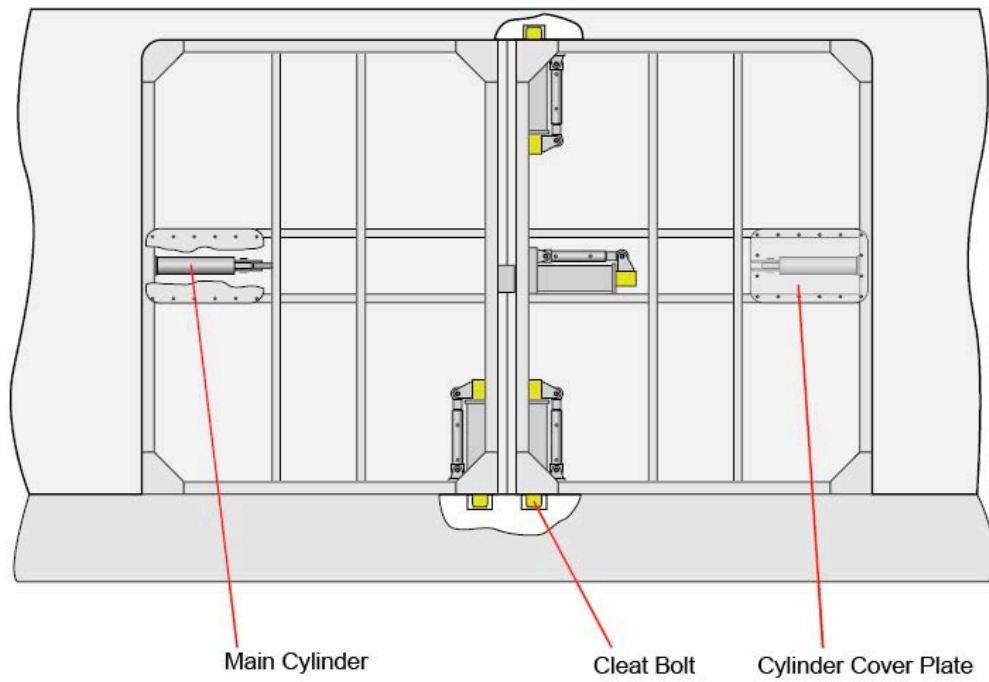
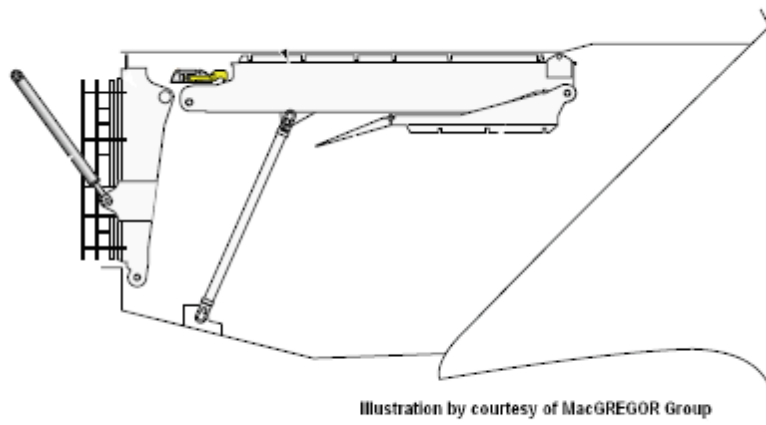


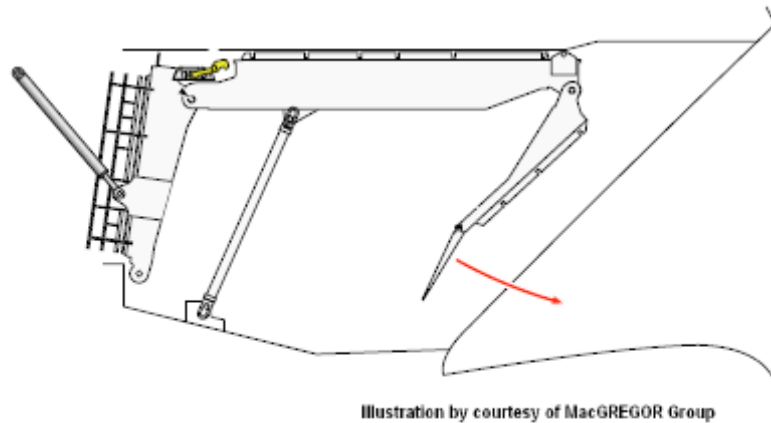
Illustration by courtesy of MacGREGOR Group

Bow Loading Ramp – stowed position, aft part (inner door) disconnected

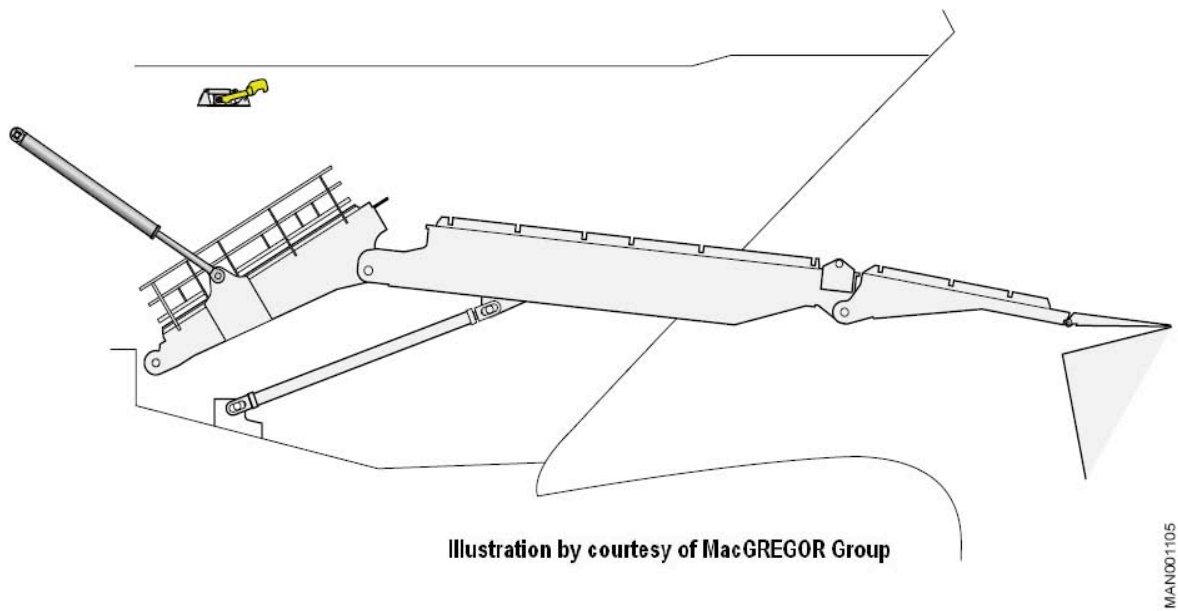


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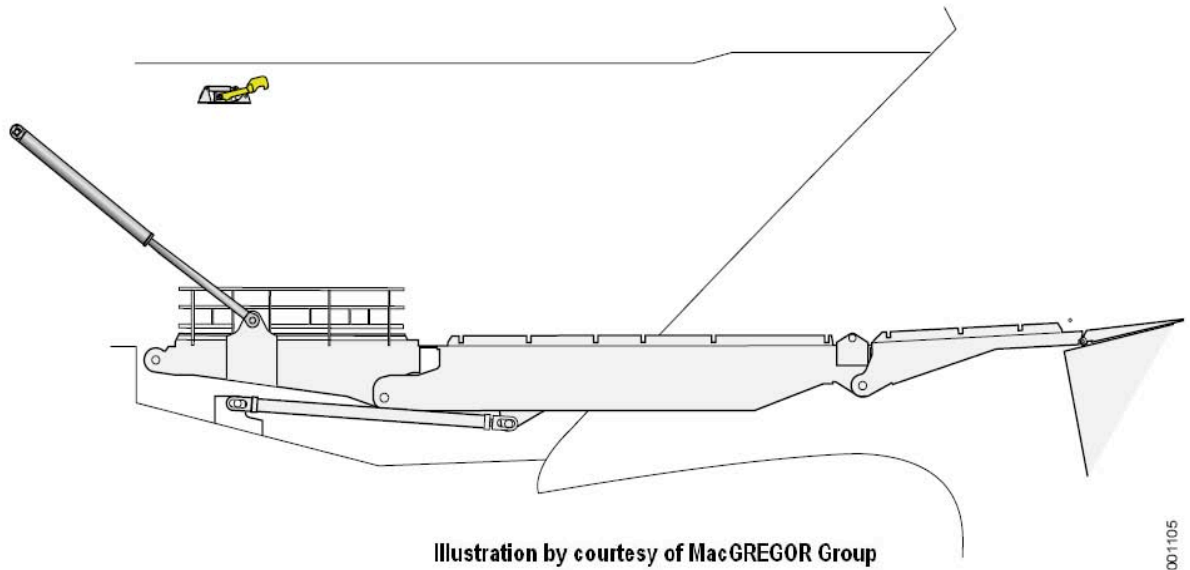
Bow Loading Ramp – beginning of opening sequence, aft part (inner door) connected by hydraulic hinge pin



Bow Loading Ramp – ramp partly extended to quay

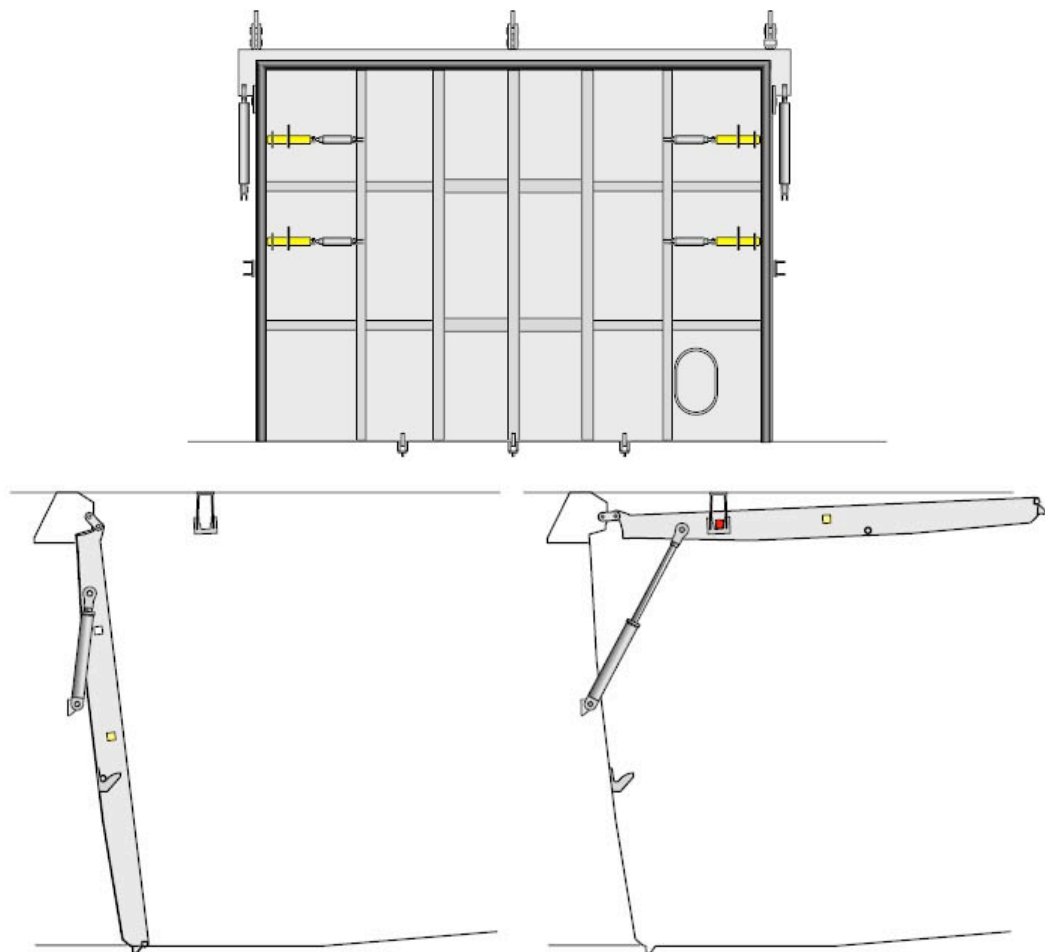


Bow Loading Ramp – ramp fully extended to quay



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Inner Bow Door – single leaf top hinged, type 1



Inner Bow Door – single leaf top hinged, type 2

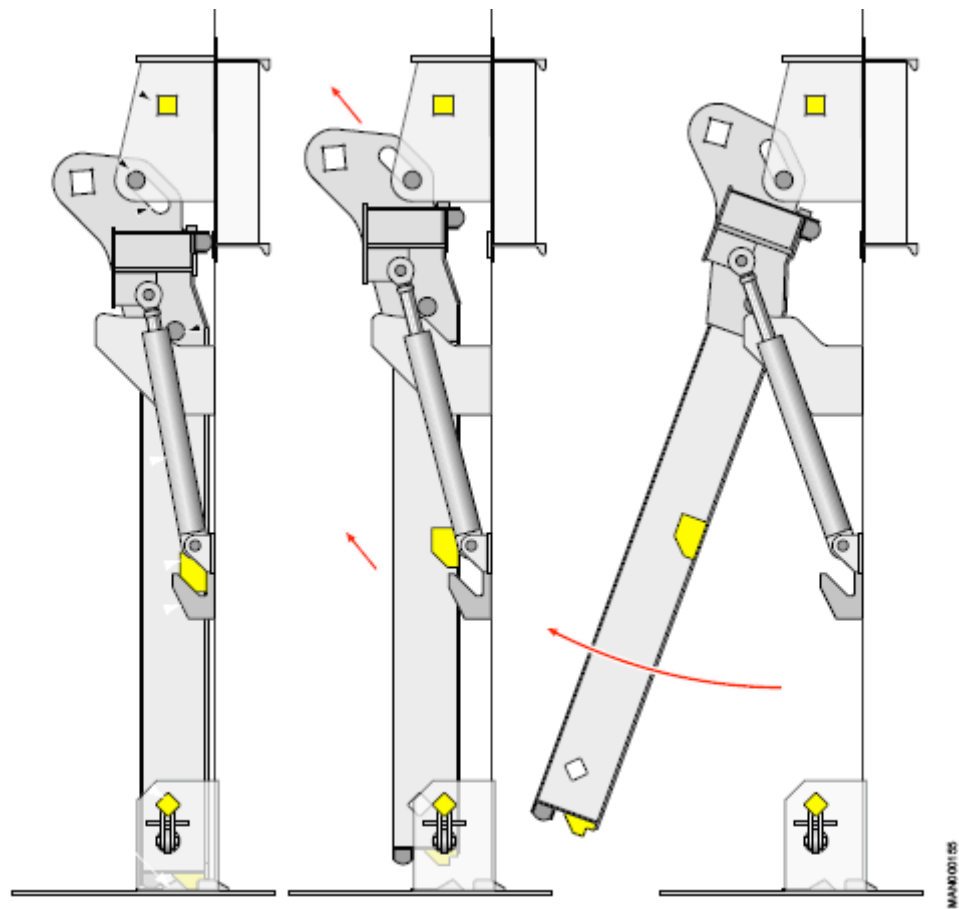


Illustration by courtesy of MacGREGOR Group

Bow Loading Ramp – side opening bow doors

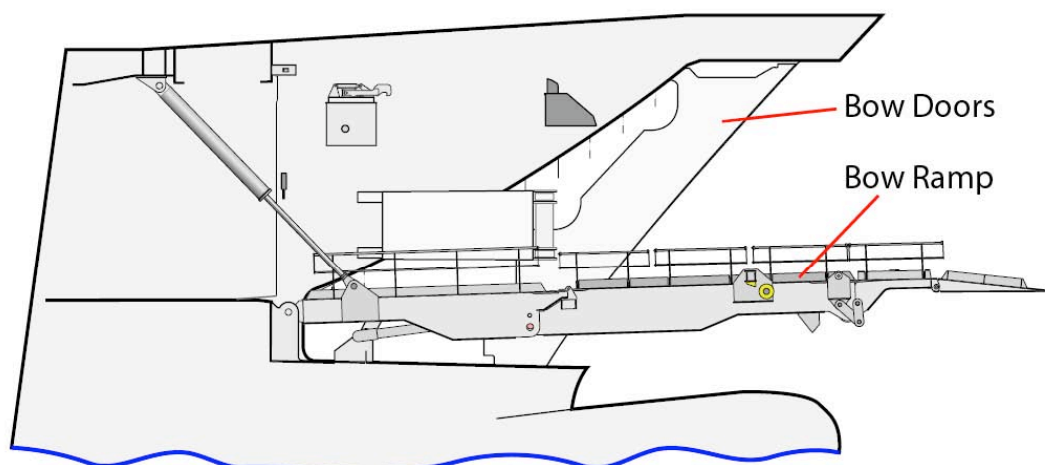


Illustration by courtesy of MacGREGOR Group

Bow side opening door – closed, side view

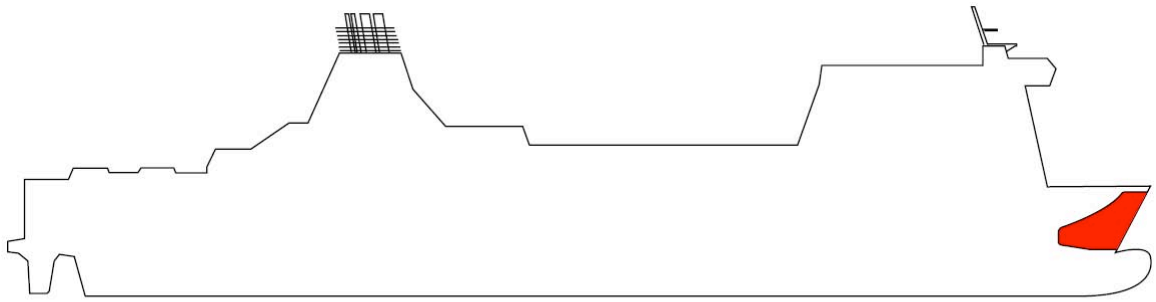


Illustration by courtesy of MacGREGOR Group

Bow side opening door – closed, top view

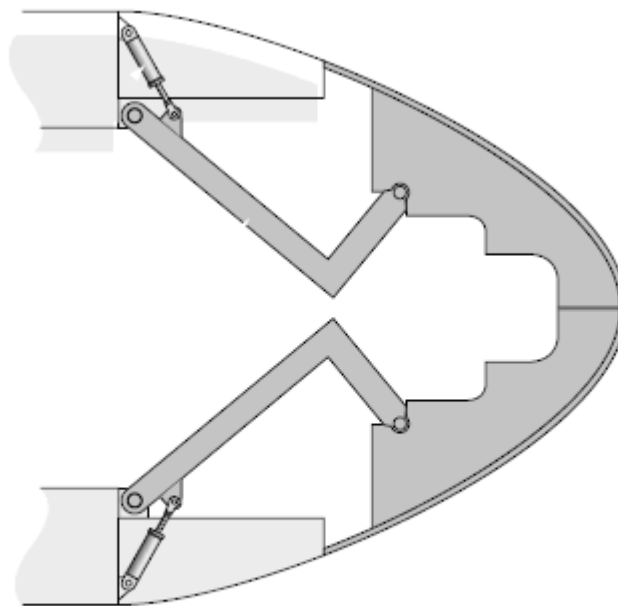
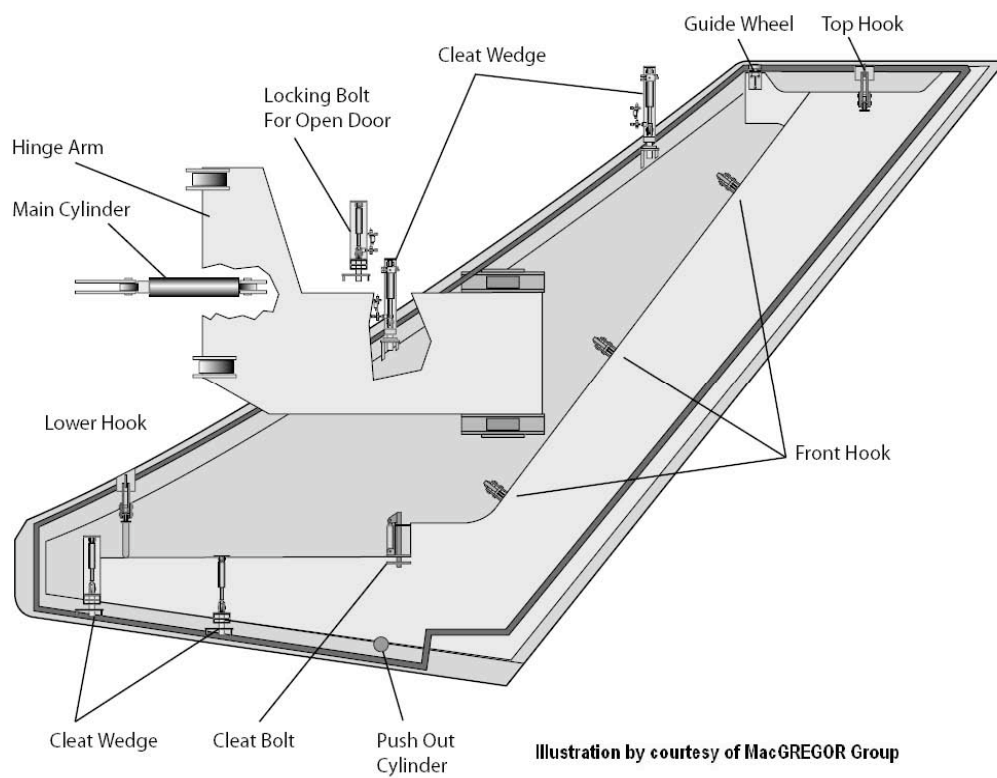


Illustration by courtesy of MacGREGOR Group

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Bow side opening door – door panel details



Bow side opening door – open, top view

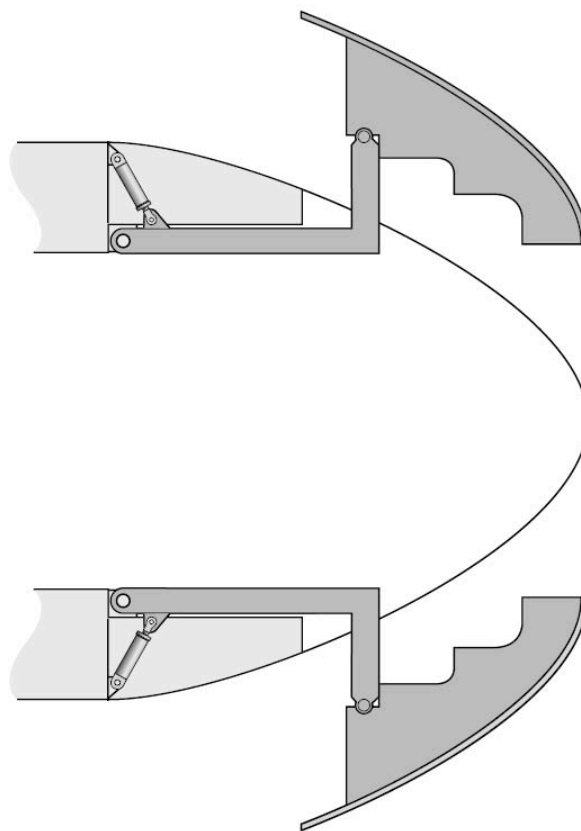
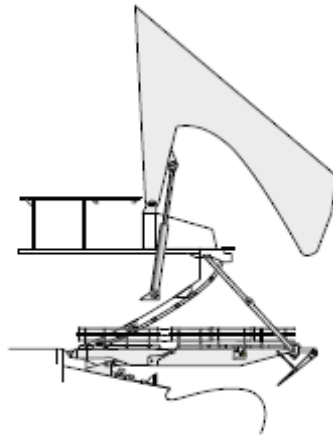


Illustration by courtesy of MacGREGOR Group

MAC10011026

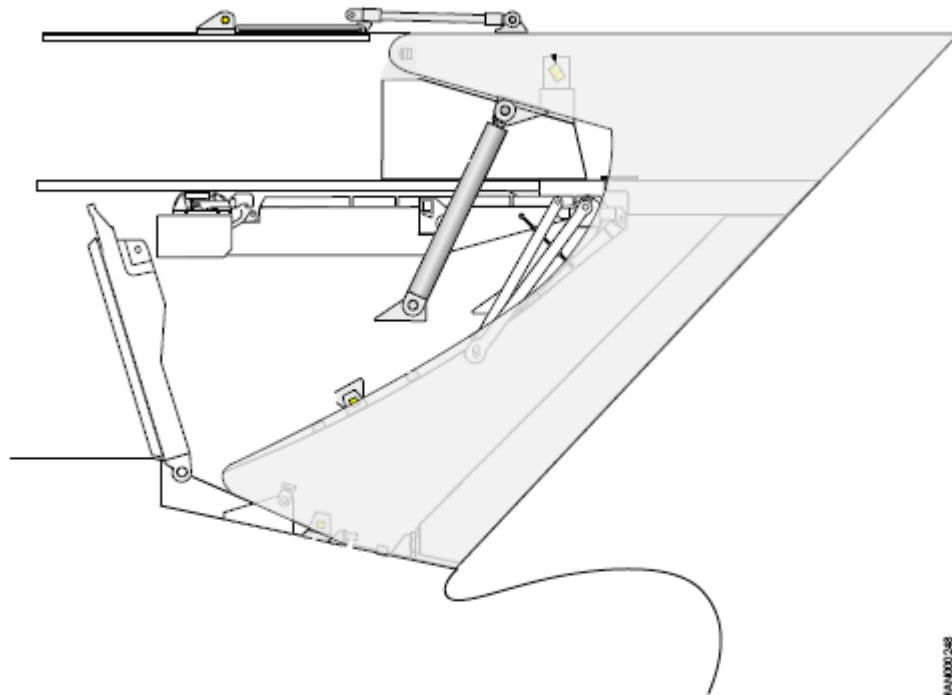
Bow Loading Ramp – visor type bow doors, general arrangement



MANR001247

Illustration by courtesy of MacGREGOR Group

Bow Visor Door – general arrangement



MANR001248

Illustration by courtesy of MacGREGOR Group

Cleating Hook 1



Illustration by courtesy of MacGREGOR Group

Cleating Hook 2

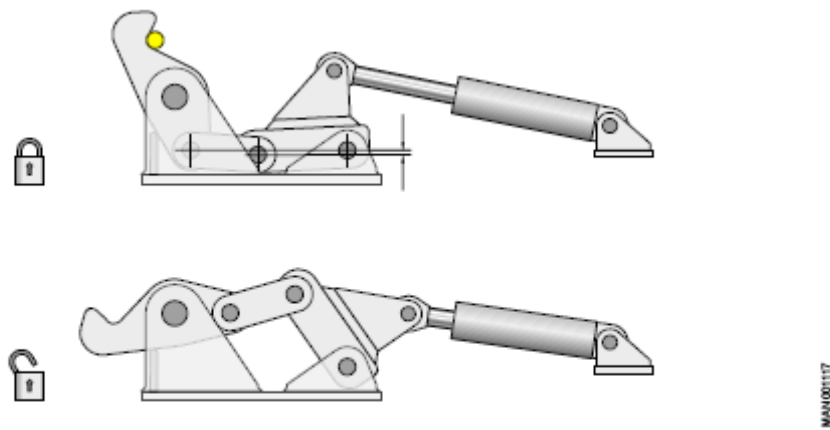


Illustration by courtesy of MacGREGOR Group

Cleating Wedge

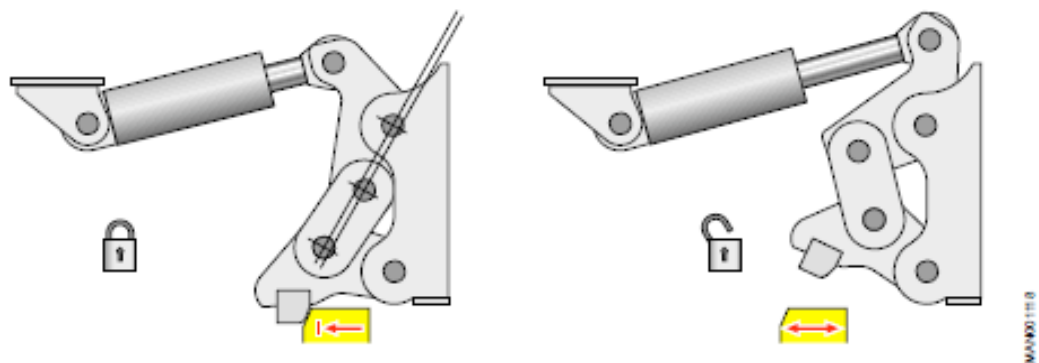


Illustration by courtesy of MacGREGOR Group

Hydraulic Actuators 1

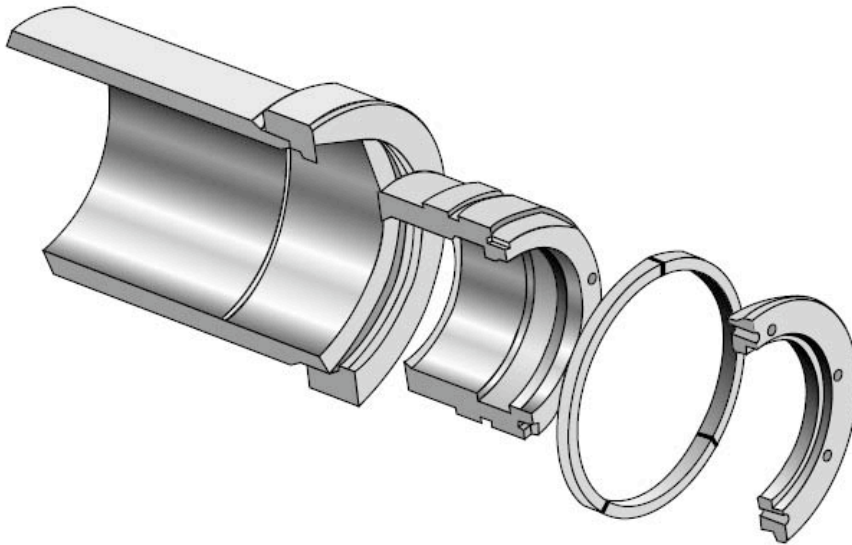


Illustration by courtesy of MacGREGOR Group

MAN000020

Hydraulic Actuators 2

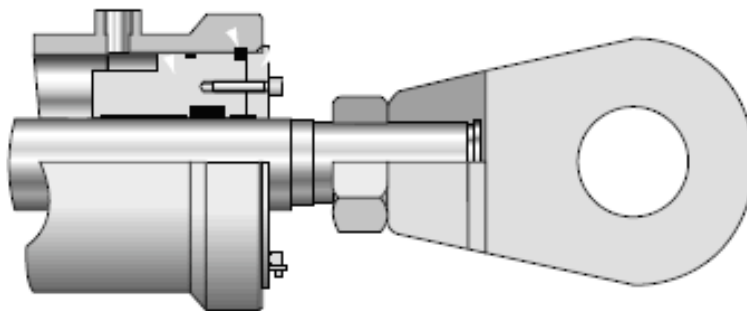


Illustration by courtesy of MacGREGOR Group

MAN000021

Hydraulic Actuators 3

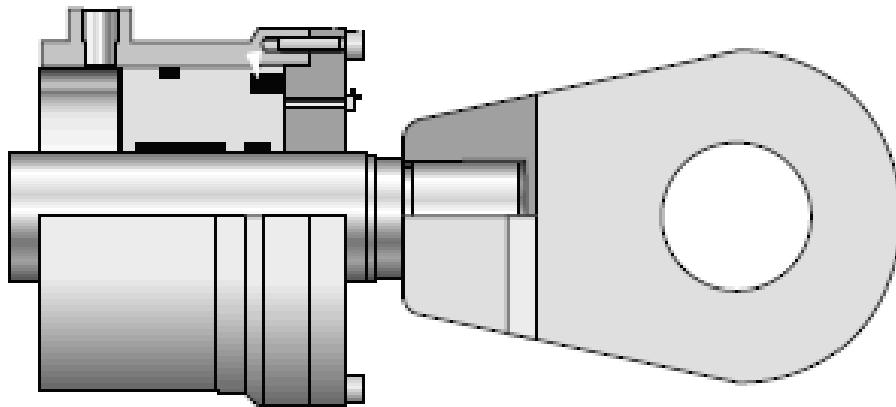


Illustration by courtesy of MacGREGOR Group

MAN0000023

Hydraulic Actuators 4

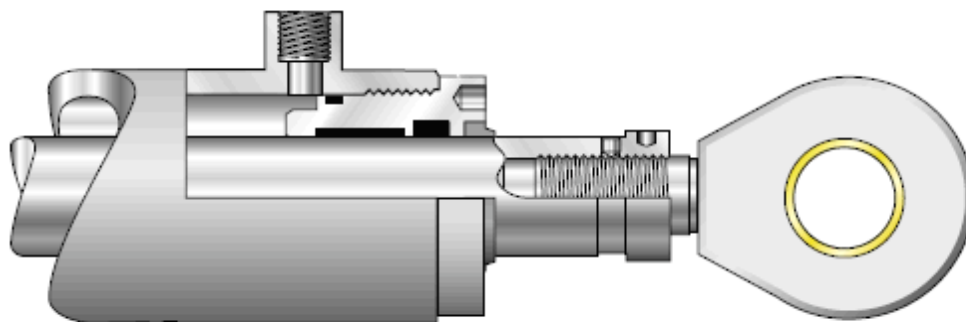


Illustration by courtesy of MacGREGOR Group

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Control Panel – closing door

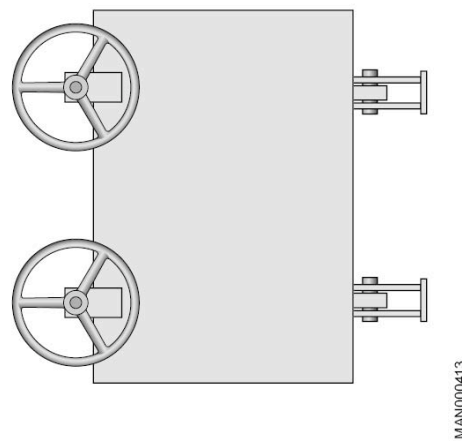


Illustration by courtesy of MacGREGOR Group

Bunker Door – closed, inside view

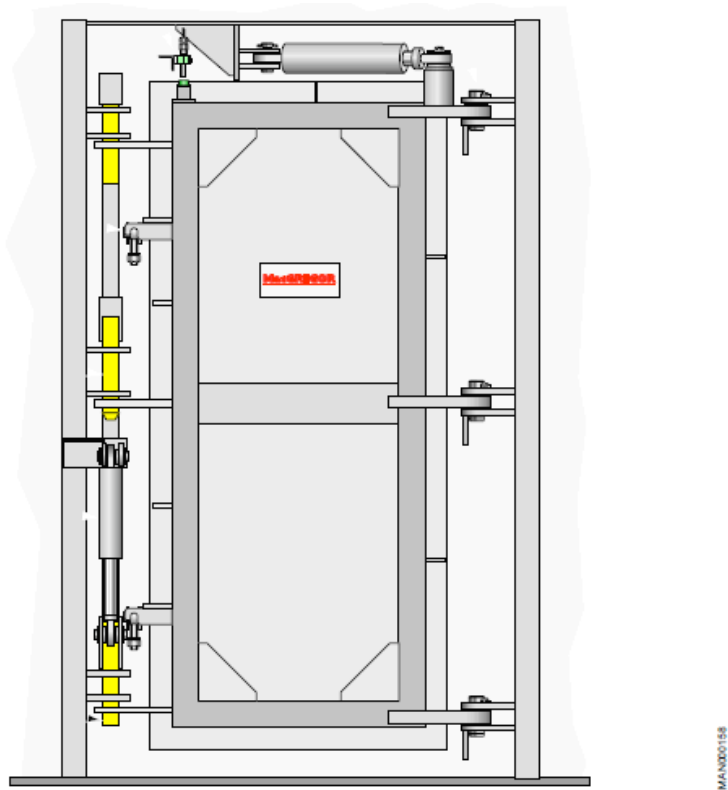


Illustration by courtesy of MacGREGOR Group

Bunker Door – Emergency Cleat

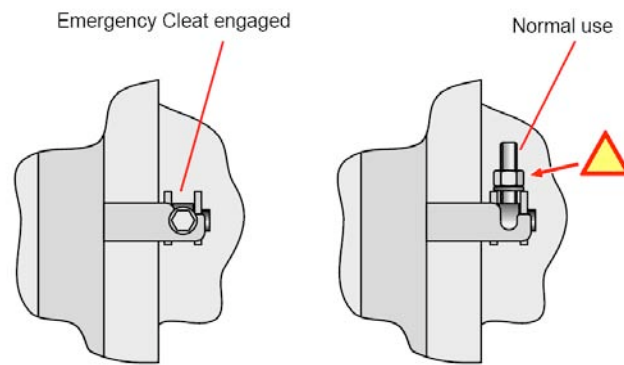
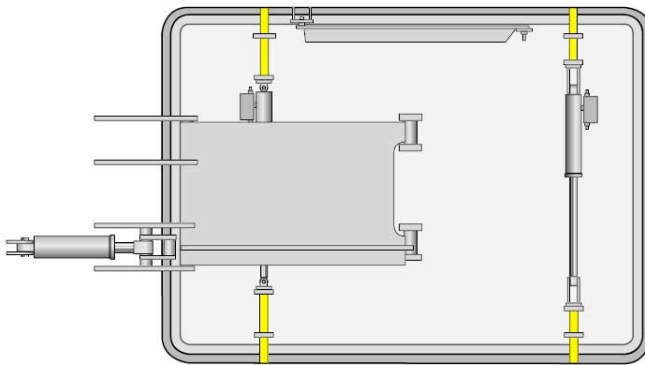


Illustration by courtesy of MacGREGOR Group

Bunker Port – type 1, closed, inside view



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Illustration by courtesy of MacGREGOR Group

Bunker Port – type 2, closed, inside view

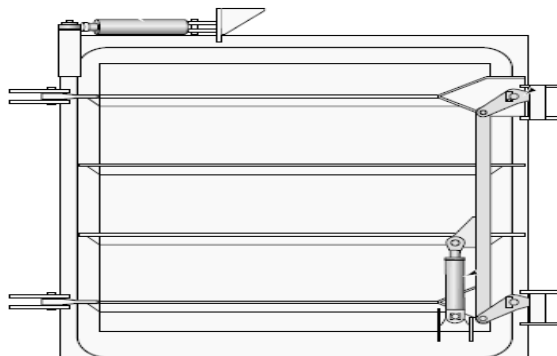


Illustration by courtesy of MacGREGOR Group

MAN001320

Cargo Door – closed, inside

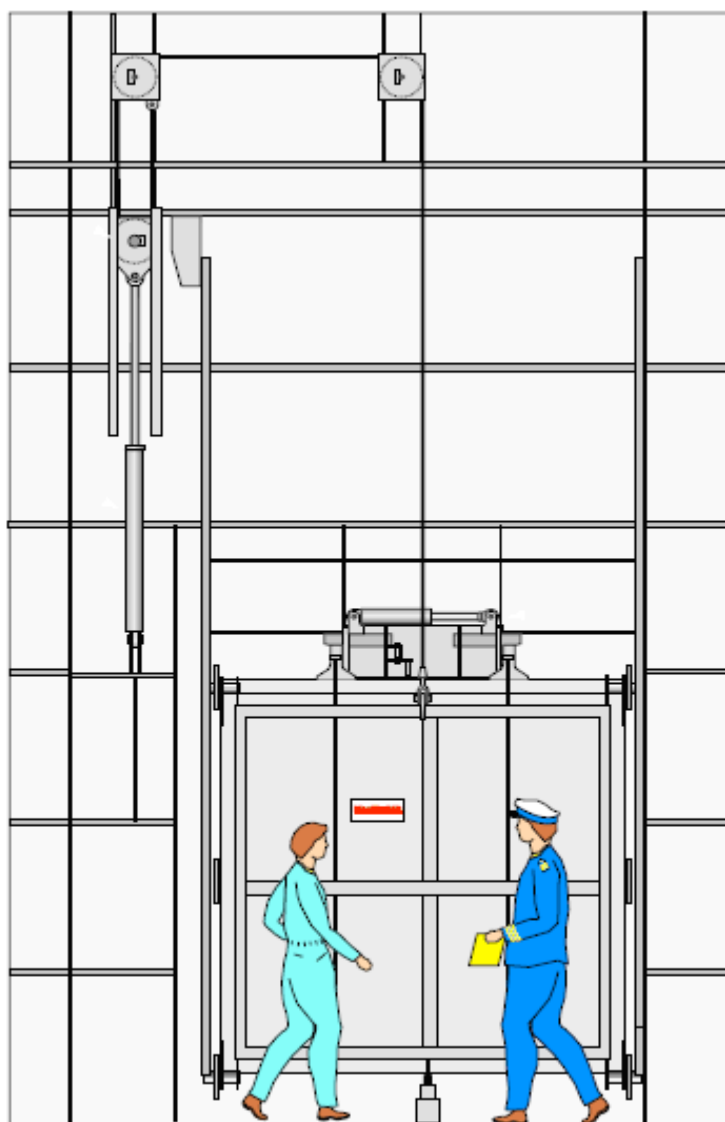


Illustration by courtesy of MacGREGOR Group

Cargo Door – open, inside

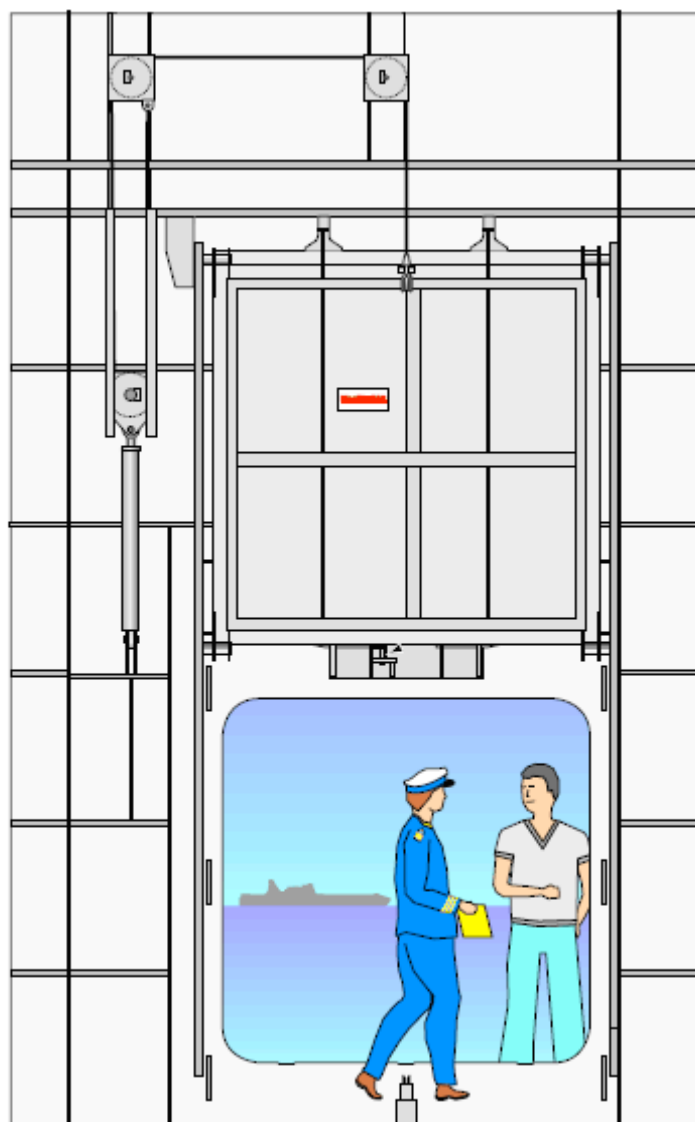


Illustration by courtesy of MacGREGOR Group

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Cargo Door – principle function

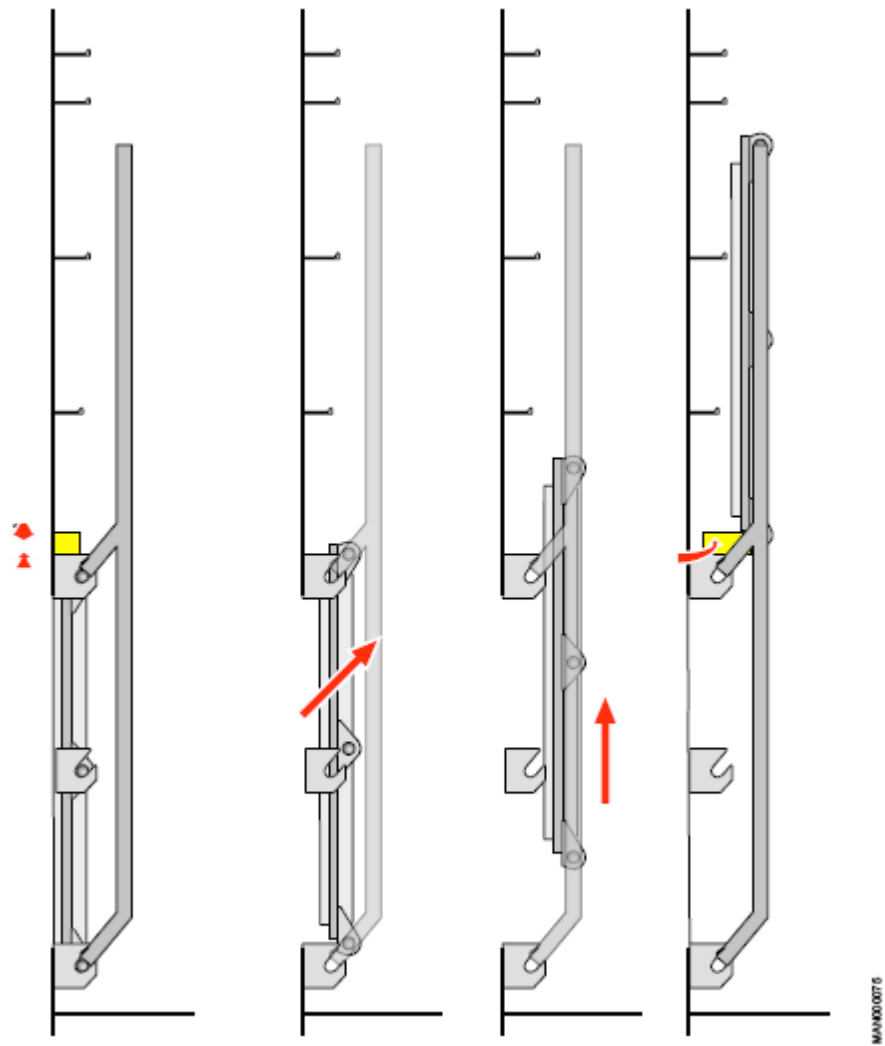
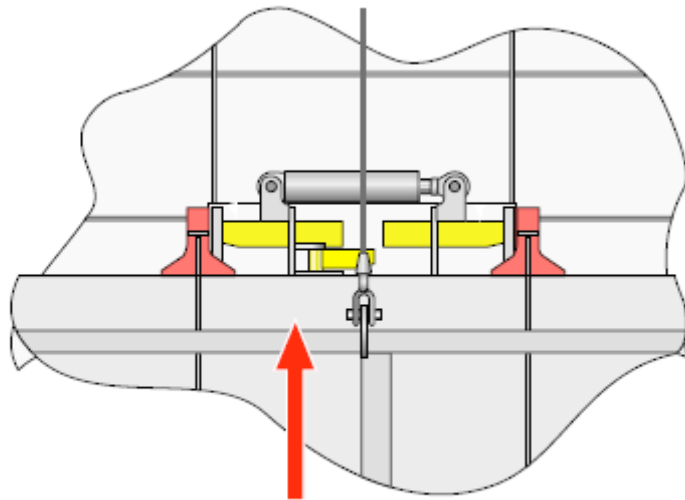


Illustration by courtesy of MacGREGOR Group

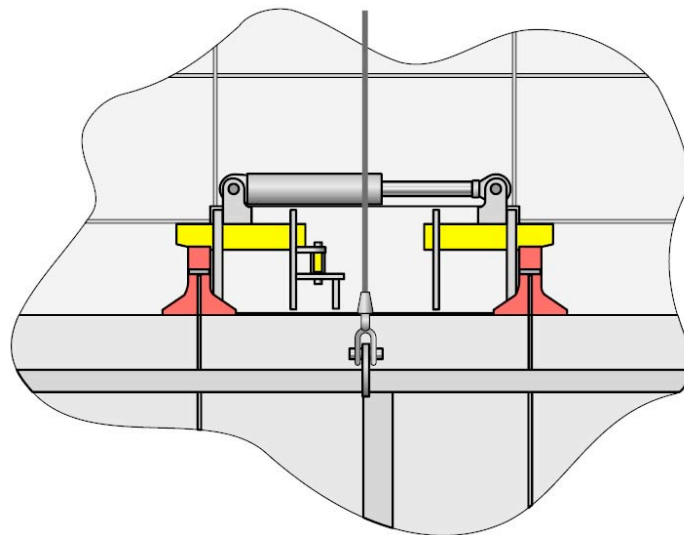
Cargo Door – type side hydraulic securing device disengaged



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Illustration by courtesy of MacGREGOR Group

Cargo Door – top side hydraulic securing device engaged



MAN000072

Illustration by courtesy of MacGREGOR Group

Side Shell Door – double leaf, closed, inside view

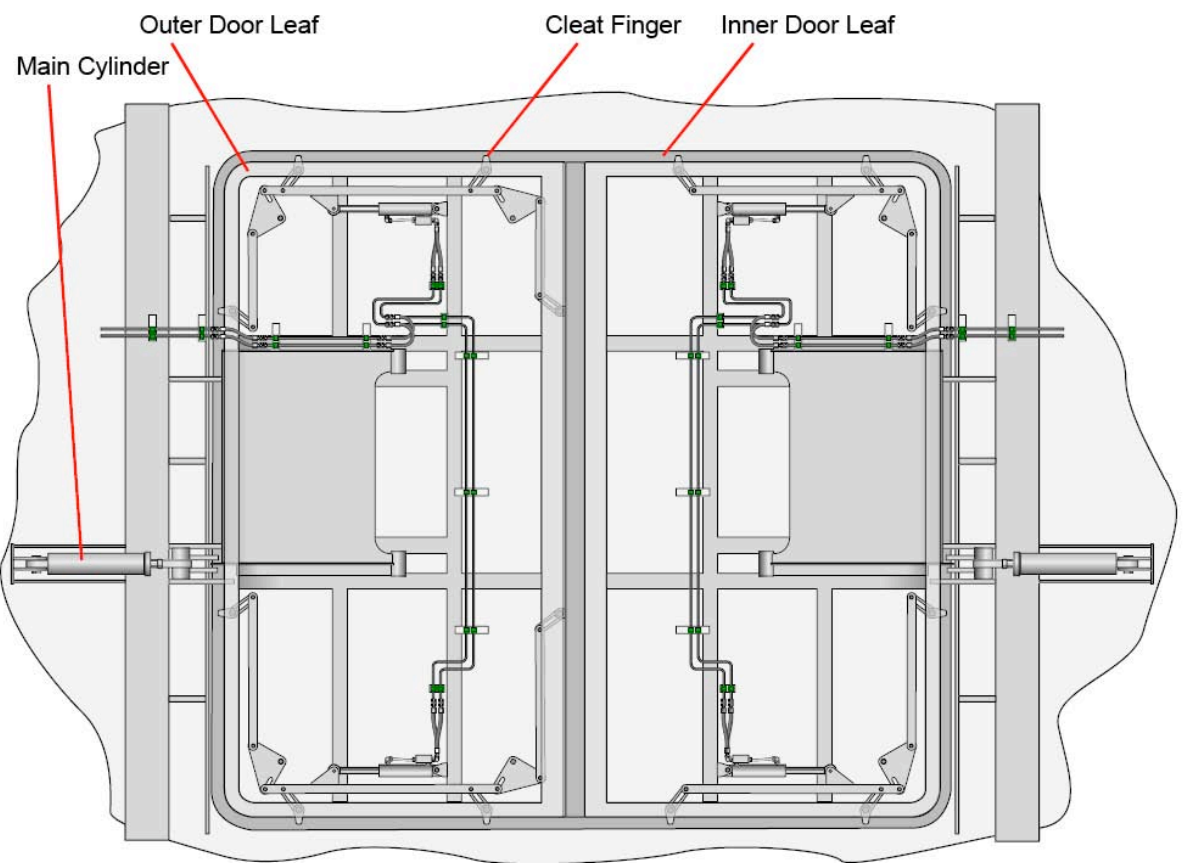


Illustration by courtesy of MacGREGOR Group

Side Shell Door – double leaf, closed, top view

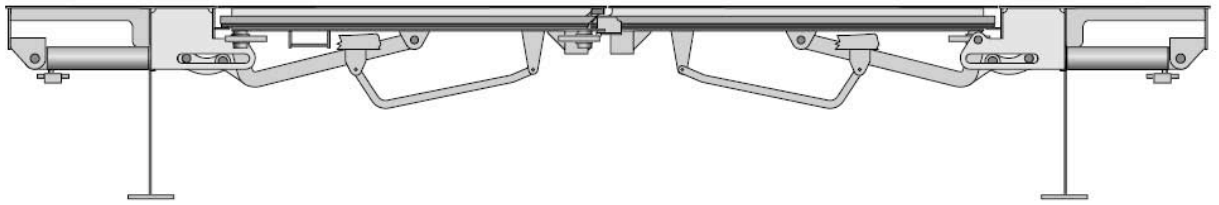


Illustration by courtesy of MacGREGOR Group

Side Shell Door – double leaf, fully opened, top view

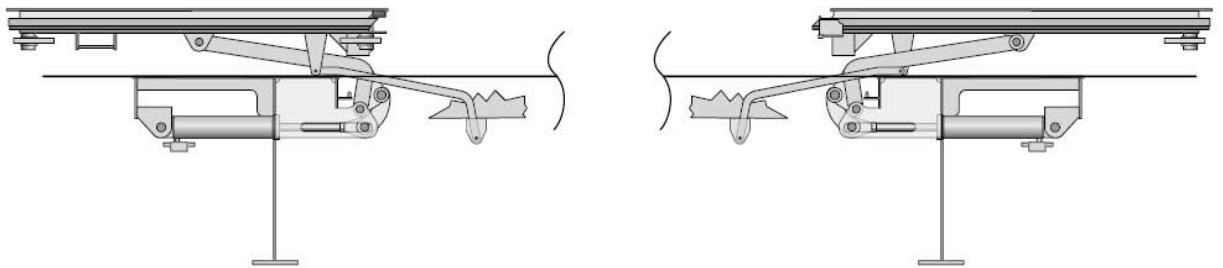


Illustration by courtesy of MacGREGOR Group

Side Shell Door – double leaf, half opened, top view

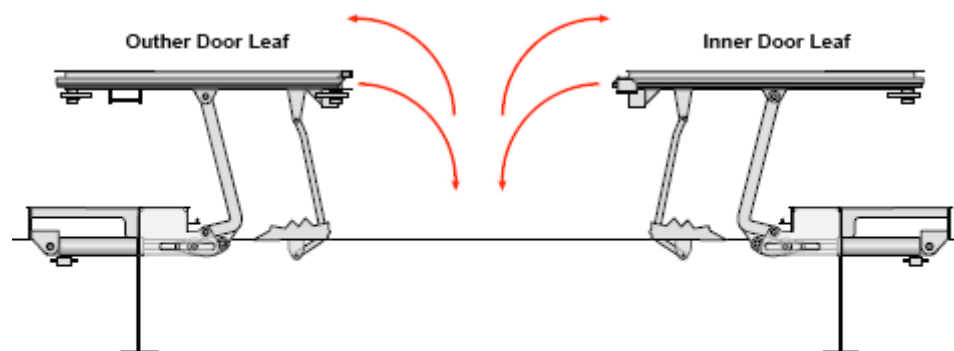
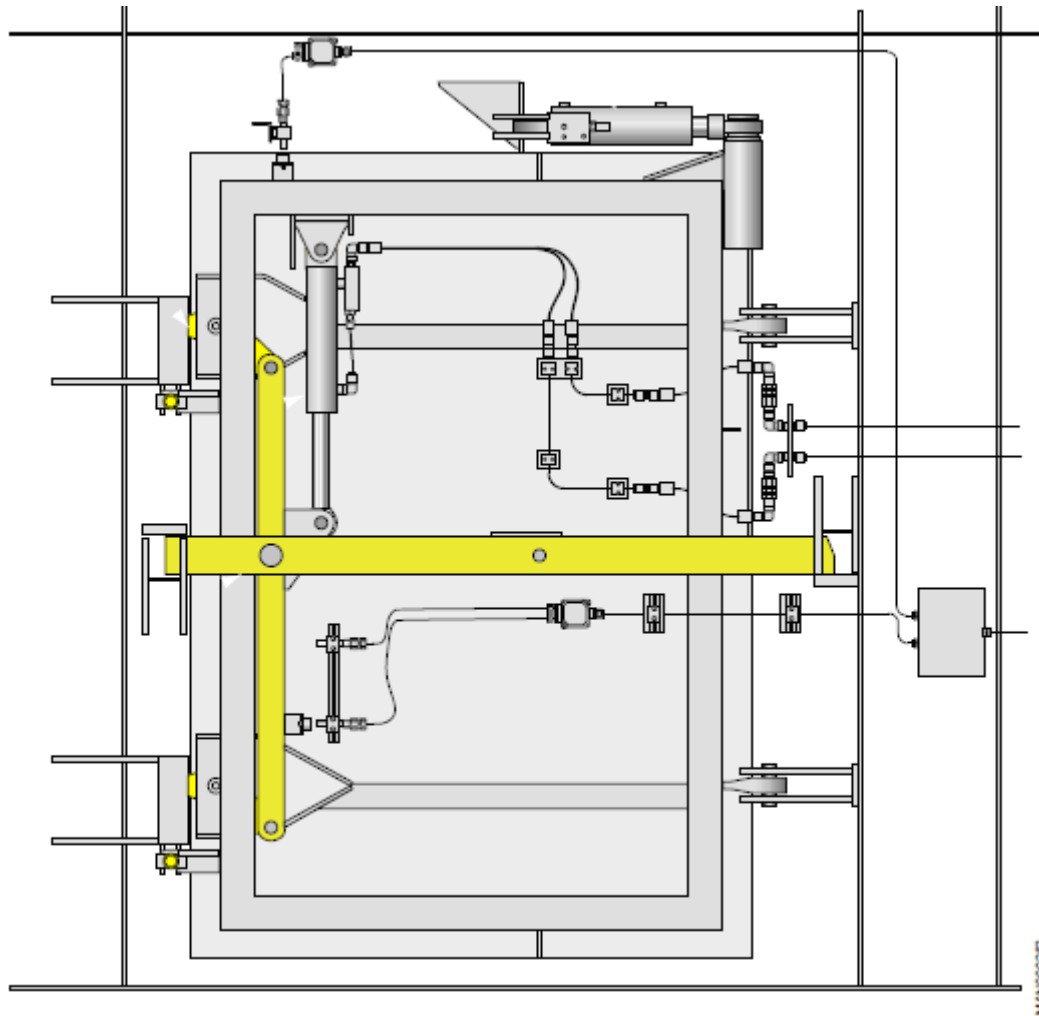


Illustration by courtesy of MacGREGOR Group

Pilot Door – inside view



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Illustration by courtesy of MacGREGOR Group

Side Ramp – front view

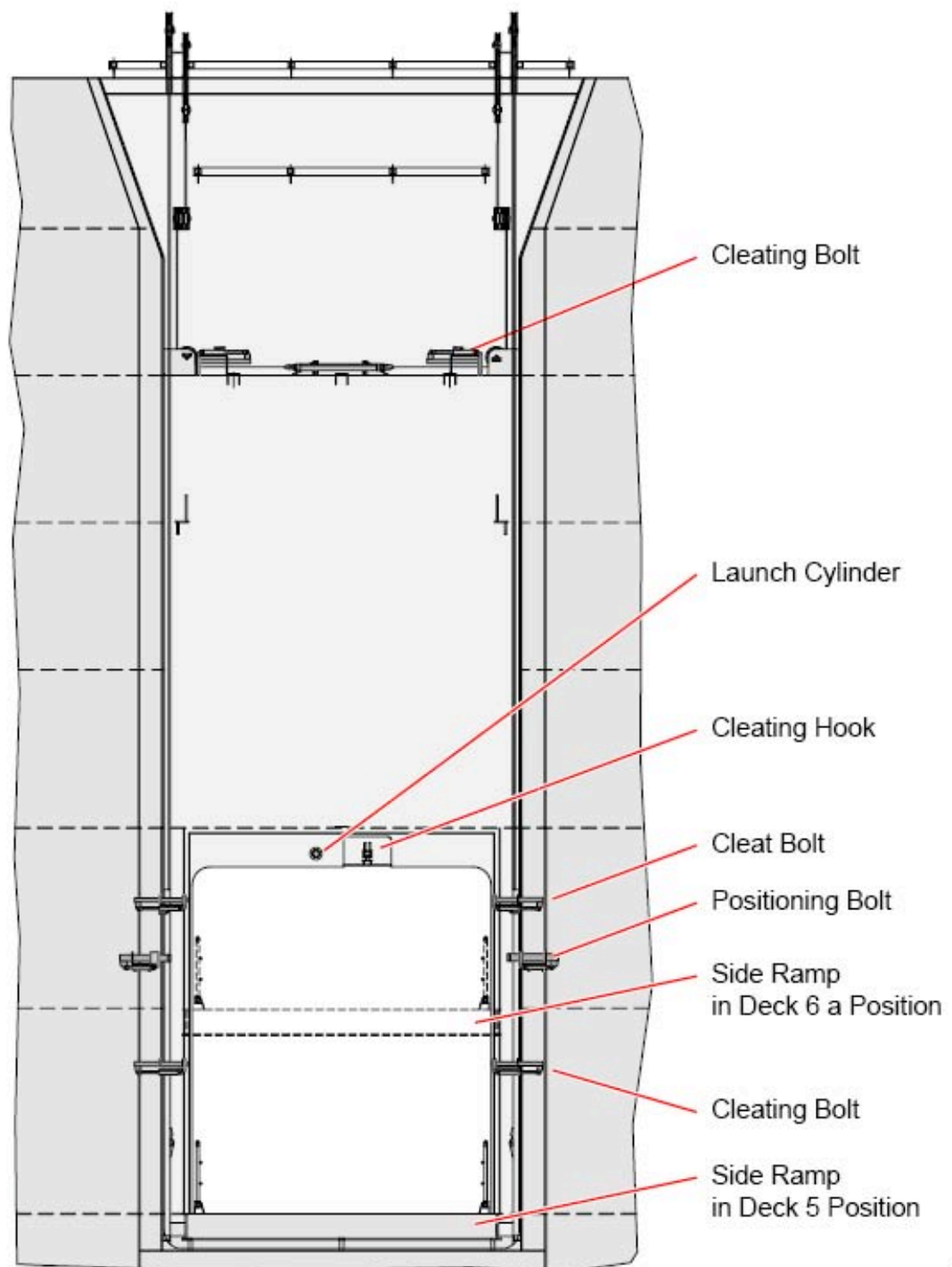


Illustration by courtesy of MacGREGOR Group

Side Ramp – side view

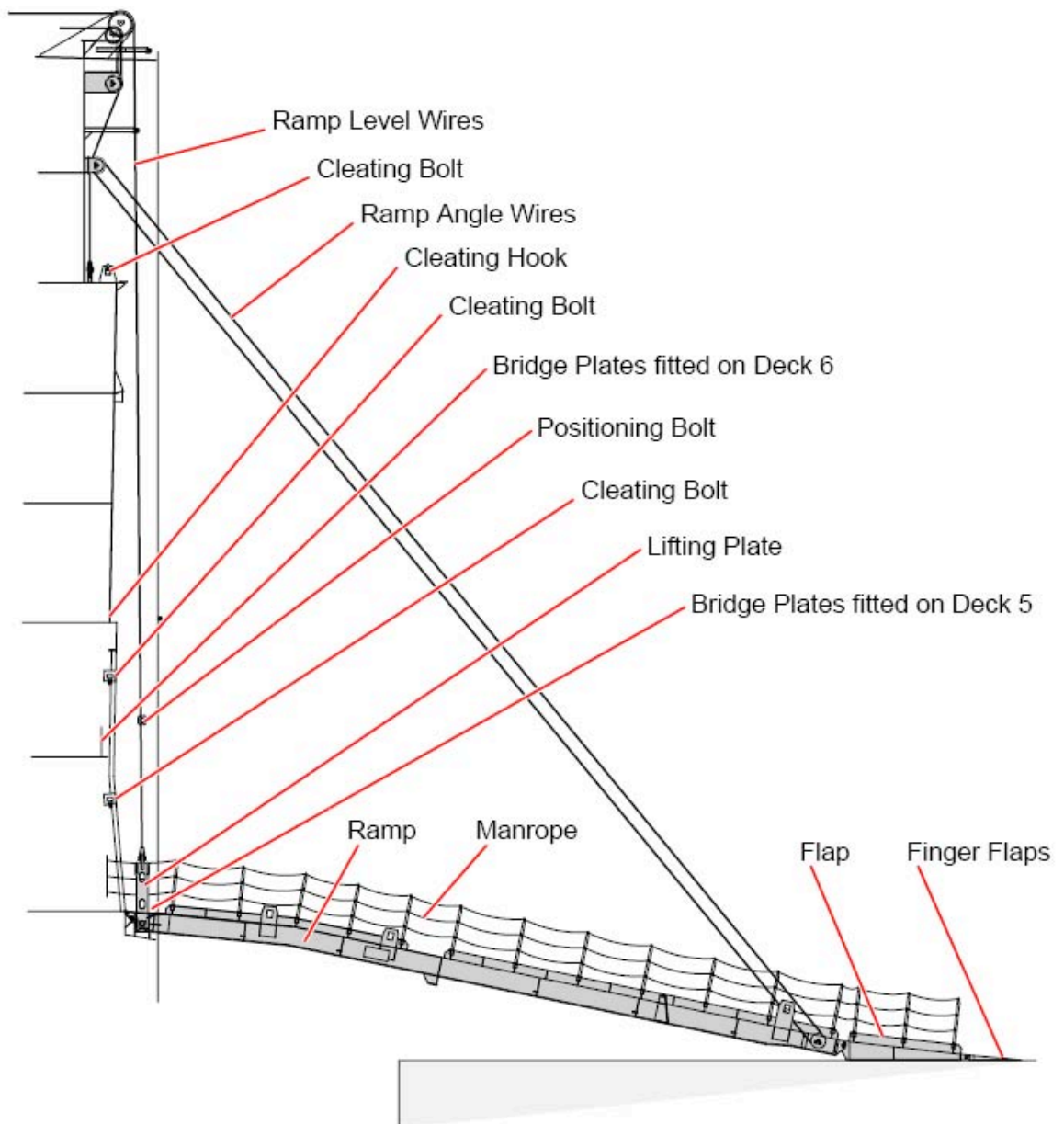


Illustration by courtesy of MacGREGOR Group

Side Ramp – top view

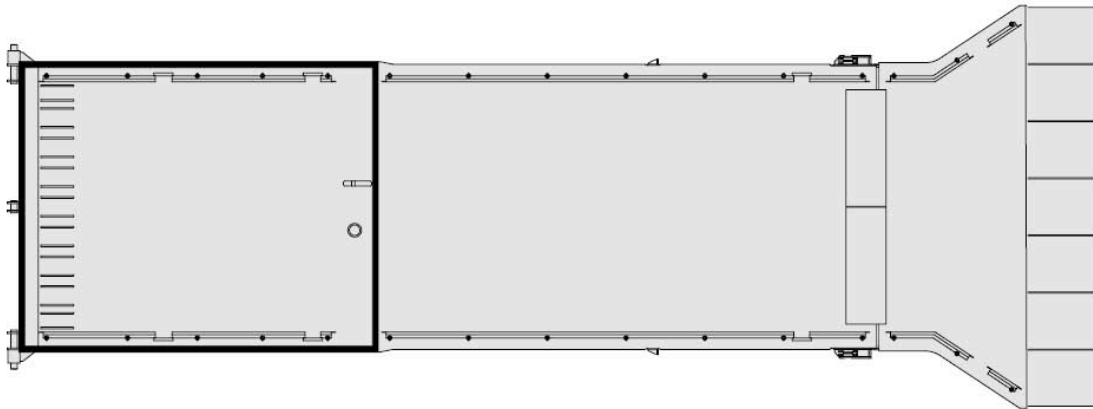


Illustration by courtesy of MacGREGOR Group

Stern Door – single leaf, closed, car carrier type

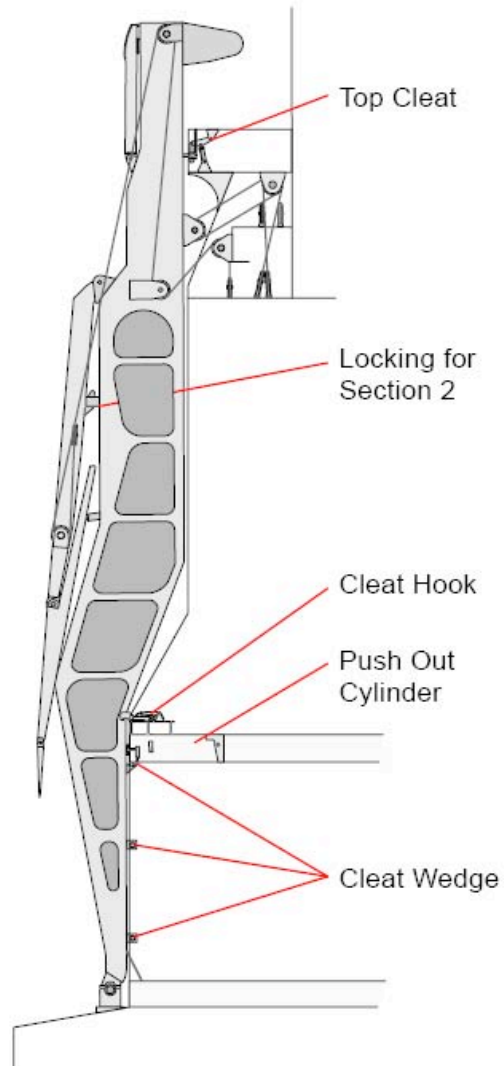


Illustration by courtesy of MacGREGOR Group

Stern Door – single leaf, open, car carrier type, top view

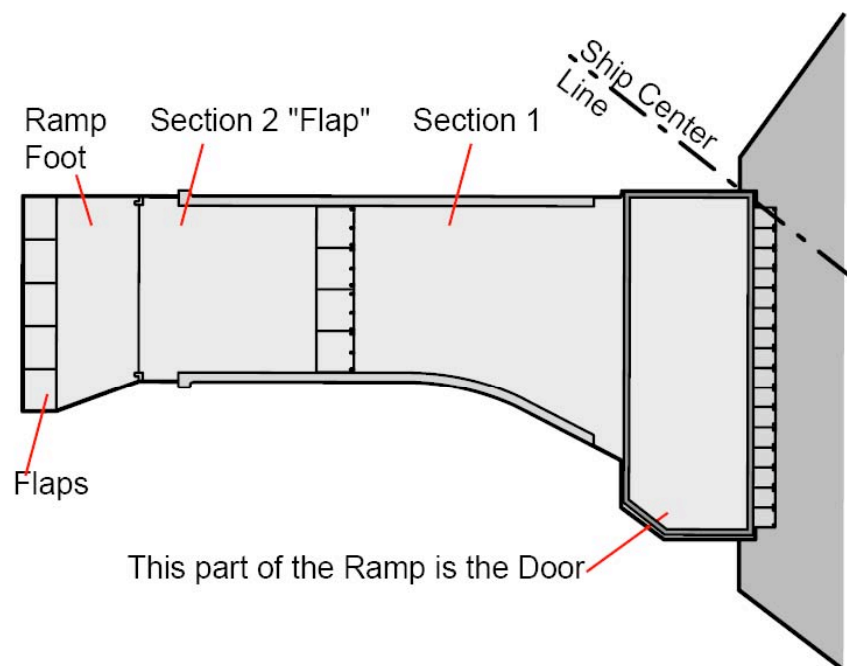


Illustration by courtesy of MacGREGOR Group

Stern Door – single leaf, open, car carrier type

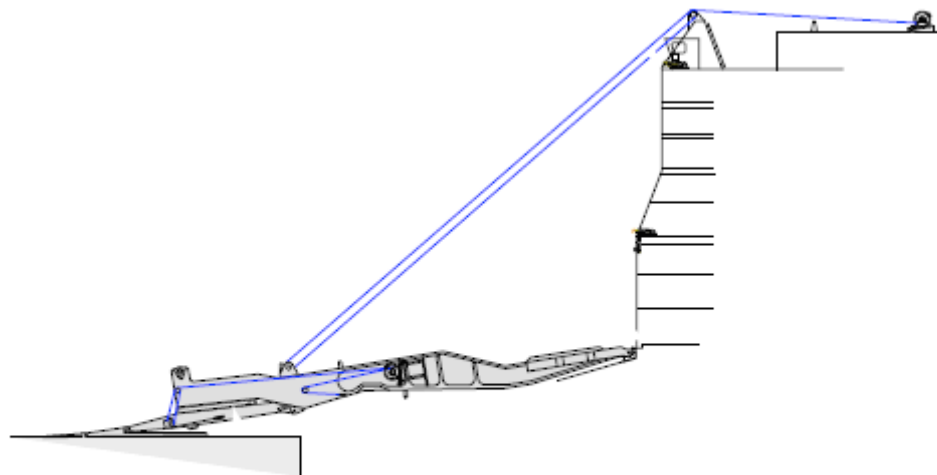


Illustration by courtesy of MacGREGOR Group

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Stern Door – double leaf, open, typical cleating arrangement

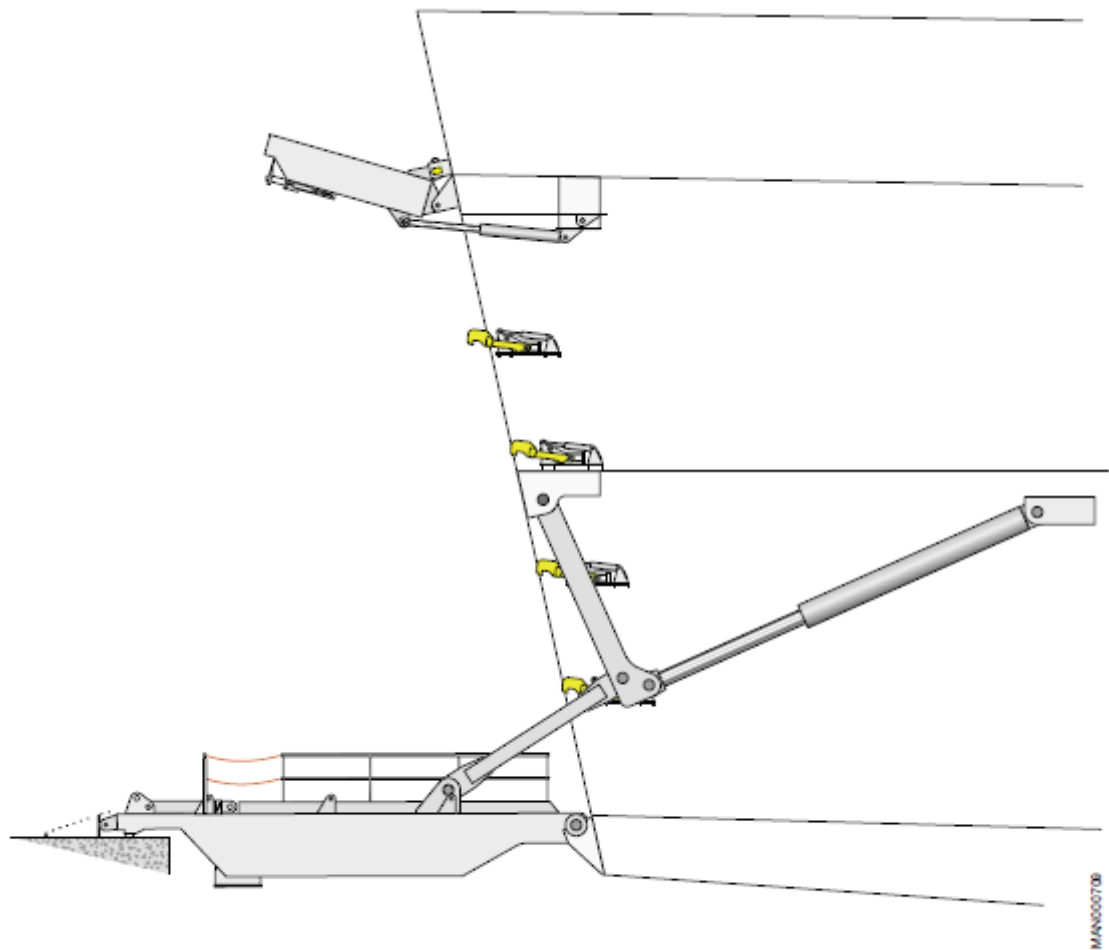


Illustration by courtesy of MacGREGOR Group

Stern Door – single leaf, open typical cleating arrangement, type 1

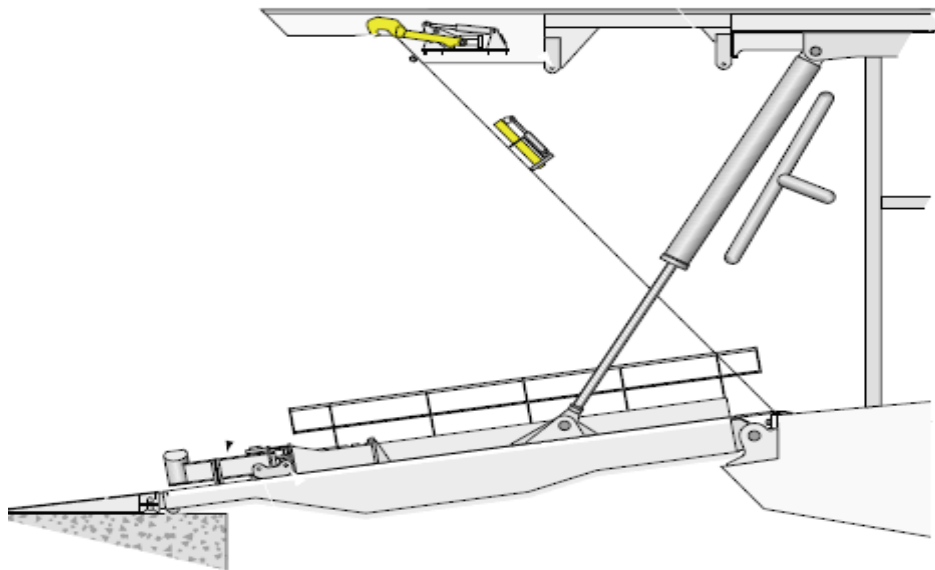


Illustration by courtesy of MacGREGOR Group

MAN00028

Stern Door – single leaf, open, typical cleating arrangement, type 2

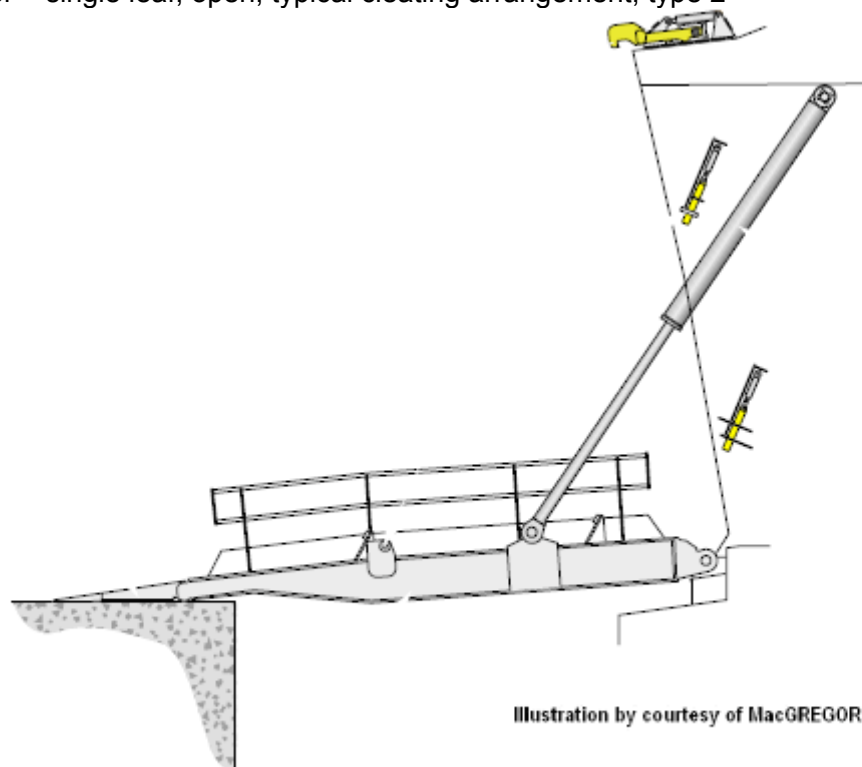


Illustration by courtesy of MacGREGOR Group

MAN01038

Stern Door – single leaf, closed, inside view, typical cleating arrangement, type 3

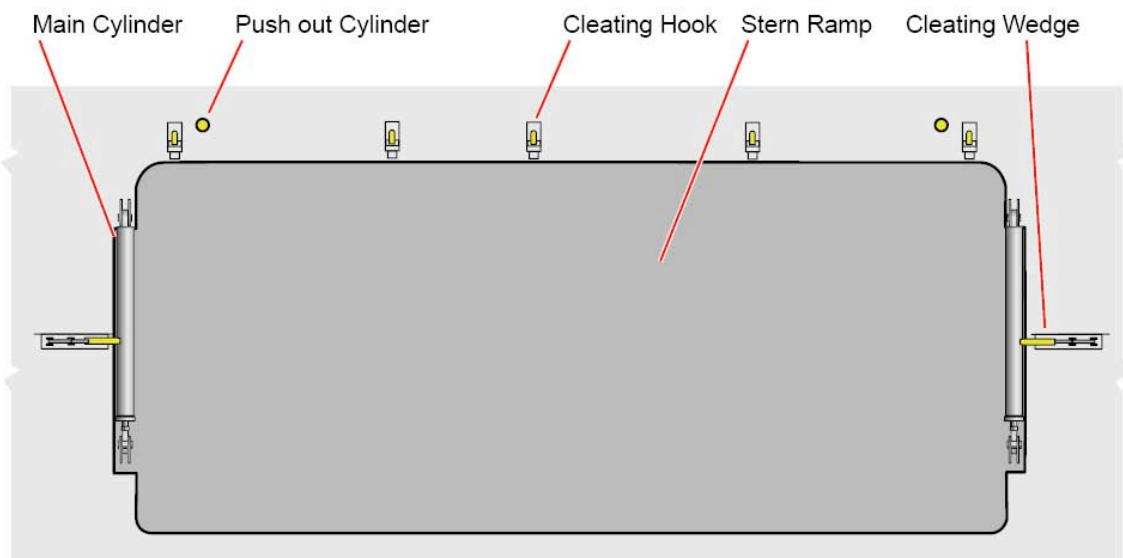


Illustration by courtesy of MacGREGOR Group

Stern Door – single leaf, closed, typical cleating arrangement, type 3

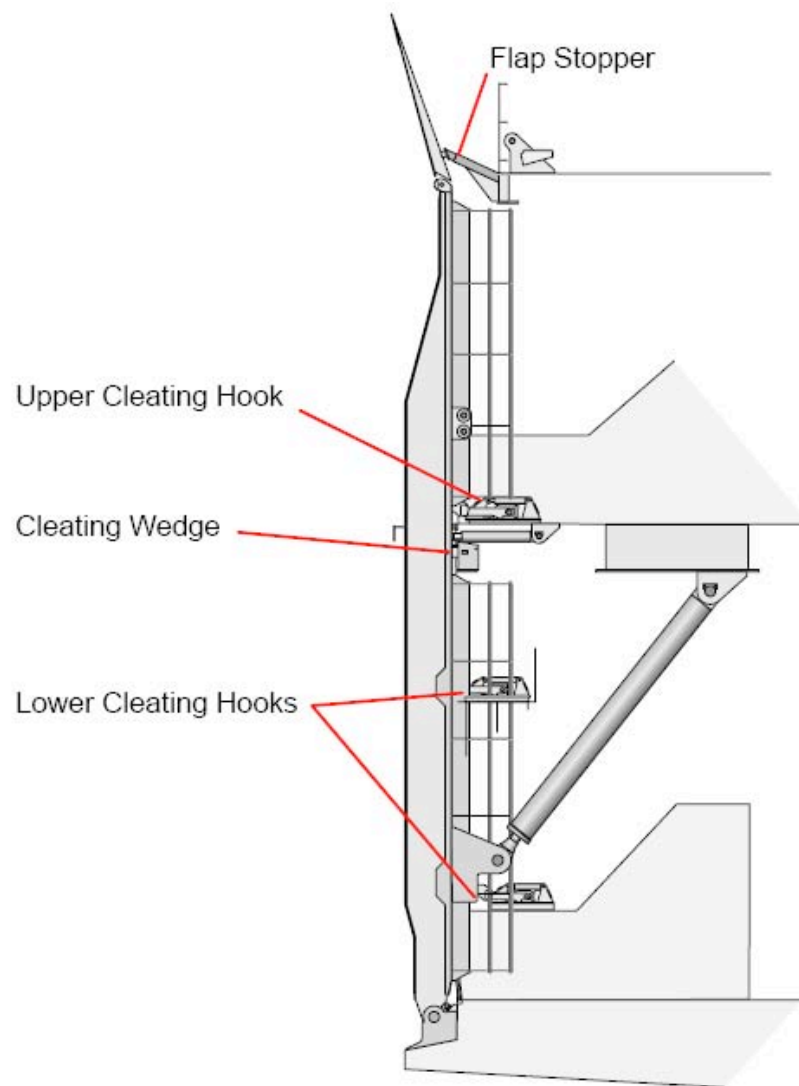


Illustration by courtesy of MacGREGOR Group

Stern Door – single leaf, open, push-out cylinder arrangement

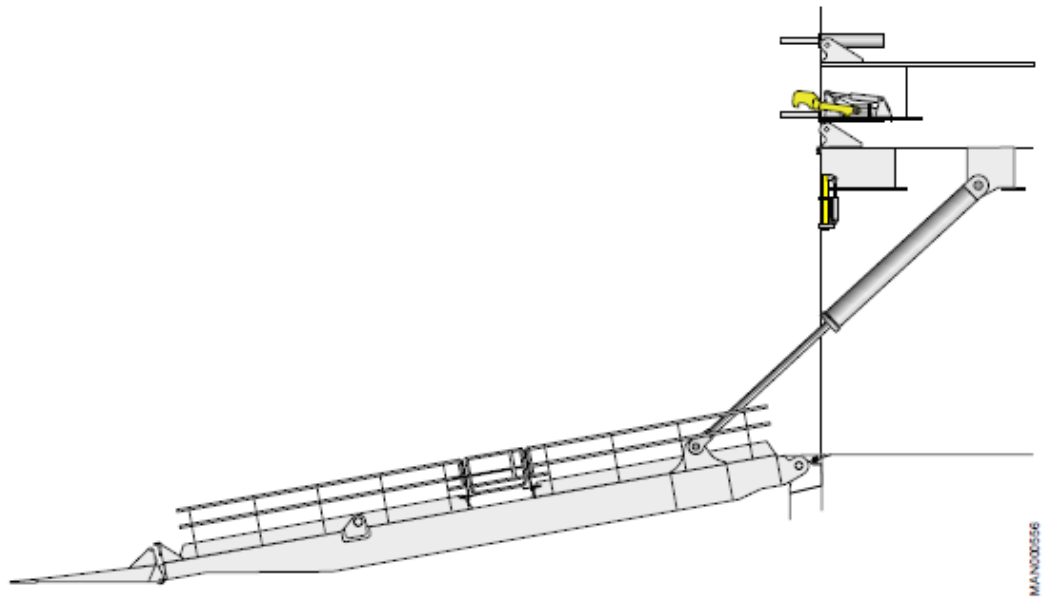


Illustration by courtesy of MacGREGOR Group

Stern Door – single leaf, open, typical cleating arrangement, type 3

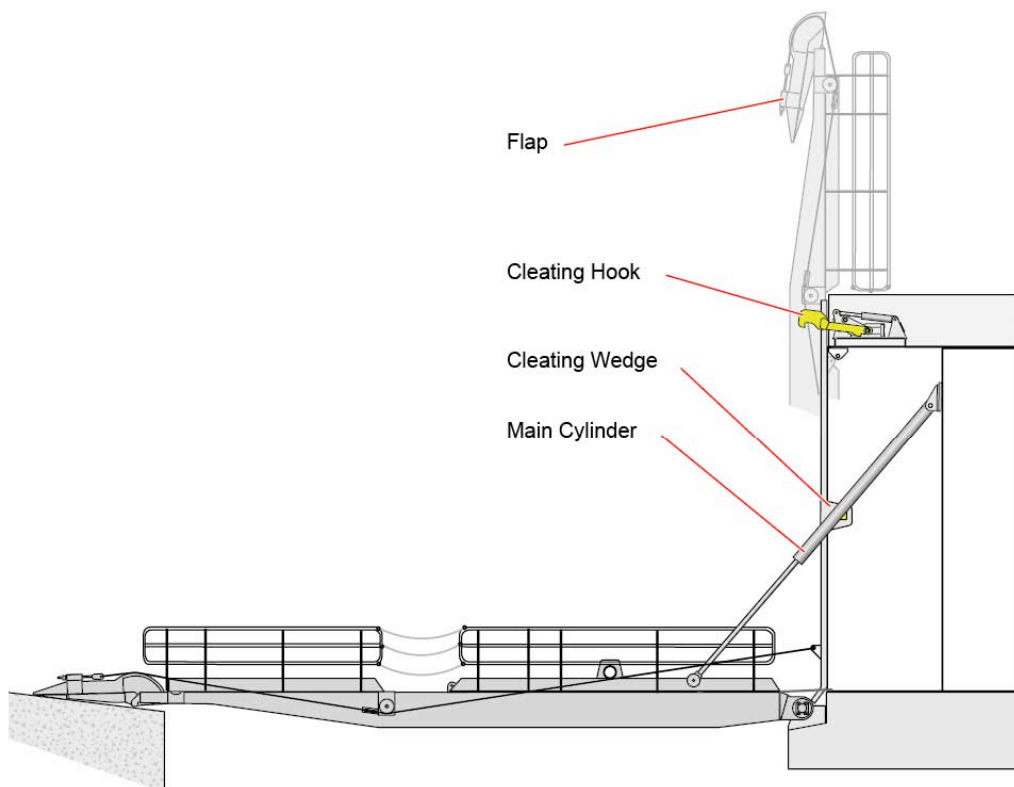


Illustration by courtesy of MacGREGOR Group

BCS-R Z25 Periodic Survey of Fuel Installations on Ships other than Liquefied Gas Carriers utilizing gas or other low flash point fuels

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 - 4.2.1.1 Safety Systems.

Note:

- 1. This requirement is implemented from 1 January 2019.

1. Application

These requirements apply to ships, other than those covered by the BCS-R Z16, which utilize gas or other low flash point fuels as a fuel for propulsion prime mover/auxiliary power generation arrangements and associated systems. These requirements are in addition to the requirements of BCS-R Z18.

These survey requirements do not cover fire protection, fire-fighting installation, and personnel protection equipment.

2. Special Survey

2.1 Schedule

2.1.1 Special Surveys are to be carried out at 5 years intervals to renew the Classification Certificate.

2.1.2 The first Special Survey is to be completed within 5 years from the date of the initial classification survey and thereafter within 5 years from the credited date of the previous Special Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances. In this case, the next period of class will start from the expiry date of the Special Survey before the extension was granted.

2.1.3 For surveys completed within 3 months before the expiry date of the Special Survey, the next period of class will start from the expiry date of the Special Survey. For surveys completed more than 3 months before the expiry date of the Special Survey, the period of class will start from the survey completion date. In cases where the vessel has been laid up or has been out of service for a considerable period because of a major repair or modification and the owner elects to only carry out the overdue surveys, the next period of class will start from the expiry date of the Special Survey. If the owner elects to carry out the next due Special Survey, the period of class will start from the survey completion date.

2.1.4 The Special Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5th anniversary date. When the Special Survey is commenced prior to the 4th Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited to the Special Survey.

2.1.5 Special Surveys may be carried out on a continuous survey basis. In this case, the interval between consecutive examinations of each item is not to exceed five (5) years.

2.2 Scope

2.2.1 General

The Special Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to ensure that the fuel installations are in a satisfactory condition and is fit for its intended purpose for the new period of class of 5 years to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

2.2.2 Fuel Handling and Piping

All piping for fuel storage, fuel bunkering, and fuel supply such as venting, compressing, refrigerating, liquefying, heating storing, burning or otherwise handling the fuel and liquid

nitrogen installations are to be examined. Removal of insulation from the piping and opening for examination may be required. Where deemed suspect, a hydrostatic test to 1.25 times the Maximum Allowable Relief Valve Setting (MARVS) for the pipeline is to be carried out. After reassembly, the complete piping is to be tested for leaks. Where water cannot be tolerated and the piping cannot be dried prior to putting the system into service, the Surveyor may accept alternative testing fluids or alternative means of testing.

2.2.3 Fuel Valves

All emergency shut-down valves, check valves, block and bleed valves, master gas valves, remote operating valves, isolating valves for pressure relief valves in the fuel storage, fuel bunkering, and fuel supply piping systems are to be examined and proven operable. A random selection of valves is to be opened for examination.

2.2.4 Pressure Relief Valves

- i) Fuel Storage Tank Pressure Relief Valves. The pressure relief valves for the fuel storage tanks are to be opened for examination, adjusted, and function tested. If the tanks are equipped with relief valves with non-metallic membranes in the main or pilot valves, such non-metallic membranes are to be replaced.
- ii) Fuel Supply and Bunkering Piping Pressure Relief Valves. Pressure relief valves for the fuel supply and bunkering piping are to be opened for examination, adjusted, and function tested. Where a proper record of continuous overhaul and retesting of individually identifiable relief valves is maintained, consideration will be given to acceptance on the basis of opening, internal examination, and testing of a representative sampling of valves, including each size and type of liquefied gas or vapor relief valve in use, provided there is logbook evidence that the remaining valves have been overhauled and tested since crediting of the previous Special Survey.
- iii) Pressure/Vacuum Relief Valves. The pressure/vacuum relief valves, rupture disc and other pressure relief devices for interbarrier spaces and hold spaces are to be opened, examined, tested and readjusted as necessary, depending on their design.

2.2.5 Fuel Handling Equipment

Fuel pumps, compressors, process pressure vessels, inert gas generators, heat exchangers and other components used in connection with fuel handling are to be examined as required in the Rules of each individual Society for periodical survey of machinery.

2.2.6 Electrical Equipment

- i) Examination of electrical equipment to include the physical condition of electrical cables and supports, intrinsically safe, explosion proof, or increased safety features of electrical equipment.
- ii) Functional testing of pressurized equipment and associated alarms.
- iii) Testing of systems for de-energizing electrical equipment which is not certified for use in hazardous areas.
- iv) An electrical insulation resistance test of the circuits terminating in, or passing through, the hazardous zones and spaces is to be carried out.

2.2.7 Safety Systems

Gas detectors, temperature sensors, pressure sensors, level indicators, and other equipment providing input to the fuel safety system are to be tested to confirm satisfactory operating condition.

- i) Proper response of the fuel safety system upon fault conditions is to be verified.
- ii) Pressure, temperature and level indicating equipment are to be calibrated in accordance with the manufacturer's requirements.

2.2.8 Fuel Storage Tanks

Fuel storage tanks are to be examined in accordance with an approved survey plan. Liquefied gas fuel storage tanks are to be examined based upon Recommendation No. 148.

3. Annual Survey

3.1 Schedule

3.1.1 Annual Surveys are to be held within 3 months before or after each anniversary date of the date of the initial classification survey or of the date credited for the last Special Survey. They will normally be performed at the same time as an Annual Hull survey.

3.2 Scope

3.2.1 General

The following is to be carried out during the survey of the Fuel Storage, Fuel Bunkering System, and Fuel Supply System:

3.2.1.1 Logbooks/Records

The logbooks and operating records are to be examined with regard to correct functioning of the gas detection systems, fuel supply/gas systems, etc. The hours per day of the re-liquefaction plant, gas combustion unit, as applicable, the boil-off rate, and nitrogen consumption (for membrane containment systems) are to be considered together with gas detection records.

3.2.1.2 Operating and Maintenance Instruction Manuals

The manufacturer/builder instructions and manuals covering the operations, safety and maintenance requirements and occupational health hazards relevant to fuel storage, fuel bunkering, and fuel supply and associated systems for the use of the fuel, are to be confirmed as being aboard the vessel.

3.2.1.3 Control, Monitoring and Safety Systems

- i) Gas detection and other leakage detection equipment in compartments containing fuel storage, fuel bunkering, and fuel supply equipment or components or associated systems, including indicators and alarms, is to be confirmed in satisfactory operating condition. Recalibration of the gas detection systems should be verified in accordance with the manufacturers' recommendations.

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- ii) Verification of the satisfactory operation of the control, monitoring and automatic shut-down systems as far as practicable of the fuel supply and bunkering systems.
 - iii) Operational test, as far as practicable, of the shutdown of ESD protected machinery spaces.

3.2.1.4 Fuel Handling Piping, Machinery and Equipment

Piping, hoses, emergency shut-down valves, remote operating valves, relief valves, machinery and equipment for fuel storage, fuel bunkering, and fuel supply such as venting, compressing, refrigerating, liquefying, heating, cooling or otherwise handling the fuel is to be examined, as far as practicable. Means for inerting is to be examined. Stopping of pumps and compressors upon emergency shut-down of the system is to be confirmed as far as practicable.

3.2.1.5 Ventilating System

Examination of the ventilation system, including portable ventilating equipment where fitted, is to be made for spaces containing fuel storage, fuel bunkering, and fuel supply units or components or associated systems, including air locks, pump rooms, compressor rooms, fuel preparation rooms, fuel valve rooms, control rooms and spaces containing gas burning equipment. Where alarms, such as differential pressure and loss of pressure alarms, are fitted, these should be operationally tested as far as practicable.

3.2.1.6 Drip Trays

Portable and fixed drip trays and insulation for the protection of the ship's structure in the event of leakage are to be examined.

3.2.1.7 Hazardous Areas

Electrical equipment and bulkhead/deck penetrations including access openings in hazardous areas are to be examined for continued suitability for their intended service and installation area.

3.2.1.8 Electrical Bonding.

Electrical bonding arrangements in hazardous areas, including bonding straps where fitted, are to be examined.

3.2.2 Fuel Storage, Bunkering and Supply Systems

The following are to be examined, so far as applicable. Insulation need not be removed, but any deterioration or evidence of dampness is to be investigated:

3.2.2.1 Fuel Storage

- i) External examination of the storage tanks including secondary barrier if fitted and accessible.
- ii) General examination of the fuel storage hold place.
- iii) Internal examination of tank connection space.
- iv) External examination of tank and relief valves.

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- v) Verification of satisfactory operation of tank monitoring system.
 - vi) Examination and testing of installed bilge alarms and means of drainage of the compartment.
 - vii) Testing of the remote and local closing of the installed main tank valve.

3.2.2.2 Fuel Bunkering System

- i) Examination of bunkering stations and the fuel bunkering system.
- ii) Verification of satisfactory operation of the fuel bunkering control, monitoring and shut-down systems.

3.2.2.3 Fuel Supply System

Examination of the fuel supply system during working condition as far as practicable.

- i) Verification of satisfactory operation of the fuel supply system control, monitoring and shut-down systems.
- ii) Testing of the remote and local closing of the master fuel valve for each engine compartment.

4. Intermediate Survey

4.1 Schedule

4.1.1 The Intermediate Survey is to be held at or between either the 2nd or 3rd Annual Survey.

4.1.2 Those items which are additional to the requirements of the Annual Surveys may be surveyed either at or between the 2nd and 3rd Annual Survey.

4.2 Scope

4.2.1 General

In addition to the applicable requirements of the Annual Survey, the Intermediate Survey is also to include:

4.2.1.1 Safety Systems

Gas detectors, temperature sensors, pressure sensors, level indicators, and other equipment providing input to the fuel safety system are to be randomly tested to confirm satisfactory operating condition. Proper response of the fuel safety system upon fault conditions is to be verified.

BCS- R Z26 Alternative Certification Scheme (ACS)

1. Definitions

1.1 ACS is a certification scheme involving a manufacturer (and associated sub-suppliers, if needed) in the inspection, testing and certification of the manufacturer's products.

1.2 An ACS will clarify:

- The extent of the required inspection and testing.
- To which extent and under which conditions the manufacturer may perform all or parts of the required inspection and testing without the presence of a Surveyor from BCS when BCS Certificate is required.

1.3 The extent to which the manufacturer is given permission to carry out inspections and testing without the presence of a Surveyor is to be agreed on a case by case basis, e.g. for a specific product production line or for specific parts.

2. Scope

2.1 An ACS may be arranged with product manufacturers and/or sub-suppliers.

2.2 An ACS with a manufacturer must define the handling of subcontracted parts (those that require BCS or work certificates or in any other way are addressed in BCS's Rules). The sub-supplier may be included in the ACS of the manufacturer or have his own ACS or deliver parts that are inspected and certified by BCS.

2.3 An ACS that permits the manufacturer to carry out all or parts of required inspection and testing without the presence of a Surveyor may be arranged in two versions with regard to traceability:

- The ACS describes inspection, testing and certification additional to the manufacturer's standard quality control in order to meet the Rules. The components are to be stamped with a special stamp supplied by BCS or identified as required by BCS.
- The manufacturer has a standard quality control that covers all required inspection, testing and certification in compliance with the Rules. Traceability and the required type of product document for components or products will be defined in the ACS.

Notes:

1. This requirement is implemented on or after 1 July 2016.

3. Conditions

3.1 The conditions for the manufacturer to be granted the permission to carry out inspection and testing without the presence of a Surveyor are that:

- The manufacturer has an implemented Quality System according to a national or international standard approved by an accredited certification body or recognised by BCS.
- The manufacturer has a quality control system, current drawings, and Rules and standards that cover the product to be certified.
- The inspection and testing required by the Rules are either standard procedures in the Quality System and recognized by BCS or specified in detail in the ACS.
- BCS initially ascertains the manufacturer's compliance with the ACS-requirements by verifying the required product and process approvals and performing an initial audit. Follow-up and renewal audits are conducted by BCS on a regular basis to verify that conditions of the ACS are continuously maintained by the manufacturer.
- If work certificates (W) or test reports (TR) are found not to fulfil the standards agreed with BCS, the component may not be accepted.
- The agreed ACS may be suspended or cancelled when / if found justified by BCS.
- BCS may carry out unscheduled inspections at the manufacturer and /or subcontractor at its own discretion.
- The manufacturers (and designers, if producing under license) commit themselves to involve BCS when changes to the design, manufacturing process or testing are made as well as when any major production problems or any major product delivery problems have occurred.
- The validity of an ACS is to be a maximum of 5 years. The ACS may be renewed subject to an audit. The scope of the renewal audit shall:
 - verify the conditions of the ACS are still met
 - verify that the current products and processes are appropriately controlled

4. Information to be submitted

4.1 For admission to an alternative certification scheme for a product, the manufacturer is to submit an application enclosing the following documentation:

- Product details.
- Existing class approvals of the manufacturer's products as far as required.
- The procedures relevant to the manufacturing process.
- A list of material suppliers with an indication of their class approval (as far as required by the Rules) and the type of material certification in each case.

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- Quality control plans relevant to the products and relevant components to be certified through the alternative certification scheme. Said plans are to detail the inspections and tests required by the Rules with an indication of which inspections and tests are delegated to the manufacturer and which are to be done in the presence of BCS representative.
 - The procedures relevant to the quality control and inspections, their methods, frequency and certification.
 - The list of suppliers of materials and main components of the product, including certificates.
 - The quality system details.
 - List of nominated personnel for:
 - Marking/stamping of products
 - Tests and Inspection (responsible)
 - Provision of data and information (e.g. declaration of conformity, test reports etc.)
 - Any other additional documents that BCS may require in order to evaluate the manufacturing processes and product quality control.

5. Audit procedure

5.1 Upon satisfactory examination of the complete documentation for application an initial audit shall be carried out at the manufacturer's works. This audit is to verify that the manufacture of the product and the relevant controls are performed in accordance with the documents submitted and are in compliance with the requirements laid down in the ACS documentation and BCS Rules.

5.2 Upon satisfactory outcome of the audits, the extent, duration and conditions of the ACS are documented.

5.3 At least one intermediate audit during the period of validity of the ACS is to be carried out. Additional audits may be required at the discretion of BCS.

BCS- R Z27 Condition Monitoring and Condition Based Maintenance

1. General

- 1.1 Application
- 1.2 Definitions
- 1.3 Condition Monitoring (CM)
- 1.4 Condition Based Maintenance (CBM)

2. Procedures and Conditions for approval of CM and CBM

- 2.1 Onboard Responsibility
- 2.2 Equipment and System Requirements
- 2.3 Documentation and Information
- 2.4 Approval validity

3. Surveys

- 3.1 Installation Survey
- 3.2 Implementation Survey
- 3.3 Annual Audit
- 3.4 Damage and repairs

Note:

- 1. This requirement is implemented for survey schemes approved on and after 1 July 2019.

1 General

1.1 Application

1.1.1 These requirements apply to the approved Condition Monitoring and Condition Based Maintenance schemes where the condition monitoring results are used to influence the scope and/or frequency of Class survey.

1.1.2 This scheme may be applied to components and systems covered by Continuous Machinery Survey (CMS), and other components and systems as requested by the owner. The extent of Condition Based Maintenance and associated monitoring equipment to be included in the maintenance scheme is decided by the Owner.

1.1.3 These requirements can be applied only to vessels operating on approved PMS survey scheme.

1.1.4 The scheme may be applied to any individual items and systems. Any items not covered by the scheme shall be surveyed and credited in accordance with the requirements of BCS- R Z18 and / or BCS- R Z20.

1.2 Definitions

1.2.1 The following standard terms are defined in ISO 13372:2012:

- **Condition monitoring:** acquisition and processing of information and data that indicate the state of a machine over time. The machine state deteriorates if faults or failures occur.
- **Diagnostic:** examination of symptoms and syndromes to determine the nature of faults or failures.
- **Condition Based Maintenance:** maintenance performed as governed by condition monitoring programmes.

1.3 Condition Monitoring (CM)

1.3.1 Where an approved condition monitoring system is fitted, credit for survey may be based on acceptable condition monitoring results. The condition monitoring results are to be reviewed during the annual audit.

1.3.2 Limiting parameters are to be based on the Original Equipment Manufacturers guidelines (OEM), or a recognised international standard.

1.3.3 The condition monitoring system is to provide an equivalent or greater degree of confidence in the condition of the machinery to traditional survey techniques.

1.3.4 The condition monitoring system shall be approved in accordance with BCS's procedures.

1.3.5 A condition monitoring system may be used to provide a greater understanding of equipment condition, and a condition based maintenance scheme may be used to obtain maintenance efficiency. Class approval is required where owners wish to change the survey cycle based on CM/CBM.

1.3.6 Software systems can use complex algorithms, machine learning and knowledge of global equipment populations/defect data in order to identify acceptability for continued service or the requirement for maintenance. These systems may be independent of the OEM recommended maintenance and condition monitoring suggested limits. Approval of this type of software is to be based on OEM recommendations, industry standards and BCS experience.

1.3.7 BCS retains the right to test or open-up the machinery, irrespective of the CM results, if deemed necessary.

1.4 Condition Based Maintenance (CBM)

1.4.1 Where an owner wishes to base their equipment maintenance on a CBM approach, this is to meet the requirements of the ISM Code.

1.4.2 Where an agreed planned maintenance and CBM scheme is in operation, the CMS and other survey intervals may be extended based on OEM maintenance recommendations and acceptable condition monitoring results.

1.4.3 Limiting parameters (alarms and warnings) are to be based on the OEM guidelines, or a recognised international standard.

1.4.4 The CBM scheme is to provide an equivalent or greater degree of confidence in the condition of the machinery to traditional maintenance techniques.

1.4.5 The scheme shall be approved in accordance with each Member Society's procedures.

1.4.6 Software systems can use complex algorithms, machine learning and knowledge of global equipment populations/defect data in order to identify acceptability for continued service or the requirement for maintenance. These systems may be independent of the OEM recommended maintenance and condition monitoring suggested limits. Approval of this type of software is to be based on OEM recommendations, industry standards and BCS experience.

2 Procedures and Conditions for approval of CM and CBM

2.1 Onboard Responsibility

2.1.1 The chief engineer shall be the responsible person on board in charge of the CM and CBM.

2.1.2 Documentation on the overhaul of items covered by CM and CBM schemes shall be reported by the chief engineer.

2.1.3 Access to computerized systems for updating of the maintenance documentation and maintenance program shall only be permitted by the chief engineer or other authorized person.

2.1.4 All personnel involved in CM and CBM shall be appropriately qualified.

Note: CM does not replace routine surveillance or the chief engineer's responsibility for taking decisions in accordance with his judgement.

2.2 Equipment and System Requirements

2.2.1 CM equipment and systems shall be approved in accordance with a procedure of BCS.

2.2.2 The CM/CBM scheme and its extent, are to be approved by BCS.

2.2.3 The CBM scheme is to be capable of producing a condition report, and maintenance recommendations.

2.2.4 A system is to be provided to identify where limiting parameters (alarms and warnings) are modified during the operation of the scheme.

2.2.5 Where CM and CBM schemes use remote monitoring and diagnosis (i.e. data is transferred from the vessel and analysed remotely), the system is to meet the applicable standards for Cyber Safety and Security. The system shall be capable of continued onboard operation in the event of loss of the communication function.

2.2.6 CBM schemes are to identify defects and unexpected failures that were not prevented by the CM system.

2.2.7 Systems shall include a method of backing up data at regular intervals.

2.3 Documentation and Information

2.3.1 The following documentation shall be made available to BCS for the approval of the scheme:

- (i) Procedure for changes to software system and CM parameters
- (ii) Listing of equipment to be included in the scheme
- (iii) Listing of acceptable condition monitoring parameters
- (iv) Description of CBM scheme
- (v) Listing, specifications and maintenance procedures for condition monitoring equipment
- (vi) Baseline data for equipment with condition monitoring
- (vii) Qualification of personnel and company responsible for analysing CM results

2.3.2 In addition to the above documentation the following information shall be available on board:

- (i) All clauses in 2.3.1 in an up-to-date fashion
- (ii) Maintenance instructions (manufacturer's and shipyard's)
- (iii) Condition monitoring data including all data since last opening of the machine and the original base line data
- (iv) Reference documentation (trend investigation procedures etc.)
- (v) Records of maintenance including repairs and renewals carried out

(vi) Records of changes to software systems and parameters

(vii) Sensors calibration records / certification / status

2.4 Approval validity

2.4.1 An Annual Audit shall be carried out to maintain the validity of the CM/CBM scheme.

2.4.2 The survey arrangement for machinery under CM/CBM can be cancelled by BCS if the scheme is not being satisfactorily carried out either from the maintenance records or the general condition of the machinery.

2.4.3 The case of sale or change of management of the ship or transfer of class shall cause the approval to be reconsidered.

2.4.4 The ship owner may, at any time, cancel the survey arrangement for machinery under the scheme by informing BCS in writing and for this case the items which have been inspected under the scheme since the last annual Audit can be credited for class at the discretion of the attending surveyor.

3 Surveys

3.1 Installation Survey

3.1.1 Condition monitoring equipment is to be installed and surveyed in accordance with BCS rules, and a set of base line readings is to be taken.

3.2 Implementation Survey

3.2.1 The Implementation Survey shall be carried out by BCS's surveyor no earlier than 6 months after installation survey and no later than the first Class annual survey.

3.2.2 During the Implementation survey the following shall be verified by a surveyor:

- (i) the CM/CBM scheme is implemented according to the approval documentation, including a comparison with baseline data;
- (ii) the scheme is producing the documentation required for the Annual Audit and the requirements of surveys and testing for the maintenance of class are complied with;
- (iii) the onboard personnel are familiar with operating the scheme.
- (iv) records of any limiting parameters (alarms and warnings) that have been modified during the operation of the scheme.
- (v) Records of any failures of monitored equipment are to be reviewed to ensure that the condition monitoring scheme is effective / sufficient.

3.2.3 When this survey is carried out and the implementation is found in order, a report describing the scheme shall be submitted to BCS and the scheme may be put into service.

3.3 Annual Audit

3.3.1 An annual audit of the CM and CBM scheme shall be carried out by BCS's surveyor concurrently with the Class annual survey.

3.3.2 The purpose of this audit shall be to verify that the scheme is being correctly operated and that the machinery has been functioning satisfactorily since the previous audit. This is to include any limiting parameters (alarms and warnings) that have been modified since the last audit. A general examination of the items concerned shall be carried out.

3.3.3 The performance, condition monitoring and maintenance records shall be examined to verify that the machinery has functioned satisfactorily since the previous survey, or action has been taken in response to machinery operating parameters exceeding acceptable tolerances.

3.3.4 Written details of break-down or malfunction shall be made available.

3.3.5 At the discretion of the surveyor, function tests, confirmatory surveys and random check readings, where Condition Monitoring / Condition Based Maintenance equipment is in use, shall be carried out as far as practicable and reasonable.

3.3.6 The familiarity of the chief engineer and other personnel involved with the CM system shall be verified.

3.3.7 Calibration status of sensors and equipment shall be verified.

3.3.8 Verification that the suitability of the CM/CBM scheme has been reviewed following defects and failures shall be carried out.

3.4 Damage and repairs

3.4.1 Damage to components or items of machinery is to be reported to BCS. The repairs of such damaged components or items of machinery are to be carried out to the satisfaction of the Surveyor.

3.4.2 Details of repairs and maintenance carried out shall be examined. Any machinery part, which has been replaced by a spare one, due to damage, is to be retained on board where possible until examined by BCS's Surveyor.

3.4.3 Defect and failure data is to be reviewed in order to ensure the system output is appropriate. Where necessary, following review of the failure data, there is to be a method of amending the CM and CBM scheme.

BCS-R Z28 Surveys of Watertight Cable Transits

1. Application

1.1 These requirements apply to all vessels and Mobile Offshore Units (MOUs) contracted for construction* on or after 1st July 2021 and are in addition to the requirements of BCS-Rs Z23 , Z7 and Z15.

1.2 Watertight cable transits are to be installed and maintained in accordance with the manufacturer's requirements and in accordance with the requirements of the relevant Type Approval certification.

1.3 For MOUs, watertight cable transit seal systems should be inspected in accordance with item 8.6, Table 1 of BCS-R Z23.

2. Cable Transit Seal Systems Register

2.1 New Construction

2.1.1 A Cable Transit Seal Systems Register (Register) is to be provided by the shipbuilder for all watertight cable transits fitted to the vessel or MOU. For an example of a register see Appendix 3 of BCS-R Z23 – "Recommendatory Sample - Cable Transit Seal Systems Register". The Register can be in either a hard copy or digitized media. It is to include a marking / identification system, documentation referencing manufacturer manual(s) for each type of cable transit installed, the Type Approval certification for each type of transit system, applicable installation drawings, and a recording of each installed transit documenting the as built condition after final inspection in the shipyard. It is to include sections to record any inspection, modification, repair and maintenance.

2.1.2 The Register shall be reviewed by the attending Surveyor to confirm it contains a list of the watertight cable transits, applicable cable transit information and sections to maintain in-service maintenance and survey records.

2.1.3 For manned vessels the Register is to be held onboard of the vessel or MOU. For unmanned vessels, if a suitable storage location does not exist onboard, the Register may be held ashore. The Register is to be readily available for the attending surveyor.

2.2 Vessel and MOU In Service

2.2.1 The owner is to maintain the Register to record any disruption (repair, modification or opening out and closing) to a cable transit or to record the installation of a new cable transit.

Note:

1. This Requirement is to be implemented on or after 1 July 2021.

* The "contracted for construction" date means the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. For further details regarding the date of "contract for construction", refer to BCS-PR 29.

3. Installation and Maintenance of Watertight Cable Transits

3.1 At new construction and periodic surveys it is to be confirmed that:

- Cable transits have been installed, and where disrupted have been reinstated, in accordance with the manufacturer's requirements and in accordance with the requirements of Type Approval.
- Where specified, appropriate specialized tools have been used.

4. Periodical Survey of Watertight Cable Transits

4.1 Special Survey

4.1.1 The requirements for Special Survey may be undertaken by the attending Surveyor or by a firm approved as a service supplier according to BCS-R Z17.

4.1.2 All transits are to be examined to confirm their satisfactory condition and the Register is to be reviewed to confirm it is being maintained. The Special Survey is to be recorded in the Register, in which a single record entry will be sufficient to record the survey of all transits.

4.1.3 From review of the Register, where there are records entered since the last special survey of any disruption to the cable transits or installation of new cable transits (except which are reviewed and examined at previous annual surveys), the satisfactory condition of those transits is to be confirmed by the attending Surveyor by review of records and examination of the transits; the results are to be recorded in the Register against each of those cable transits.

4.1.4 In case the cable transits have been examined by an approved service supplier, the attending surveyor is to review the Register in order to ascertain that it has been properly maintained by the owner and correctly endorsed by the service supplier.

4.2 Annual Survey

4.2.1 The Register is to be reviewed to confirm it is being maintained and as far as practicable the transits are to be examined to confirm their satisfactory condition.

4.2.2 Where there are records entered since the last annual survey of any disruption to the cable transits or installation of new cable transits, the satisfactory condition of those transits is to be confirmed by review of records and, if deemed necessary, by examination. The results are to be recorded in the Register against the specific cable transit.