3.5.2 Where substantial corrosion as defined in 1.2.8 is found, the extent of thickness measurements should be increased in accordance with the requirements in annex 4.

3.5.3 Double-hull oil tankers exceeding 15 years of age

All ballast tanks adjacent to (i.e., with a common plane boundary) a cargo or fuel tank with any means of heating should be examined internally. When considered necessary by the surveyor, thickness measurement should be carried out and if the results of these thickness measurements indicate that substantial corrosion is found, the extent of thickness measurements should be increased in accordance with annex 4.

Ballast tanks which were found, at the previous intermediate or renewal survey, to have no substantial corrosion within the tank and which were found in compliance with either of the following conditions:

.1 coating in GOOD condition; or

.2 coating of the common boundary, including adjacent structures, in GOOD condition and the coating of the remaining parts of the tank in FAIR condition,

may be specially considered by the Administration.

4 Intermediate survey

4.1 *General*

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

4.1.2 The survey extent of cargo and ballast tanks dependent on the age of the ship is specified in 4.2, 4.3 and 4.4 and shown in annex 5.

4.1.3 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. 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 *Oil tankers 5 to 10 years of age*

4.2.1 The requirements of 4.1.3 apply.

4.2.2 For tanks used for salt-water ballast, an overall survey of representative tanks selected by the surveyor should be carried out. If the overall survey of salt water ballast tanks reveals no visible structural defects, the examination may be limited to verification that the protective coatings remain efficient.

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

4.2.4 In salt water ballast tanks where a protective coating is found in POOR condition and it is not renewed, where soft coating has been applied, or where a protective coating was not applied from the time of construction, the tanks in question should be examined and thickness measurements carried out as considered necessary at annual intervals.

4.3 *Oil tankers 10 to 15 years of age*

4.3.1 The requirements of 4.2 apply.

4.3.2 An overall survey of at least two representative cargo tanks should be carried out.

4.3.3 For ballast tanks, where fitted, an overall survey of all such tanks should be carried out. If such survey reveals no visible structural defects, the survey may be limited to a verification that the protective coatings remain efficient.

4.3.4 Extent of close-up survey

Ballast tanks: to the same extent as previous renewal survey;

Cargo tanks: the extent of survey should be based on the record of the previous renewal survey and repair history of the tanks, and be applied to two cargo tanks after the second renewal survey.

The minimum requirements of close-up surveys are given in annex 5. The extent of close-up surveys may be extended as stated in 2.4.3. For areas in tanks where coatings are found to be in GOOD condition, the extent of the close-up surveys according to annex 5 may be specially considered by the Administration.

4.3.5 Extent of thickness measurements

The extent of thickness measurements is also given in annex 5. The minimum requirements for thickness measurements at the intermediate survey are areas found to be suspect areas according to 1.2.7 at the previous renewal survey. Where substantial corrosion as defined in 1.2.8 is found, the extent of the thickness measurements according to annex 5 should be increased in accordance with the requirements of annex 4.

4.4 *Oil tankers exceeding 15 years of age*

The requirements of the intermediate survey should be to the same extent as the previous renewal 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.

5 Preparations for survey

5.1 *Survey programme*

5.1.1 A specific survey programme should be worked out in advance of the renewal survey by the owner in co-operation with the Administration. The survey programme should be in a written format based on the information in annex 6A. The survey should not commence until the survey programme has been agreed.

5.1.1.1 Prior to the development of the survey programme, the survey planning questionnaire should be completed by the owner based on the information set out in annex 6B, and forwarded to the Administration.

5.1.2 In developing the survey programme, the following documentation should be collected and consulted with a view to selecting tanks, 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 Condition Evaluation Report, according to annex 9;

.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 three 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 anodes and previous class notations), if any;

.11 inspections of the owner's personnel during the last three years with reference to structural deterioration in general, leakages in tank boundaries and piping and condition of the coating and corrosion protection system (including anodes) if any. A guidance for reporting is shown in annex 6C;

.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 should account for and comply, as a minimum, with the requirements of annexes 1, 2 and 3 and paragraph 2.6 for close-up survey, thickness measurement and tank testing, respectively, and should 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 2.4);

.9 identification of areas and sections for thickness measurement (see 2.5);

.10 identification of tanks for tank testing (see 2.6);

.11 identification of the thickness measurement company;

.12 damage experience related to the ship in question; and

.13 critical structural areas and suspect areas, where relevant.

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

5.1.5 Use may also be made of the Guidelines for technical assessment in conjunction with the planning of enhanced surveys for tankers, contained in annex 11. These Guidelines are a recommended tool which may be invoked at the discretion of the Administration, when considered necessary and appropriate, in conjunction with the preparation of the required survey programme.

5.2 *Conditions for survey*

5.2.1 The owner should provide the necessary facilities for a safe execution of the survey.

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

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

5.2.1.3 In cases where the provisions of safety and required access are judged by the attending surveyors not to be adequate, the survey of the spaces involved should not proceed.

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

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

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

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

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

5.3 *Access to structures**

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

.1 permanent staging and passages through structures;

.2 temporary staging and passages through structures;

.3 lifts and moveable platforms;

.4 boats or rafts;

.5 portable ladders;

.6 other equivalent means.

5.4 *Equipment for survey*

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

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

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

.1 radiographic equipment;

.2 ultrasonic equipment;

.3 magnetic particle equipment;

.4 dye penetrant; and

.5 other equivalent means.

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

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

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

5.5 *Surveys at sea or at anchorage*

5.5.1 Surveys at sea or at anchorage may be accepted provided the surveyor(s) is given the necessary assistance from the personnel on board. Necessary precautions and procedures for carrying out the survey should be in accordance with 5.1, 5.2, 5.3 and 5.4.

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

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

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

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

.2 the boat or raft should be tethered to the access ladder and an additional person should be stationed down the access ladder with a clear view of the boat or raft;

.3 appropriate lifejackets should be available for all participants;

.4 the surface of water in the tank should be calm (under all foreseeable conditions the expected rise of water within the tank should not exceed 0.25 m) and the water level either stationary or falling. On no account should the level of the water be rising while the boat or raft is in use;

.5 the tank 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).

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

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

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

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

5.6 *Survey planning meeting*

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

5.6.2 Prior to commencement of any part of the renewal and intermediate survey, a survey planning meeting should be held between the attending surveyor(s), the owner's representative in attendance, the thickness measurement company operator (as applicable) and the master of the ship 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.

5.6.3 The following is an indicative list of items that should be addressed in the meeting:

.1 schedule of the vessel (i.e., the voyage, docking and undocking manoeuvres, periods alongside, cargo and ballast operations etc.);

.2 provisions and arrangements for thickness measurements (i.e., access, cleaning/descaling, illumination, ventilation, personal safety);

.3 extent of the thickness measurements;

.4 acceptance criteria (refer to the list of minimum thicknesses);

.5 extent of close-up survey and thickness measurement considering the coating condition and suspect areas/areas of substantial corrosion;

.6 execution of thickness measurements;

.7 taking representative readings in general and where uneven corrosion/pitting is found;

.8 mapping of areas of substantial corrosion; and

.9 communication between attending surveyor(s) the thickness measurement company operator(s) and owner representative(s) concerning findings.

6 Documentation on board

6.1 *General*

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

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

6.2 *Survey report file*

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

.1 reports of structural surveys (annex 8);

.2 condition evaluation report (annex 9); and

.3 thickness measurement reports (annex 10).

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

6.3 *Supporting documents*

The following additional documentation should be available on board:

.1 all documents required by 5.1.2;

.2 survey programme as required by 5.1 until such time as the renewal survey has been completed; and

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

6.4 *Review of documentation on board*

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

7 Procedures for thickness measurements

7.1 *General*

7.1.1 The required thickness measurements, if not carried out by the recognized organization acting on behalf of the Administration, should be witnessed by a surveyor of the recognized organization. The surveyor should be on board to the extent necessary to control the process.

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

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

7.2 *Certification of thickness measurement company*

The thickness measurements should be carried out by a qualified company certified by an organization recognized by the Administration according to principles stated in annex 7.

7.3 *Reporting*

7.3.1 A thickness measurement report should be prepared and submitted to the Administration. The report should give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report should give the date when the measurements were carried out, type of measuring equipment, names of personnel and their qualifications and be signed by the operator. The thickness measurement report should follow the principles as specified in the recommended procedures for thickness measurements set out in annex 10.

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

8 Reporting and evaluation of survey

8.1 *Evaluation of survey report*

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

8.1.2 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 should be evaluated by using the thickness of structural members

measured, renewed and reinforced, as appropriate, during the renewal survey of safety construction 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 12.

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

8.1.4 The final result of the evaluation of the ship's longitudinal strength required in 8.1.2, after renewal or reinforcement work of structural members, if carried out as a result of initial evaluation, should be reported as a part of the condition evaluation report.

8.2 *Reporting*

8.2.1 Principles for survey reporting are shown in annex 8.

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

8.2.3 A condition evaluation report of the survey and results should be issued to the owner as shown in annex 9 and placed on board the ship for reference at future surveys. The condition evaluation report should be endorsed by the Administration.

Annex 1

Minimum requirements for close-up survey at renewal survey of double-hull oil tankers

Age ⩽ 5 years	5 <Age ⩽ 10 years	10 < Age ⩽ 15 years	Age > 15 years
1	2	3	4
One web frame **(1)**, in a complete ballast tank *(see **Note 1**)*	All web frames **(1)**, in a complete ballast tank *(see **Note 1**)* The knuckle area and the upper part (5 m approximately) of one web frame in each remaining ballast tank **(6)**	All web frames **(1)**, in all ballast tanks	As for ships referred to in column 3 Additional transverse areas as deemed necessary by the Administration
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	

Age ⩽ 5 years	5 <Age ⩽ 10 years	10 < Age ⩽ 15 years	Age > 15 years
1	2	3	4
One transverse bulkhead **(4)**, in a complete ballast tank *(see **Note 1**)*	One transverse bulkhead **(4)**, in each complete 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**)*		

Notes:

(1), **(2)**, **(3)**, **(4)**, **(5)**, **(6)** and **(7)** are areas to be subjected to close-up surveys and thickness measurements (see appendix 3 of annex 10).

(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 (5 m 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 m from the corners both on the bulkhead and the double-bottom.

(7) Web frame in a cargo oil tank means deck transverse, longitudinal bulkhead vertical girder and cross ties, where fitted, including adjacent structural members.

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

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

Annex 2

minimum requirements for thickness measurements at renewal survey of double-hull oil tankers

Age ⩽ 5 years	**5 < Age ⩽ 10 years**	**10 < Age ⩽ 15 years**	**Age > 15 years**
1	**2**	**3**	**4**
One section of deck plating for the full beam of the ship within the cargo area	Within the cargo area: - each deck plate - one transverse section	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 - all wind and water strakes
	Selected wind and water strakes outside the cargo area	Selected wind and water strakes outside the cargo area	Selected wind and water strakes outside the cargo area
Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to annex 1	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to annex 1	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to annex 1	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to annex 1
Suspect areas	Suspect areas	Suspect areas	Suspect areas

(1): at least one section should be within 0.5*L* amidships.

Annex 3

Minimum requirements for tank testing at renewal survey of double-hull oil tankers

Age ⩽ 5 years	5 < Age ⩽ 10 years	Age > 10 years
1	2	3
All ballast tank boundaries	All ballast tank boundaries	All ballast tank boundaries
Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, representative fuel oil tanks, pump-rooms or cofferdams	Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, representative fuel oil tanks, pump-rooms or cofferdams	Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, representative fuel oil tanks, pump-rooms or cofferdams
	All cargo tank bulkheads which form the boundaries of segregated cargoes	All remaining cargo tank bulkheads

Annex 4/Sheet 1

Requirements for extent of thickness measurements at areas of substantial corrosion of double-hull oil tankers

Renewal survey of double-hull oil tankers

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 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 bays where bottom plating measured, with measurements at both ends and middle	Five-point pattern over 2 m^2 area
Hopper structure web frame ring	Three floors in bays where bottom plating measured	Five-point pattern over 1 m^2 of plating. Single measurements on flange

Bottom, inner bottom and hopper structure (cont'd)		
Structural member	**Extent of measurement**	**Pattern of measurement**
Hopper structure transverse watertight bulkhead or swash bulkhead	– lower $\frac{1}{3}$ of bulkhead	Five-point pattern over 1 m^2 of plating
	– upper $\frac{2}{3}$ of bulkhead	Five-point pattern over 2 m^2 of plating
	– stiffeners (minimum of three)	For web, five-point pattern over span (two measurements across web at each end and one at centre of span). For flange, single measurements at each end and centre of span
Panel stiffening	Where applicable	Single measurements

Annex 4/Sheet 2

Requirements for extent of thickness measurements at areas of substantial corrosion of double-hull oil tankers

Renewal 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. Five-point pattern on girder/bulkhead brackets
Deck transverse webs	Minimum of two webs, with measurements at both ends and middle of span	Five-point pattern over 1 m^2 area. Single measurements on flange
Vertical web and transverse bulkhead in wing ballast tank (2 m from deck)	Minimum of two webs, and both transverse bulkheads	Five-point pattern over 1 m^2 area
Panel stiffening	Where applicable	Single measurements

Annex 4/Sheet 3

Requirements for extent of thickness measurements at areas of substantial corrosion of double-hull oil tankers

Renewal 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: - upper strake and strakes in way of horizontal girders - all other strakes	Plating between each pair of longitudinals in a minimum of three bays (along the tank) Plating between every third pair of longitudinals in same three bays	Single measurement Single measurement
Side shell and longitudinal bulkhead longitudinals on: - upper strake - all other strakes	Each longitudinal in same three bays Every third longitudinal in same three bays	Three measurements across web and one measurement on flange 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	Five-point pattern over area of bracket

Structure in wing ballast tanks (cont'd)		
Structural member	**Extent of measurement**	**Pattern of measurement**
Vertical web and transverse bulkheads (excluding deckhead area): - strakes in way of horizontal girders - other strakes	Minimum of two webs and both transverse bulkheads Minimum of two webs and both transverse bulkheads	Five-point pattern over approximately 2 m^2 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

Annex 4/Sheet 4

Requirements for extent of thickness measurements at areas of substantial corrosion of double-hull oil tankers

Renewal 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	Five-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	Five-point pattern over approximately 2 m^2 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	Five-point pattern over approximately 2 m^2 area of brackets, plus single measurements on bracket flanges

Annex 4/Sheet 5

Requirements for extent of thickness measurements at areas of substantial corrosion of double-hull oil tankers

Renewal 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	Transverse band within 25 mm of welded connection to inner bottom/deck plating Transverse band within 25 mm of welded connection to shelf plate	Five-point pattern between stiffeners over 1 m length
Deckhead and bottom strakes, and strakes in way of horizontal stringers	Plating between pair of stiffeners at three locations: approximately $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ width of tank	Five-point pattern between stiffeners over 1 m 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	Five-point pattern over approximately 1 m^2 of plating
Stiffeners	Minimum of three typical stiffeners	For web, five-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

Transverse watertight and swash bulkheads in cargo tanks (cont'd)		
Structural member	**Extent of measurement**	**Pattern of measurement**
Brackets	Minimum of three at top, middle and bottom of tank	Five-point pattern over area of bracket
Horizontal stringers	All stringers with measurements at both ends and middle	Five-point pattern over 1 m^2 area, plus single measurements near bracket toes and on flanges

Annex 5

Minimum requirements for overall and close-up survey and thickness measurements at intermediate survey of double-hull oil tankers

5 < Age ⩽ 10 years	**10 < Age ⩽ 15 years**	**Age > 15 years**
1	**2**	**3**
Overall survey of representative salt water ballast tanks, selected by the attending surveyor (the selection should include fore and aft peak tanks and three other tanks) (see 4.2)	Overall survey of all salt water ballast tanks, including combined cargo/ ballast tanks where fitted (see 4.3)	As for renewal survey given in annex 1
	Overall survey of at least two representative cargo tanks	As for renewal survey given in annex 1
	Close-up survey in salt water ballast tanks of: - all web frames **(1)** in one complete tank (*see **Note 1***) - the knuckle area and the upper part (5 m approximately) of one web frame in each remaining ballast tank **(6)** - one transverse bulkhead **(4)** in each complete tank (*see **Note 1***) (*see 4.2.3*)	As for renewal survey given in annex 1

5 < Age ⩽ 10 years	10 < Age ⩽ 15 years	Age > 15 years
1	2	3
	Close-up survey in two cargo tanks (or two combined cargo/ballast tanks, where fitted): the extent of survey should be based on the records of the previous renewal survey and repair history of the tanks (see 4.3)	As for renewal survey given in annex 1
Thickness measurements of those areas found to be suspect areas, as defined in 1.2.7, at the previous renewal survey (see 4.3.5)	Thickness measurements of those areas found to be suspect areas, as defined in 1.2.7, at the previous renewal survey (see 4.3.5)	As for renewal survey given in annex 2

Notes:

(1), **(4)** and **(6)** are areas to be subjected to close-up surveys and thickness measurements (see appendix 3 of annex 3)

(1) Web frame 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.

(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, inner hull longitudinal bulkhead, connecting brackets.

(6) The knuckle area and the upper part (5 m 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 m from the corners both on the bulkhead and the double-bottom.

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

Annex 6A

Survey programme

Basic information and particulars

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

1 Preamble

1.1 *Scope*

1.1.1 The present survey programme covers the minimum extent of overall surveys, close-up surveys, thickness measurements and pressure testing within the cargo area, ballast tanks, including fore and aft peak tanks, required by the Guidelines.

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

1.2 *Documentation*

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

2 Arrangement of tanks and spaces

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

5 Provisions and method of access to structures

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

6 List of equipment for survey

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

7 Survey requirements

7.1 *Overall survey*

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

7.2 *Close-up survey*

This section of the survey programme should identify and list the hull structures that should undergo a close-up survey for the ship in accordance with 2.4.2.

8 Identification of tanks for tank testing

This section of the survey programme should identify and list the tanks that should undergo tank testing for the ship in accordance with 2.6.

9 Identification of areas and sections for thickness measurements

This section of the survey programme should identify and list the areas and sections where thickness measurements should be taken in accordance with 2.5.1.

10 Minimum thickness of hull structures

This section of the survey programme should specify the minimum thickness for hull structures of the ship that are subject to the Guidelines (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			

Area or location	Original as-built thickness (mm)	Minimum thickness (mm)	Substantial corrosion thickness (mm)
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 should be attached to the survey programme.

11 Thickness measurement company

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

12 Damage experience related to the ship

This section of the survey programme should, 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 this 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 should identify and list the areas of substantial corrosion from previous surveys.

14 Critical structural areas and suspect areas

This section of the survey programme should 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 should 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 on regarding use of high tensile steel (HTS), to be available. This appendix of the survey programme should identify and list the main structural plans which form part of the survey programme.

Appendix 2 – Survey planning questionnaire

The survey planning questionnaire (annex 6B), which has been submitted by the owner, should be appended to the survey programme.

Appendix 3 – Other documentation

This part of the survey programme should identify and list any other documentation that forms part of the plan.

Prepared by the owner in co-operation with the Administration for compliance with 5.1.3.

Date: .....
(name and signature of authorized owner's representative)

Date: .....
(name and signature of authorized representative of the Administration)

Annex 6B
Survey planning questionnaire

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

Particulars

Ship's name:

IMO number:

Flag State:

Port of registry:

Owner:

Recognized Organization (RO):

Gross tonnage:

Deadweight (metric tonnes):

Date of delivery:

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

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

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	Underdeck						
	Side shell						
	Bottom transverse						
	Longitudinal						
	Transverse						
Centre tanks	Under deck						
	Bottom transverse						
	Transverse						

History of cargo with H_2S content or heated cargo for the last three years together with indication as to whether cargo was heated and, where available, Marine Safety Data Sheets (MSDS)*

Owner's inspections

Using a format similar to that of the table below (which is given as an example), the owner should provide details of the results of their inspections for the last three 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					
Ballast tanks Aft peak Fore peak					
Miscellaneous spaces					

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

* Refer to resolution MSC.150(77) on Recommendation for material safety data sheets for MARPOL Annex I cargoes and marine fuel oils.

1) HC = hard coating; SC = soft coating; A = anodes; NP = no protection

2) U = upper part; M = middle part; L = lower part; C = complete

3) G = good; F = fair; P = poor; RC = recoated (during the last three years)

4) N = no findings recorded; Y = findings recorded, description of findings should be attached to this questionnaire

5) DR = Damage & Repair; L = Leakages; CV = Conversion (Description to be attached to this questionnaire)

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

Reports of port State control inspections

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

Safety management system

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

Name and address of the approved thickness measurement company:

Annex 6C

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: .....

Annex 7

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

1 Application

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

2 Procedures for certification

Submission of documents

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

.1 outline of the company, e.g., organization and management structure;

.2 experience of the company in thickness measurement of hull structures of ships;

.3 technicians' careers, i.e., experience of technicians as thickness measurement operators, technical knowledge and experience of hull structure, etc. Operators should be qualified according to a recognized industrial non-destructive test (NDT) standard;

.4 equipment used for thickness measurement such as ultrasonic testing machines and their maintenance/calibration procedures;

.5 a guide for thickness measurement operators;

.6 training programmes for technicians for thickness measurement; and

.7 measurement record format in accordance with recommended procedures for thickness measurements (see annex 10). Recommended procedures for thickness measurements of double-hull oil tankers are contained in annex 2.

Auditing of the company

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

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

3 Certification

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

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

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

In case any alteration to the certified thickness measurement operation system of the company is made, such alteration should be immediately reported to the organization recognized by the Administration. A re-audit should be carried out where deemed necessary by the organization recognized by the Administration.

5 Withdrawal of certification

The certification may be withdrawn in the following cases:

.1 where the measurements were improperly carried out or the results were improperly reported;

.2 where the surveyor found any deficiencies in the approved thickness measurement operation system of the company;

.3 where the company failed to report any alteration referred to in 4 to the organization recognized by the Administration as required.

Annex 8
Survey reporting principles

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

1 General

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

.1 in connection with commencement, continuation and/or completion of periodical hull surveys, i.e., annual, intermediate and renewal surveys, as relevant;

.2 when structural damages/defects have been found;

.3 when repairs, renewals or modifications have been carried out; and

.4 when condition of class (recommendation) has been imposed or deleted.

1.2 The reporting should provide:

.1 evidence that prescribed surveys have been carried out in accordance with applicable requirements;

.2 documentation of surveys carried out with findings, repairs carried out and condition of class (recommendation) imposed or deleted;

.3 survey records, including actions taken, which should form an auditable documentary trail. Survey reports should be kept in the survey report file required to be on board;

.4 information for planning of future surveys; and

.5 information which may be used as input for maintenance of classification rules and instructions.

1.3 When a survey is split between different survey stations, a report should be made for each portion of the survey. A list of items surveyed, relevant findings and an indication of whether the item has been credited, should be made available to the next attending surveyor, prior to continuing or completing the survey. Thickness measurement and tank testing carried out should also 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 should include a confirmation with description of individual structural members corresponding to the extent of requirements stipulated in this part of annex B 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 should include location within each ballast tank and cargo hold 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 should be identified.

2.5 Identification of tanks subject to tank testing.

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

.1 examination including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been carried out; and

.2 operational test to working pressure has been carried out.

3 Result of survey

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

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

.1 Identification of findings, such as:

.1.1 corrosion with description of location, type and extent;

.1.2 areas with substantial corrosion;

.1.3 cracks/fractures with description of location and extent;

.1.4 buckling with description of location and extent; and

.1.5 indents with description of location and extent.

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

.3 Thickness measurement report should be verified and signed by the surveyor controlling the measurements on board.

.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 should be included, as relevant:

.4.1 measured and as-built transverse sectional areas of deck and bottom flanges;

.4.2 diminution of transverse sectional areas of deck and bottom flanges; and

.4.3 details of renewals or reinforcements carried out, as relevant (see 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 should be identified in a numbered list. Whenever repairs are carried out, details of the repairs effected should be reported by making specific reference to relevant items in the numbered list.

4.2 Repairs carried out should be reported with identification of:

.1 compartment;

.2 structural member;

.3 repair method (i.e., renewal or modification), including:

.3.1 steel grades and scantlings (if different from the original);

.3.2 sketches/photos, as appropriate;

.4 repair extent; and

.5 non-destructive tests (NDT).

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

Annex 9

Condition Evaluation Report

Issued upon completion of renewal survey

General particulars

Ship's name:	Class/Administration identity number: Previous class/Administration identity number(s): IMO number:
Port of registry:	National flag: Previous national flag(s):
Deadweight (metric tonnes):	Gross tonnage: National: ITC (1969):
Date of build:	Classification notation:
Date of major conversion:	
Type of conversion:	Owner: Previous owner(s):

1 The survey reports and documents listed below have been reviewed by the undersigned and found to be satisfactory.

2 The renewal survey has been completed in accordance with the present Guidelines on (date) . . . . . .

Condition evaluation report completed by	Name Signature	Title
Office	Date	
Condition evaluation report verified by	Name Signature	Title
Office	Date	

Attached reports and documents:

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

Contents of condition evaluation report

Part 1	General particulars:	- See front page
Part 2	Report review:	- Where and how survey was done
Part 3	Close-up survey:	- Extent (which tanks)
Part 4	Cargo and ballast piping system:	- Examined - Operationally tested

Part 5	Thickness measurements:	- Reference to thickness measurement report
		- Summary of where measured
		- Separate form indicating the spaces with substantial corrosion, and corresponding:
		  - thickness diminution
		  - corrosion pattern

Part 6	Tank corrosion prevention system:	- Separate form indicating:
		  - location of coating/anodes
		  - condition of coating (if applicable)

Part 7	Repairs:	- Identification of tanks/areas
Part 8	Condition of class/flag State requirements:	
Part 9	Memoranda:	- Acceptable defects - Any points of attention for future surveys, e.g., for suspect areas - Extended annual/intermediate survey due to coating breakdown
Part 10	Conclusion:	- Statement on evaluation/ verification of survey report

Extract of thickness measurements

Reference is made to the thickness measurement report:

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

Notes:

1 Substantial corrosion, i.e., 75%–100% of acceptable margins wasted.

2 P = Pitting
C = Corrosion in general

3 Any bottom plating with a pitting intensity of 20% or more, with wastage in the substantial corrosion range or having an average depth of pitting of $\frac{1}{3}$ or more of actual plate thickness should be noted.

Tank corrosion prevention system

Tank nos.[1]	Tank corrosion prevention system[2]	Coating condition[3]	Remarks

Notes:

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

2 C = Coating A = Anodes NP = No protection

3 Coating condition according to the following standard:

GOOD condition with only minor spot rusting.

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

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

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

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 should 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 renewal survey of the Cargo Ship Safety Construction Certificate or the Cargo Ship Safety Certificate (SC renewal 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 SC renewal survey most recently conducted after the ship reached 10 years of age in accordance with the provisions of paragraph 2.1.1 of annex 12, and are found to be within their diminution limits determined by the Administration, taking into account the recommendations adopted by the Organization,* as shown in the following table:

* Refer to resolution MSC.108(73) on Recommendations on compliance with the requirements of paragraph 2.2.1.1 of annex 12 to annex B to resolution A.744(18).

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			

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 SC renewal survey, in accordance with the provisions of paragraph 2.1.1 of annex 12.

2 Z_{req} means the diminution limit of the longitudinal bending strength of ships, as calculated in accordance with the provisions of paragraph 2.1.1 of annex 12.

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

3 This section applies to ships constructed before 1 July 2002: Section moduli of transverse sections of the ship's hull girder have been calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the SC renewal 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 12, and found to meet the criteria required by the Administration or the recognized classification society and that Z_{act} is not less than Z_{mc} (defined in note 2 below) as specified in appendix 2 to annex 12, 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 the Administration or the recognized classification society.

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 the provisions of paragraph 2.1.2 of annex 12.

Annex 10

Recommended procedures for thickness measurements of double-hull oil tankers

General

1 These procedures should be used for recording thickness measurements as required by annexes 2 and 4.

2 Reporting forms TM1-DHT, TM2-DHT(i), TM2-DHT(ii), TM3-DHT, TM4-DHT, TM5-DHT and TM6-DHT, set out in appendix 2, should be used for recording thickness measurements and the maximum allowable diminution should be stated.

3 Appendix 3 contains guidance diagrams and notes relating to the reporting forms and the requirements for thickness measurement.

4 The reporting forms should, where appropriate, be supplemented by data presented on structural sketches.

Appendix 1
GENERAL PARTICULARS

Ship's name: . . . . . .

IMO number: . . . . . .

Class/Administration identity number: . . . . . .

Port of registry: . . . . . .

Gross tonnage: . . . . . .

Deadweight: . . . . . .

Date of build: . . . . . .

Classification society: . . . . . .

Name of company performing thickness measurement: . . . . . .

. . . . . .

Thickness measurement company certified by: . . . . . .

Certificate number: . . . . . .

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

Place of measurement: . . . . . .

First date of measurement: . . . . . .

Last date of measurement: . . . . . .

Renewal survey/intermediate survey* due: . . . . . .

Details of measurement equipment: . . . . . .

Qualification of operator: . . . . . .

Report number: . . . . . consisting of . . . . . pages

Name of operator: . . . . . Name of surveyor: . . . . . .

Signature of operator: . . . . . Signature of surveyor: . . . . . .

Company official stamp: . . . . . Administration: . . . . . .
Official stamp

---

* Delete as appropriate.

Appendix 2

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

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

STRAKE POSITION / PLATE POSITION	No. or letter	Org. thk.	Forward reading								Aft reading								Mean diminution %		
			Gauged		Diminution P		Diminution S		Gauged		Diminution P		Diminution S								
		mm	P	S	mm	%	mm	%	P	S	mm	%	mm	%					P	S	mm
11th forward																					
10th																					
9th																					
8th																					
7th																					
6th																					
5th																					
4th																					
3rd																					
2nd																					
1st																					
Amidships																					
1st aft																					
2nd																					
3rd																					
4th																					
5th																					
6th																					
7th																					
8th																					
9th																					
10th																					
11th																					
11th																					

Operator's signature . . . . . Suveyor's signature . . . . . *Notes – see following page*

(– delete as appropriate)*

Notes to the report TM1-DHT:

1 This report should be used for recording the thickness measurement of:

.1 All strength deck plating within the cargo area.

.2 All keel, bottom shell plating and bilge plating within the cargo area.

.3 Side shell plating including selected wind and water strakes outside cargo area.

.4 All wind and water strakes within cargo area.

2 The strake position should be clearly indicated as follows:

.1 For strength deck indicate the number of the strake of plating inboard from the stringer plate.

.2 For bottom plating indicate the number of the strake of plating outboard from the keel plate.

.3 For side shell plating give number of the strake of plating below sheerstrake and letter as shown on shell expansion.

3 Measurements should 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 should 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.

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

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

	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. allow. dimin.	Gauged		Diminution P		Diminution S		No. or letter	Org. thk.	Max. allow. dimin.	Gauged		Diminution P		Diminution S		No. or letter	Org. thk.	Max. allow. dimin.	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																																				

Operator's signature ..... Surveyor's signature ..... *Notes – see following page*

Notes to the report TM2-DHT(i)

1 This report form should 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 structural items (0), (1) and (2) as shown on the diagrams of typical transverse sections illustrated in appendix 3.

2 The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).

3 The exact frame station of measurement should 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.

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

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

	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. allow. dimin.	Gauged		Diminution P		Diminution S		No. or letter	Org. thk.	Max. allow. dimin.	Gauged		Diminution P		Diminution S		No. or letter	Org. thk.	Max. allow. dimin.	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 sheerstrake																											
2nd																											
3rd																											
4th																											
5th																											
6th																											
7th																											
8th																											
9th																											
10th																											
11th																											
12th																											
13th																											
14th																											
15th																											
16th																											
17th																											
18th																											
19th																											
20th																											
keel strake																											
BOTTOM TOTAL																											

Operator's signature ..... Surveyor's signature .....

Notes – see following page

Notes to the report TM2-DHT(ii)

1 This report form should be used for recording the thickness measurements of shell plating transverse sections:

One, two or three sections within the cargo area comprising structural items (3), (4) and (5) and (6) as shown on the diagrams of typical transverse sections illustrated in appendix 3.

2 The bottom area comprises keel, bottom and bilge plating.

3 The exact frame station of measurement should 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.

Report on thickness measurement of longitudinal members (one, two or three transverse sections) (TM3-DHT)

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

	FIRST TRANSVERSE SECTION AT FRAME NUMBER										SECOND TRANSVERSE SECTION AT FRAME NUMBER										THIRD TRANSVERSE SECTION AT FRAME NUMBER									
STRUCTURAL MEMBER	Item no.	Org. thk.	Max. allow. dimin.	Gauged		Diminution P		Diminution S		Item no.	Org. thk.	Max. allow. dimin.	Gauged		Diminution P		Diminution S		Item no.	Org. thk.	Max. allow. dimin.	Gauged		Diminution P		Diminution S	
				P	S								P	S								P	S				
		mm	mm			mm	%	mm	%		mm	mm			mm	%	mm	%		mm	mm			mm	%	mm	%

Operator's signature . . . . Surveyor's signature . . . . Notes – see following page

Notes to the report TM3-DHT

1 This report should be used for recording the thickness measurements of longitudinal members at transverse sections:

One, two or three sections within the cargo area comprising appropriate structural items (10) to (29) as shown on the diagrams of typical transverse sections illustrated in appendix 3.

2 The exact frame station of measurement should 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.

Report on thickness measurement of transverse structural members (in the cargo oil and water ballast tanks within the cargo tank length) (TM4-DHT)

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

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

Operator's signature . . . . Surveyor's signature . . . . *Notes – see following page*

Notes to the report TM4-DHT

1 This report should be used for recording the thickness measurements of transverse structural members, comprising appropriate structural items (30) to (36) as shown on diagrams of typical transverse sections illustrated in appendix 3.

2 Guidance for areas of measurement is indicated in appendix 3. The single measurements recorded are to represent the average of multiple measurements.

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

Report on thickness of W.T./O.T. transverse bulkheads (within the cargo tank or cargo hold spaces) (TM5-DHT)

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

TANK/HOLD description

LOCATION OF STRUCTURE: FRAME NO:

STRUCTURAL COMPONENT (Plating, Stiffener)	Original thickness	Max. allow. dimin.	Gauged		Diminution P		Diminution S	
	mm	mm	P	S	mm	%	mm	%

Operator's signature .... Surveyor's signature ....

Notes – see following page

Notes to the report TM5-DHT

1 This report should be used for recording the thickness measurement of W.T./O.T. transverse bulkheads.

2 Guidance for areas of measurement is indicated in appendix 3.

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 on thickness measurement of miscellaneous structural members (TM6-DHT)

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

STRUCTURAL MEMBER:

LOCATION OF STRUCTURE:

Description	Org. thk.	Max. allow. dimin.	Gauged		Diminution P		Diminution S	
	mm	mm	P	S	mm	%	mm	%

SKETCH

Operator's signature .... Surveyor's signature .... *Notes – see following page*

Notes to the report TM6-DHT

1 This report should be used for recording the thickness measurement of miscellaneous structural members.

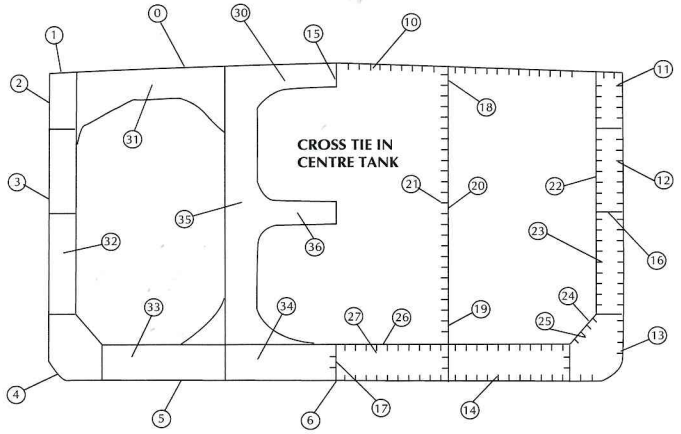
2 The single measurements recorded are to represent the average of multiple measurements.

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

Appendix 3

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



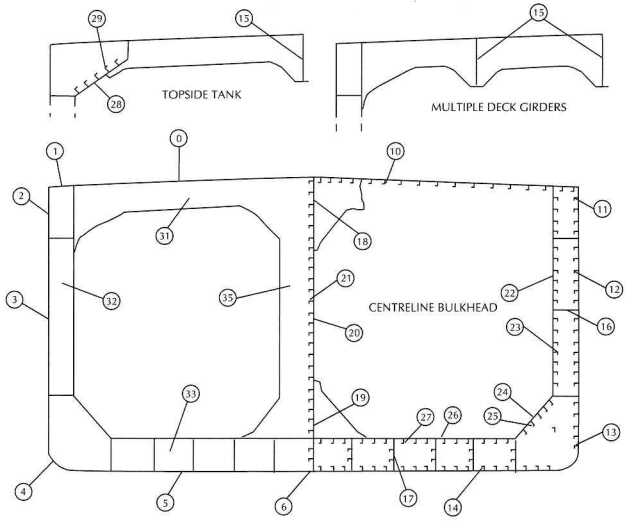
REPORT ON TM2-DHT(i) and (ii)
(0) Strength deck plating
(1) Stringer plate
(2) Sheerstrake
(3) Side shell plating
(4) Bilge plating
(5) Bottom shell plating
(6) Keel plate

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 up to 150,000 dwt with indication of longitudinal and transverse members



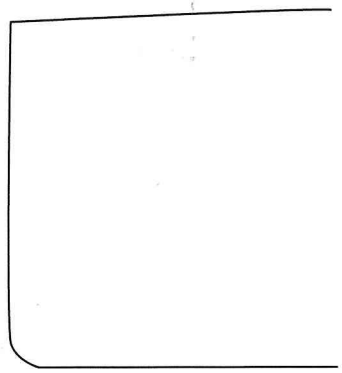
REPORT ON TM2-DHT(i) and (ii)
(0) Strength deck plating
(1) Stringer plate
(2) Sheerstrake
(3) Side shell plating
(4) Bilge plating
(5) Bottom shell plating
(6) Keel plate

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

Transverse section outline. The diagram may be used for those ships where typical sections are not applicable



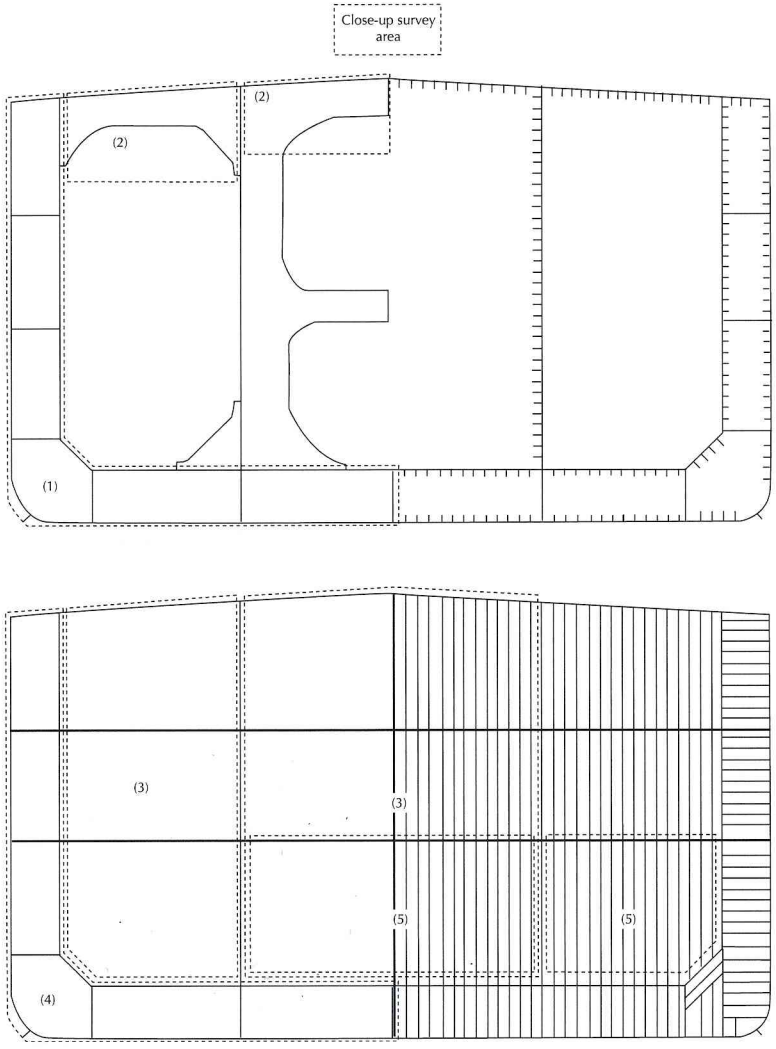
REPORT ON TM2-DHT(i) and (ii)
(0) Strength deck plating
(1) Stringer plate
(2) Sheerstrake
(3) Side shell plating
(4) Bilge plating
(5) Bottom shell plating
(6) Keel plate

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

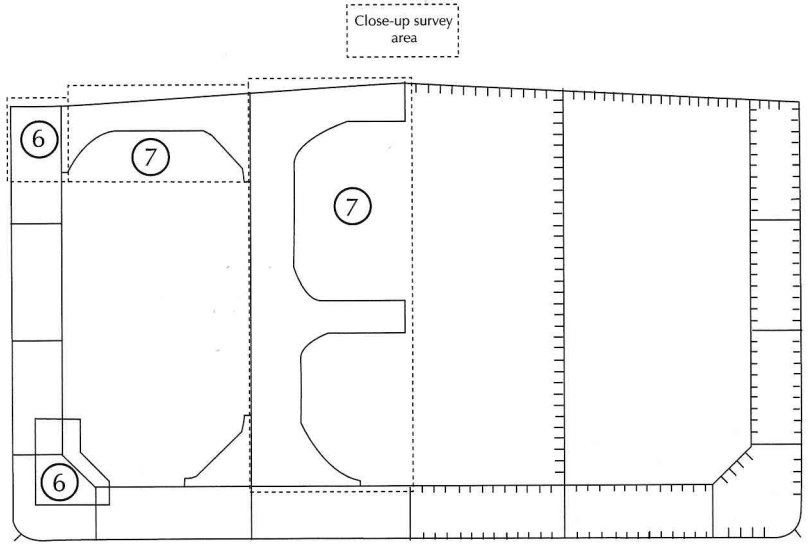
THICKNESS MEASUREMENT – DOUBLE-HULL OIL TANKERS

Areas subject to close-up survey and thickness measurements – areas (1) to (5) as defined in annex 1 – Thickness to be reported on TM3-DHT, TM4-DHT and TM5-DHT as appropriate



THICKNESS MEASUREMENT – DOUBLE-HULL OIL TANKERS

Areas subject to close-up survey and thickness measurements – areas (6) to (7) as defined in annex 1 – Thickness to be reported on TM3-DHT and TM4-DHT as appropriate



Annex 11

Guidelines for technical assessment in conjunction with the planning of enhanced surveys for oil tankers

Renewal survey

1 Introduction

These Guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of renewal surveys of oil tankers. As indicated in 5.1.5, these Guidelines are a recommended tool which may be invoked at the discretion of an Administration, when considered necessary and appropriate, in conjunction with the preparation of the required survey programme.

2 Purpose and principles

2.1 *Purpose*

The technical assessments described in these Guidelines should 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.

2.2 *Minimum requirements*

These Guidelines may not be used to reduce the requirements of annexes 1, 2 and 3 for close-up survey, thickness measurement and tank testing, respectively, which are, in all cases, to be complied with as a minimum.

2.3 *Timing*

As with other aspects of survey planning, the technical assessments described in these Guidelines should be carried out by the owner or operator in co-operation with the Administration well in advance of the commencement of the renewal survey, i.e., prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

2.4 *Aspects to be considered*

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 of:

.1 design features such as stress levels on various structural elements, design details and extent of use of high-tensile steel (HTS);

.2 former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available; and

.3 information with respect to types of cargo carried, 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 should be judged and decided on the basis of recognized principles and practices, such as may be found in references 1 and 2.

3 Technical assessment

3.1 *General*

3.1.1 There are three basic types of possible failure which may be the subject of a technical assessment in connection with the 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 normal routine by surveyors.

3.1.2 Technical assessments performed in conjunction with the survey planning process should, in principle, be as shown schematically in figure 1 which depicts 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.

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

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

3.2 *Methods*

3.2.1 Design details

3.2.1.1 Damage experience related to the ship in question and similar ships, where available, are the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings should be included. Typical damage experience to be considered will consist of:

.1 number, extent, location and frequency of cracks; and

.2 location of buckles.

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

3.2.1.3 In addition, general experience should be utilized. For example, reference should be made to reference 1, which contains a catalogue of typical damages and proposed repair methods for various tanker structural details.

3.2.1.4 Such figures should be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage. An example is shown in figure 2. In particular, chapter 3 of reference 1 deals with various aspects specific to double-hull tankers, such as stress concentration locations, misalignment during construction, corrosion trends, fatigue considerations and areas requiring special attention, which should be considered in working out the survey planning.

3.2.1.5 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 should be carefully considered.

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

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

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

3.2.2 Corrosion

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

.1 usage of tanks and spaces;

.2 condition of coatings;

.3 condition of anodes;

.4 cleaning procedures;

.5 previous corrosion damage;

.6 ballast use and time for cargo tanks;

.7 corrosion risk scheme (see reference 2, table 2.1); and

.8 location of heated tanks.

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

3.2.2.3 The evaluation of corrosion risks should be based on information in reference 2, together with the age of the ship and relevant information on the anticipated condition as derived from the information collected in order to prepare the survey programme.

3.2.2.4 The various tanks and spaces should be listed with the corrosion risks nominated accordingly. Special attention should be given to the areas where the double-hull tanker is particularly exposed to corrosion. To this end, the specific aspects addressing corrosion in double-hull tankers indicated in 3.4 (Corrosion trends) of reference 1 should be taken into account.

3.2.3 Locations for close-up survey and thickness measurement

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

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

3.2.3.3 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 should be that the extent is increased by age or where information is insufficient or unreliable.

References

1 TSCF, *Guidelines for the Inspection and Maintenance of Double Hull Tanker Structures*, 1995.

2 TSCF, *Guidance Manual for Tanker Structures*, 1997.

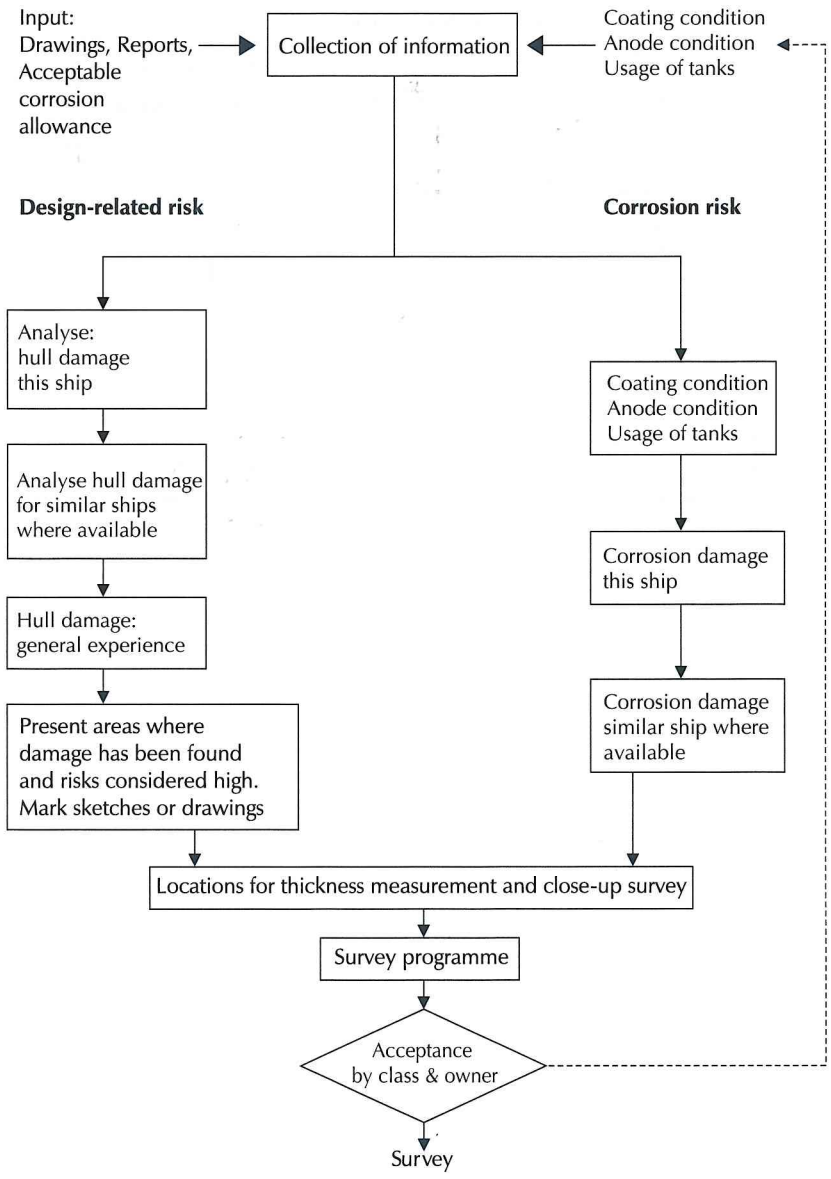


Figure 1 – *Technical assessment and the survey planning process*

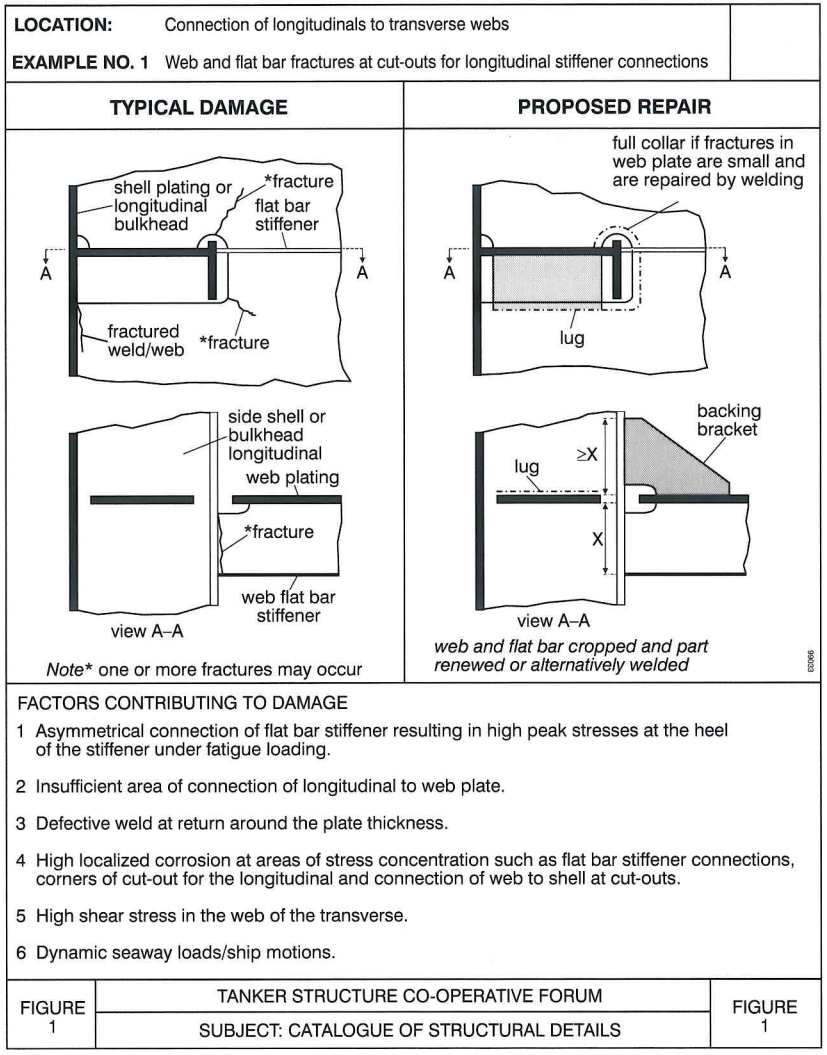


Figure 2 – *Typical damage and repair example (reproduced from reference 2)*

Annex 12
Criteria for longitudinal strength of hull girder for oil tankers

1 General

1.1 These criteria should be used for the evaluation of the longitudinal strength of the ship's hull girder as required by 8.1.2.

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

2 Evaluation of longitudinal strength

On oil tankers of 130 m in length and upwards and over 10 years of age, the longitudinal strength of the ship's hull girder should be evaluated in compliance with the requirements of this annex on the basis of the thickness measured, renewed or reinforced, as appropriate, during the renewal survey of the Cargo Ship Safety Construction Certificate or Cargo Ship Safety Certificate (SC renewal 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 should be calculated by using the thickness measured, renewed or reinforced, as appropriate, during the SC renewal 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 should 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 of 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 SC renewal survey.

2.2 *Requirements for transverse section modulus of hull girder*

The actual section moduli of the transverse section of the ship's hull girder, calculated in accordance with paragraph 2.1.2.2, should 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 paragraph 2.1.2.2 should be not less than the diminution limits determined by the Administration, taking into account the recommendations adopted by the Organization;* 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 paragraph 2.1.2.2 should meet the criteria for minimum section modulus for ships in service required by the Administration or recognized classification society, provided that in no case Z_{act} should be less than the diminution limit of the minimum section modulus (Z_{mc}) as specified in appendix 2.

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 should be taken into account.

* Refer to resolution MSC.108(73) on Recommendation on compliance with the requirements of paragraph 2.2.1.1 of annex 12 to annex B to resolution A.744(18).

2 Large openings, i.e., openings exceeding 2.5 m in length or 1.2 m 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 75 mm.

4 A deduction-free sum of smaller opening breadths in one transverse section in the bottom or deck area of $0.06(B - \Sigma b)$ (where B = breadth of ship, Σb = 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 should 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:

$$Z_{mc} = cL^2B(C_b + 0.7)k \quad (cm^3)$$

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 0.6.

$$C_b = \frac{\text{moulded displacement } (m^3) \text{ at draught } d}{LBd}$$

$c = 0.9c_n$

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

$c_n = 10.75$ for 300 m $\leq L \leq$ 350 m

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

k = material factor, e.g.

k = 1.0 for mild steel with yield stress of 235 N/mm^2 and over

k = 0.78 for high-tensile steel with yield stress of 315 N/mm^2 and over

k = 0.72 for high-tensile steel with yield stress of 355 N/mm^2 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 2.5, 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 seawater 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 seawater should be selected where present.

2.2 The minimum number of transverse sections to be sampled should be in accordance with annex 2. 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 annex 2.

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 annex 2, 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 annex 2, 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 0.5*L* amidships region has been sampled. Tank spaces that are partially within, but extend beyond, the 0.5*L* 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 the Guidelines.

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 the Administration;

.4 the straps are continuous over the entire 0.5*L* 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 the Administration.

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.

Part B

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

1 General

1.1 *Application**

1.1.1 The Guidelines should apply to self-propelled oil tankers of 500 gross tonnage and above other than double-hull oil tankers, as defined in 1.2.1 of part A of annex B.

1.1.2 The Guidelines should 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 surveys should be carried out during the surveys prescribed by regulation I/10 of the 1974 SOLAS Convention, as amended.

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

1.2 *Definitions*

1.2.1 *Ballast tank* is a tank which is used for water ballast and includes segregated ballast tanks, ballast double-bottom spaces and peak tanks. A tank which is used for both cargo and ballast will be treated as a ballast tank when substantial corrosion has been found in that tank.

1.2.2 *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* is a survey where the details of structural components are within the close visual inspection range of the surveyor, i.e., preferably within reach of hand.

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

1.2.4 *Transverse section* includes all longitudinal members such as plating, longitudinals and girders at the deck, side, bottom, inner bottom and longitudinal bulkheads.

1.2.5 *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 should be taken of the service and repair history on board and identifiable critical and/or suspect areas.

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

1.2.7 *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.

1.2.8 *Corrosion prevention system* is normally considered either:

.1 a full hard coating; or

.2 a full hard coating supplemented by anodes.

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

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

1.2.9 *Coating condition* is defined as follows:

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

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

1.2.11 *Cargo area* is an area as defined in regulation II-2/3.6 of the 1974 SOLAS Convention, as amended.

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

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

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

1.3 *Repairs*

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

.1 side shell frames, their end attachments or adjacent shell plating;

.2 deck structure and deck plating;

.3 bottom structure and bottom plating;

.4 watertight or oiltight bulkheads;

.5 hatch covers or hatch coamings; and

.6 items in 3.3.

Where adequate repair facilities are not available, the Administration may allow the ship to proceed directly to a repair facility. This may require discharging the cargo and/or temporary repairs for the intended voyage.

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

1.4 *Surveyors*

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

2 Renewal survey

2.1 *General*

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

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

2.1.3 The survey should include, in addition to the requirements of the annual survey, examination, tests and checks of sufficient extent to ensure that the hull and related piping as required in 2.1.5 is in a satisfactory condition and is fit for its intended purpose for the new period of validity of the Cargo Ship Safety Construction Certificate, subject to proper maintenance and operation and to renewal surveys being carried out.

2.1.4 All cargo tanks, ballast tanks, pump-rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull should be examined, and this examination should be supplemented by thickness measurement and testing as deemed necessary, to ensure that the structural integrity remains effective. The examination should be sufficient to discover substantial corrosion, significant deformation, fractures, damages or other structural deterioration.

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

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

2.2 *Dry dock survey*

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

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

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

2.3 *Tank corrosion prevention system*

Where provided, the condition of the corrosion prevention system of cargo tanks should be examined. A ballast tank where a protective coating is found in POOR condition and it is not renewed, or where soft coating has been applied, or where a protective coating has not been applied from the time of construction, the tank in question should be examined at annual intervals. Thickness measurements should be carried out as deemed necessary by the surveyor.

2.4 *Extent of overall and close-up surveys*

2.4.1 An overall survey of all integral tanks and spaces should be carried out at the renewal survey.

2.4.2 The requirements for close-up surveys at the enhanced survey carried out during renewal survey are given in annex 1.

2.4.3 The surveyor may extend the scope of the close-up survey as deemed necessary taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:

.1 in particular, tanks having structural arrangements or details which have suffered defects in similar tanks or on similar ships according to available information;

.2 in tanks which have structures with reduced scantlings in association with a corrosion prevention system approved by the Administration.

2.4.4 For areas in tanks where coatings are found to be in GOOD condition as defined in 1.2.9, the extent of close-up surveys according to annex 1 may be specially considered by the Administration.

2.5 *Extent of thickness measurements*

2.5.1 The requirements for thickness measurements at the renewal survey are given in annex 2.

2.5.2 Where substantial corrosion as defined in 1.2.7 is found, the extent of thickness measurements should be increased in accordance with the requirements of annex 4.

2.5.3 The surveyor may extend the thickness measurements as deemed necessary.

2.5.4 For areas in tanks where coatings are found to be in GOOD condition as defined in 1.2.9, the extent of thickness measurements according to annex 2 may be specially considered by the Administration.

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

2.5.6 In cases where two or three sections should be measured, at least one should include a ballast tank within 0.5*L* amidships.

2.6 *Extent of tank pressure testing*

2.6.1 The requirements for tank pressure testing at the renewal survey are given in annex 3.

2.6.2 The surveyor may extend the tank pressure testing as deemed necessary.

2.6.3 Generally, the pressure should correspond to a water level to the top of access hatches for cargo tanks, or top of air pipes for ballast tanks.

3 Annual survey

3.1 *General*

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

3.2 *Examination of the hull*

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

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

3.3 *Examination of weather decks*

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

3.3.2 Examination of cargo tank pressure/vacuum valves and flame screens.

3.3.3 Examination of flame screens on vents to all bunker and oily slop tanks.

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

3.4 *Examination of cargo pump-rooms and pipe tunnels*

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

3.4.2 Examination of the condition of all piping systems and pipe tunnels.

3.5 *Examination of ballast tanks*

3.5.1 Examination of ballast tanks should be carried out when required as a consequence of the results of the renewal survey and intermediate survey. When extensive corrosion is found, thickness measurements should be carried out.

3.5.2 Where substantial corrosion as defined in 1.2.7 is found, the extent of thickness measurements should be increased in accordance with the requirements in annex 4.

3.5.3 For oil tankers exceeding 15 years of age, all ballast tanks adjacent to (i.e., with a common plane boundary) a cargo or fuel tank with any means of heating should be examined internally. When considered necessary by the surveyor, thickness measurements should be carried out and if the results of these thickness measurements indicate that substantial corrosion is found, the extent of thickness measurements should be increased in accordance with the requirements of annex 4. Tanks or areas where coating was found to be in GOOD condition at the previous intermediate or renewal survey may be specially considered by the Administration.

4 Intermediate survey

4.1 *General*

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

4.1.2 The survey extent of cargo and ballast tanks dependent on the age of the ship is specified in 4.2, 4.3 and 4.4.

4.1.3 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. 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 *Oil tankers 5 to 10 years of age*

4.2.1 The requirements of 4.1.3 apply.

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

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

4.2.4 In salt water ballast tanks where a protective coating is found in POOR condition and it is not renewed, or where soft coating has been applied, or where a protective coating was not applied from the time of construction, the tanks in question should be examined and thickness measurements carried out as considered necessary at annual intervals.

4.3 *Oil tankers 10 to 15 years of age*

4.3.1 The requirements of 4.2 apply.

4.3.2 An overall survey of at least two representative cargo tanks should be carried out.

4.3.3 For ballast tanks, an overall survey of all such tanks should be carried out. If such survey reveals no visible structural defects, the survey may be limited to a verification that the protective coatings remain efficient.

4.3.4 Extent of close up survey:

.1 Ballast tanks: To the same extent as previous renewal survey.

.2 Cargo tanks: Two combined cargo/ballast tanks. The extent of survey should be based on the record of the previous renewal survey, and repair history of the tanks.

The extent of close-up surveys may be extended as stated in 2.4.3. For areas in tanks where coatings are found to be in GOOD condition, the extent of the close-up surveys may be specially considered by the Administration.

4.3.5 *Extent of thickness measurement*

The minimum requirements for thickness measurements at the intermediate survey are areas found to be suspect areas at the previous renewal survey. Where substantial corrosion is found, the extent of the thickness measurements should be increased in accordance with the requirements of annex 4.

4.4 *Oil tankers exceeding 15 years of age*

4.4.1 The requirements of the intermediate survey should be to the same extent as the previous renewal survey 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.

4.4.2 In application of 4.4.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.1.

5 Preparations for survey

5.1 *Survey programme*

5.1.1 A specific survey programme should be worked out in advance of the renewal survey by the owner in co-operation with the Administration. The survey programme should be in a written format based on the information in annex 6A. The survey should not commence until the survey programme has been agreed.

5.1.1.1 Prior to the development of the survey programme, the survey planning questionnaire should be completed by the owner based on the information set out in annex 6B, and forwarded to the Administration.

5.1.2 In developing the survey programme, the following documentation should be collected and consulted with a view to selecting tanks, 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 Condition Evaluation Report, according to annex 9;

.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 anodes and previous class notations), if any;

.11 inspections of the owner's personnel during the last three years with reference to structural deterioration in general, leakages in tank boundaries and piping and condition of the coating and corrosion protection system (including anodes) if any. A guidance for reporting is shown in annex 5;

.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 should account for and comply, as a minimum, with the requirements of 2.6 and annexes 1, 2 and 3 for close-up survey, thickness measurement and tank testing, respectively, and should 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 2.4);

.9 identification of areas and sections for thickness measurement (see 2.5);

.10 identification of tanks for tank testing (see 2.6);

.11 identification of the thickness measurement company;

.12 damage experience related to the ship in question; and

.13 critical structural areas and suspect areas, where relevant.

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

5.1.5 Use may also be made of the Guidelines for technical assessment in conjunction with the planning of enhanced surveys for tankers, contained in annex 11. These Guidelines are a recommended tool which may be invoked at the discretion of the Administration, when considered necessary and appropriate, in conjunction with the preparation of the required survey programme.

5.2 *Conditions for survey*

5.2.1 The owner should provide the necessary facilities for a safe execution of the survey.*

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

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

5.2.1.3 In cases where the provisions of safety and required access are judged by the attending surveyors not to be adequate, the survey of the spaces involved should not proceed.

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

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

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

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

* Refer to chapter 10 of the *International Safety Guide for Oil Tankers and Terminals (ISGOTT)*, Entry into and working in enclosed spaces.

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

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

5.3 *Access to structures**

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

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

.1 permanent staging and passages through structures;

.2 temporary staging and passages through structures;

.3 lifts and moveable platforms;

.4 boats or rafts;

.5 portable ladders; and

.6 other equivalent means.

5.4 *Equipment for survey*

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

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

.1 radiographic equipment;

.2 ultrasonic equipment;

.3 magnetic particle equipment;

.4 dye penetrant; and

.5 other equivalent means.

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

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

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

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

5.5 *Surveys at sea or at anchorage*

5.5.1 Surveys at sea or at anchorage may be accepted provided the surveyor is given the necessary assistance from the personnel on board. Necessary precautions and procedures for carrying out the survey should be in accordance with 5.1, 5.2, 5.3 and 5.4.

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

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

5.5.4 When rafts or boats will be used for close-up survey the following conditions should be observed:

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

.2 the boat or raft should be tethered to the access ladder and an additional person should be stationed down the access ladder with a clear view of the boat or raft;

.3 appropriate lifejackets should be available for all participants;

.4 the surface of water in the tank should be calm (under all foreseeable conditions the expected rise of water within the tank should not exceed 0.25 m) and the water level either stationary or falling. On no account should the level of the water be rising while the boat or raft is in use;