



GUIDANCE NOTES  
GD 01-2008

**CHINA CLASSIFICATION SOCIETY**

**GUIDELINES FOR SURVEYS OF CONDITION ASSESSMENT  
SCHEME (CAS) FOR EXISTING OIL TANKERS**

2008

BeiJing

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## Chapter 1 GENERAL

### 1.1 Purpose and general requirements

1.1.1 The Guidelines is specially prepared to provide as guidance for CCS surveyors to conduct CAS surveys, for the purpose of determining the working procedures to be followed by CCS as the recognized organization (RO).

1.1.2 On the basis of resolutions MEPC.94(46), MEPC.99(48), MEPC.112(50), MEPC.131(53), and regulations 20 and 21 of the revised Annex I of MARPOL (hereinafter referred to as MARPOL Annex I) adopted by resolution MEPC.117(52), the Guidelines is prepared to analyze and illustrate regulations 20 and 21.

1.1.3 The Guidelines is to provide as guidance for CCS and shipping companies to conduct CAS. In conducting CAS, additional requirements of administrations of flag States are to be taken into consideration.

1.1.4 For the purpose of 2.1.6(2) and (3), 2.2.5 and 2.2.6 of the Guidelines, special attention is to be paid that some administrations may deny entry of oil tankers in compliance with CAS into the ports or offshore terminals under their jurisdiction.

1.1.5 CCS will not to accept the entrustment by the Administration to review the CAS final reports made by other ROs, in accordance with the provisions of IACS procedural document.

### 1.2 Definitions

1.2.1 Unless expressly provided otherwise, for the purpose of the Guidelines:

(1) “CAS (Condition Assessment Scheme)” means a survey method developed by IMO to assess the structural condition of single hull oil tankers. The purpose of which is to provide an international standard to meet the requirements of regulation 20.6, regulation 20.7 and regulation 21.6.1 of Annex I of MARPOL 73/78 adopted by resolution MEPC.117(52), as amended by resolution MEPC.141(54);

(2) “Resolution A.744(18), as amended”, means the Guidelines on the Enhanced Programme of Inspections During Surveys of Bulk Carriers and Oil Tankers adopted by the Assembly of the International Maritime Organization by resolution A.744(18), as amended by resolution 2 of the 1997 SOLAS Conference and by resolutions MSC.49(66), MSC.105(73) and MSC.144(77);

(3) “Category 1 oil tanker” means an oil tanker of 20,000 tonnes deadweight and above carrying crude oil, fuel oil, heavy diesel oil or lubricating oil as cargo, and of 30,000 tonnes deadweight and above carrying oil other than the above, which does not comply with the requirements for oil tankers as defined in regulation 1.28.4 of Annex I of MARPOL 73/78;

(4) “Category 2 oil tanker” means an oil tanker of 20,000 tonnes deadweight and above carrying crude oil, fuel oil, heavy diesel oil or lubricating oil as cargo, and of 30,000 tonnes deadweight and above carrying oil other than the above, which complies with the requirements for oil tankers as defined in regulation 1.28.4 of Annex I of MARPOL 73/78;

(5) “Category 3 oil tanker” means an oil tanker of 5,000 tonnes deadweight and above but less than that specified in (2) or (3) mentioned above;

(6) “Company” means the owner of the ship or any other organization or person such as the manager or the bareboat charterer, who has assumed the responsibility for the operation of the ship from the owner of the ship and who, on assuming such responsibility, has agreed to take over all duties and responsibilities imposed by the International Safety Management (ISM) Code;

(7) “Recognized Organization (RO)” means an organization recognized by the Administration to perform the surveys in accordance with the provisions of regulation 6.3 of Annex I of MARPOL 73/78;

(8) “Substantial corrosion” means an extent of corrosion such that the assessment of the corrosion pattern indicates wastage in excess of 75% of the allowable margins, but within acceptable limits;

(9) “Good condition” means a coating condition with only minor spot rusting;

(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 (where applicable) to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship;

(11) “Suspect areas” are locations showing substantial corrosion and/or are considered by the attending surveyors to be prone to rapid wastage;

(12) “Administration” means the Government of the State as defined in Article 2(5) of MARPOL 73/78;

(13) “Surveyor” means an exclusive surveyor specially designated to carry out CAS survey;

(14) “Statement of Compliance” means a document issued by the Administration for each ship upon completion of CAS survey and to the satisfaction of the Administration;

(15) “Interim Statement of Compliance” means an interim document issued by a recognized organization (RO) in accordance with 2.1.6(1) or 2.2.6 of the Guidelines after a satisfactory CAS survey for the ship;

(16) “Heavy diesel oil” means diesel oil other than those distillates of which more than 50 per cent by volume distills at a temperature not exceeding 340 °C when tested by the method acceptable to IMO<sup>①</sup>;

(17) “Fuel oil” means heavy distillates or residues from crude oil or blends of such materials intended for use as a fuel for the production of heat or power of a quality equivalent to the specification acceptable to IMO<sup>②</sup>;

(18) “Heavy grade oil” means, for the purpose of the Guidelines, any of the following:

- (a) crude oils having a density at 15°C higher than 900 kg/m<sup>3</sup>;
- (b) oils having either a density at 15°C higher than 900 kg/m<sup>3</sup> or a kinematic viscosity at 50°C higher than 180 mm<sup>2</sup>/s except crude oils;
- (c) bitumen, tar and their emulsions.

① Refer to the American Society for Testing and Material’s Standard Test Method (designation D86).

② Refer to the American Society for Testing and Material’s Specification for Number Four Fuel Oil (Designation D396) or heavier.

## Chapter 2 APPLICATION AND SCOPE OF CAS SURVEY

### 2.1 Regulation 20 of MARPOL Annex I

2.1.1 Regulation 20 of MARPOL Annex I, adopted by MEPC.117(52), “Double hull and double bottom requirements for oil tankers delivered before 6 July 1996”, applies to oil tankers of 5,000 tonnes deadweight and above, which are contracted, the keels of which are laid or which are delivered as defined in regulation 1.28.5 of Annex I.

2.1.2 Notwithstanding the provisions of 2.1.1, regulation 20 does not apply to the following oil tankers:

- (1) complying with the double hull requirements in regulation 19 of MARPOL;
- (2) except that the requirement in regulation 19 of MARPOL for minimum distances between the breadth of wing tanks and height of double bottom need not be met in all respects, complying with other requirements in regulation 19.3.1 and 19.3.2. In that event, the double bottom protection distances at centerline are at least  $B/15$  or 2 m, and the wing tanks protection distances are at least 760 mm;
- (3) complying with the hydrostatic balance loading requirements in regulation 19.4 of MARPOL , or other methods in regulation 19.5 of MARPOL as approved by IMO MEPC.

2.1.3 For the purpose of regulation 20, oil tankers are divided into the following three categories according to the dates of contract, the keels of which are laid or which are delivered, and cargo oils carried and tonnes deadweight:

**Table 2.1.3**

Category	Tonnes deadweight (DWT)	Cargo oils	Type
Category 1	$\geq 20,000$	Crude oil, fuel oil, heavy diesel oil, lubricating oil	Not complying with definitions in regulation 1.28.4 of Annex I
	$\geq 30,000$	Oils other than the above*	
Category 2	$\geq 20,000$	Crude oil, fuel oil, heavy diesel oil, lubricating oil	Complying with definitions in regulation 1.28.4 of Annex I
	$\geq 30,000$	Oils other than the above*	
Category 3	$5,000 \leq DWT < 20,000$	Crude oil, fuel oil, heavy diesel oil, lubricating oil	
	$5,000 \leq DWT < 30,000$	Oils other than the above*	

\* including clarified oil, diesel oil, aromatic oil (excluding vegetable oil), distillates, gas oil, gasoline, jet fuel, asphalt solvent, naphtha.

2.1.4 Phase-out date of single-hull oil tankers is described in regulation 20 shown as follows:

**Table 2.1.4**

Phase-out date (anniversary of the date of delivery of ship)	Delivery date		
	Category 1	Category 2	Category 3
April 5, 2005 (effective date of the amendment)	April 5, 1982 or earlier	April 5, 1977 or earlier	April 5, 1977 or earlier
2005	April 5, 1982 or later	After April 5, 1977, but before January 1, 1978	After April 5, 1977, but before January 1, 1978
2006		1978/1979	1978/1979
2007		1980/1981	1980/1981
2008		1982	1982
2009		1983	1983
2010		1984 or later	1984 or later

2.1.5 Category 1 oil tankers are all to be phased out in 2005, for which a CAS survey is not required.

2.1.6 Phase-out dates and CAS survey requirements for category 2 and 3 oil tankers are as follows:

(1) A category 2 or 3 oil tanker of 15 years or over after the date of its delivery is to be subject to a satisfactory CAS survey and to have a Statement of Compliance or Interim Statement of Compliance (if any) before it is allowed to continue operation until the phase-out data specified in Table 2.1.4;

(2) A category 2 or 3 oil tanker delivered on or after January 1, 1986 may be allowed to continue, only after satisfactory CAS survey and having a Statement of Compliance, operation beyond the anniversary of the date of delivery of the ship in 2010 until the anniversary of the date of delivery in 2015 or the date on which the ship reaches 25 years after the date of its delivery, whichever is the earlier date;<sup>①</sup>

(3) A category 2 or 3 oil tanker delivered on or after January 1, 1986 may be allowed to continue operation beyond the anniversary of the date of delivery of the ship in 2010 to 25 years, provided that the ship was in service on July 1, 2001 and fitted with only double bottoms or double sides or double hull spaces not used for the carriage of oil and extending to the entire cargo tank length and subject to a satisfactory CAS survey and to have a valid Statement of Compliance or Interim Statement of Compliance (if any).<sup>②</sup>

2.1.7 Reference may be made to flow chart in Appendix 1 to the Guidelines as required by regulation 20 to determine the category of oil tankers.

## 2.2 Regulation 21 of MARPOL Annex I

2.2.1 Regulation 21 of MARPOL Annex I, "Prevention of oil pollution from oil tankers carrying heavy grade oil as cargo", adopted by MEPC.117(52), applies to oil tankers of 600 tonnes deadweight and above carrying heavy grade oil as cargo regardless of the date of delivery.

① Some administrations may deny entry of category 2 or 3 oil tankers which continue to operation beyond the anniversary of the date of delivery of the ship in 2010 into the ports or offshore terminals under their jurisdiction.

② Some administrations may deny entry of such oil tankers which continue to operation beyond the anniversary of the date of delivery of the ship in 2010 into the ports or offshore terminals under their jurisdiction.

2.2.2 Notwithstanding the provisions of 2.2.1, regulation 21 does not apply to the following oil tankers:

(1) except that the requirement in regulation 19 of MARPOL for minimum distances between the breadth of wing tanks and height of double bottom need not be met in all respects, complying with other requirements in regulation 19.3.1 and 19.3.2. In that event, the double bottom protection distances at centerline are at least  $B/15$  or 2 m, and the wing tanks protection distances are at least 760 mm;

(2) complying with the hydrostatic balance loading requirements in regulation 19.4 of MARPOL Annex I, or other methods in regulation 19.5 of MARPOL Annex I approved by IMO MEPC.

2.2.3 Oil tankers of 5,000 tonnes deadweight and above carrying heavy grade oil are to comply with the double hull requirements in regulation 19 of MARPOL Annex I, not later than April 5, 2005.

2.2.4 Oil tankers of 600 tonnes deadweight and above but less than 5,000 tonnes deadweight carrying heavy grade oil are to be fitted with both double bottom tanks or spaces complying with the provisions of regulation 19.6.1 of MARPOL Annex I and wing tanks or spaces arranged in accordance with regulation 19.3.1 and complying with the requirement for distance  $w$  as referred to in regulation 19.6.2, not later than the anniversary of the date of delivery of the ship in 2008.

2.2.5 Oil tankers of 5,000 tonnes deadweight and above delivered after April 5, 1980 and carrying heavy grade oil may be allowed to continue operation beyond the date of April 5, 2005 to 25 years, provided that the ship was in service on December 5, 2003 and fitted with<sup>①</sup> only double bottoms or double sides or double hull spaces not used for the carriage of oil and extending to the entire cargo tank length and subject to a satisfactory CAS survey and to have a valid Statement of Compliance or Interim Statement of Compliance (if any).<sup>①</sup>

2.2.6 Oil tankers of 5,000 tonnes deadweight and above, carrying crude oil having a density at 15°C higher than 900 kg/m<sup>3</sup> but lower than 945 kg/m<sup>3</sup> may be allowed to continue operation after April 5, 2005 until the anniversary of the date of delivery of the ship in 2015 or the date on which the ship reaches 25 years after the date of its delivery, whichever is the earlier date, provided that the ship is subject to a satisfactory CAS survey and to have a valid Statement of Compliance or Interim Statement of Compliance (if any).<sup>①</sup>

### 2.3 Application of CAS

2.3.1 Category 2 or 3 oil tankers which reach 15 years and above after the date of its delivery as specified in 2.1.6(1).

2.3.2 Category 2 or 3 oil tankers which are allowed to continue operation beyond the anniversary of the date of delivery of the ship in 2010 as specified in 2.1.6(2).

2.3.3 Single hull oil tankers of 5,000 tonnes deadweight and above carrying heavy grade oil and which reach 15 years and above after the date of its delivery as specified in 2.2.6.

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① Some administrations may deny entry of such oil tankers which continue to operation beyond the date of April 5, 2005 into the ports or offshore terminals under their jurisdiction.

## Chapter 3 SURVEY PROCEDURES

### 3.1 Preparations for CAS survey before commencement

3.1.1 In implementing CAS, the flow chart of CAS survey in Appendix 2 may be referred to.

3.1.2 Application from the Company to the Administration and to the CCS Headquarters (hereinafter referred to as the Headquarters) to proceed with the CAS is to be submitted not less than 8 months prior to the planned commencement of the CAS survey.

3.1.3 Upon receipt of the application, the Headquarters is to call related personnel to prepare for CAS survey and determine the necessary plans and documents to be submitted, then issue to the Company the Survey Planning Questionnaire (see Appendix 3) not less than 7 months prior to the planned commencement of the CAS survey and the list of plans and documents and fees as required, and notify the Company of the maximum acceptable structural corrosion diminution applicable to the ship.

3.1.4 The Company is to complete and return the Survey Planning Questionnaire to the Headquarters not less than 5 months prior to the planned commencement of the CAS survey. A copy of the completed questionnaire is to be forwarded by the Company to the Administration.

3.1.5 Upon receipt of the Survey Planning Questionnaire completed by the Company, the Headquarters is to carry out review and assist the Company to complete the Survey Plan for CAS not less than 2 months prior to the planned commencement of the CAS survey in accordance with Model Survey Plan for CAS as specified in Appendix 4, which is then to be examined in accordance with 3.1.9.

3.1.6 The Survey Plan for CAS agreed by the Headquarters is to be submitted in signed order by the Company to the Headquarters. A copy of the Survey Plan for CAS is to be forwarded by the Company to the Administration. The Administration may, where considers necessary, participate in the development of the Survey Plan for CAS.

3.1.7 The Survey Plan for CAS is to be reviewed and signed by the Headquarters in accordance with 3.1.10. The Headquarters may authorize the unit executing the CAS survey or the attending surveyor to review and sign the Survey Plan.

3.1.8 In special circumstances, such as re-activation from lay-up or unexpected events such as an extended stoppage period for hull or machinery damage, the Administration may relax the time frame as outlined in 3.1.2 to 3.1.5. Such relaxation is, at all times, to be subject to CCS having sufficient time to complete the CAS survey and issue the Interim Statement of Compliance according to 2.3.1 or 2.3.3 of the Guidelines, or for the Administration to review the CAS Final Report and issue the Statement of Compliance under 2.3.2 of the Guidelines prior to re-entry of the ship to service.

3.1.9 In developing the Survey Plan, the following documentation is to be collected and reviewed with a view to identifying tanks, areas and structural elements to be examined:

- (1) basic ship information and survey status;
- (2) main structural plans of cargo and ballast tanks (scantling drawings), including information regarding use of high tensile steels (HTS);
- (3) condition evaluation report, according to Annex 9 of Annex B to resolution A.744(18), as amended, and, where relevant, any previous CAS final reports;
- (4) the latest thickness measurement report;

- (5) relevant previous damage and repair history;
- (6) survey reports from the Society and inspection reports from the Company;
- (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 as indicated in the Survey Planning Questionnaire;
- (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 sacrificial anodes and previous class notations), if any;
- (11) inspections by the Company's personnel during the last 3 years with reference to:
  - a. structural deterioration in general;
  - b. leakages in tank boundaries and piping;
  - c. condition of the coating and corrosion protection system (including sacrificial anodes), if any;
- (12) information regarding the relevant maintenance level during operation including:
  - a. port State control reports of inspection containing hull related deficiencies;
  - b. Safety Management System non-conformities relating to hull maintenance, including the associated corrective actions; and
- (13) any other information that will help identify suspect areas and critical structural areas.

3.1.10 The Survey Plan is to include the following information and to set out the requirements with respect to close-up surveys and thickness measurements:

- (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 the close-up survey;

- (9) identification of tanks for tank testing, as per Annex 3 of Annex B to Resolution A.744(18), as amended;
- (10) identification of areas and sections for thickness measurement;
- (11) identification of the Thickness Measurement (TM) firm;
- (12) damage experience related to the ship in question; and
- (13) critical structural areas and suspect areas, where relevant.

### **3.2 Documentation on board**

3.2.1 The Company is to keep the agreed Survey Plan and all other documents and necessary drawings used in the development of the Survey Plan referred to in 3.1.8 of the Guidelines on board available at the time of the CAS survey.

### **3.3 Survey requirements**

#### **3.3.1 General requirements**

- (1) The CAS survey is to be aligned to the Enhanced Programme of Inspections;
- (2) The first CAS survey in accordance with 2.3.1 of the Guidelines is to be carried out concurrent with the first scheduled intermediate or renewal survey after April 5, 2005, or when the ship reaches the 15 years of age, whichever occurs later;
- (3) The first CAS survey in accordance with 2.3.2 of the Guidelines is to be carried out concurrent with the scheduled intermediate or renewal survey due prior to the anniversary of the date of delivery of the ship in 2010;
- (4) The first CAS survey in accordance with 2.3.3 of the Guidelines is to be carried out concurrent with the first scheduled intermediate or renewal survey after 5 April 2005;
- (5) In the case where the Statement of Compliance issued following the first CAS survey under (2) is valid beyond the anniversary of the date of delivery of the ship in 2010, that CAS may be treated as the first CAS carried out in compliance with 2.3.2 of the Guidelines;
- (6) Any subsequent CAS survey, required for the renewal of the Statement of Compliance, is to be carried out at intervals not exceeding 5 years and 6 months;
- (7) Notwithstanding the above, the Company may, with the agreement of the Administration, opt to carry out the CAS survey at a date earlier than the due date of the survey referred to above, provided that all the requirements of the CAS are complied with. The company is to obtain from the Administration the written form of the Statement of Agreement and submit it to the CCS Headquarters or the unit executing the CAS survey.

3.3.2 According to the flow chart of CAS survey, after the Survey Plan of the Company is reviewed and agreed by the Headquarters or the designated survey unit or the surveyor, the survey unit on site is to be notified to prepare the CAS survey.

3.3.3 The survey unit is to designate not less than two qualified exclusive surveyors to carry out the CAS survey. A qualified surveyor is to attend on board during the taking of the thickness measurements for the purpose of controlling the process. Prior to the CAS survey, the attending surveyor is to examine and ascertain the completeness of the drawings and documents on board and to ensure its consistency with the Survey Plan.

3.3.4 The survey unit is to designate the surveyor and other personnel who will be engaged in the CAS survey for each vessel, and is to keep the qualifications and experience records of such personnel to this end. A qualified surveyor is to have documented experience in carrying out intermediate or renewal surveys in accordance with the Enhanced Survey Programme of Inspections (ESP) for oil tankers and hold the qualifications for CAS survey. All personnel engaged in CAS work are to be specially trained by CCS, and their qualifications and experience records are to be kept in respective survey units. Each survey unit is to keep monitoring the activities of personnel engaged in CAS work.

3.3.5 Prior to the commencement of any part of CAS survey, a meeting is to be held between the attending surveyor, the Company's representative in attendance, the TM Firm operator (as applicable) and the master of the ship, for the purpose of ascertaining that all the arrangements envisaged in the Survey Plan are in place, so as to ensure the safe and efficient execution of the survey work to be carried out.

3.3.6 When the CAS survey for an oil tanker is split between survey units, a list of the items examined and an indication of whether the CAS survey has been completed are to be made available to the attending surveyors at the next survey unit prior to continuing the CAS survey.

3.3.7 Whenever the attending surveyors are of the opinion that repairs are required, each item to be repaired is to be identified in a numbered list, and details of the repairs effected are to be reported by making specific reference to relevant items in the numbered list.

3.3.8 Where the attending surveyors are of the opinion that it is acceptable to defer hull repairs beyond the due date previously assigned, the Headquarters is to be reported and consulted in such circumstances and is to give specific approval to the recommended action. However, such deferment is not to affect the submission of CAS final reports to the Administration.

3.3.9 The CAS survey is not to be regarded as complete unless all recommendations/conditions of class which relate to hull structures under review by the CAS survey have been rectified to the satisfaction of the survey unit.

#### **3.4 Extent of surveys**

3.4.1 An overall survey for the hull structure in way of cargo tanks, pump rooms, cofferdams, pipe tunnels, void spaces within the cargo area and all ballast tanks is to be carried out at the CAS survey.

3.4.2 The requirements for close-up surveys at the CAS survey are set out as follows:

- (1) all complete transverse web frame rings including adjacent structural members, in all ballast tanks;
- (2) all complete transverse web frame rings including adjacent structural members, in a cargo wing tank;
- (3) a minimum of 30% of all complete transverse web frame rings including adjacent structural members, in each remaining cargo wing tank;<sup>①</sup>
- (4) all transverse bulkheads, in all cargo and ballast tanks, including girder and stiffener systems and adjacent members;
- (5) a minimum of 30% of deck and bottom transverses including adjacent structural members, in each cargo center tank;<sup>①</sup>

<sup>①</sup> The 30% is to be rounded up to the next whole integer, i.e. where 30% is 1.6, it is obtained as 2, where 30% is 1.2, it is also obtained as 2.

(6) additional complete transverse web frame rings or deck and bottom transverse including adjacent structural members as considered necessary by the attending surveyors.

3.4.3 The attending surveyors may extend the scope of the close-up survey as considered necessary, taking into account the Survey Plan, the condition of the spaces under survey, the condition of the corrosion prevention system and coating technical condition. However, sufficient close-up surveys are to be carried out, in all cases, to confirm the actual average condition of the structure and to note the maximum observed diminution of the structure.

3.4.4 The thickness measurements are to be carried out either prior to or, to the maximum extent possible, concurrently with the close-up survey. The minimum requirements for thickness measurements for the CAS surveys are to be those set out as follows:

- (1) Within the cargo area:
  - a. each deck plate;<sup>①</sup>
  - b. three transverse sections;
  - c. each bottom plate;
- (2) Measurements of structural members subject to close-up survey according to 3.4.2 above;
- (3) Suspect areas;
- (4) Selected wind and water strakes outside the cargo area;
- (5) All wind and water strakes within the cargo area;
- (6) Internal structure in the fore and aft peak tanks;
- (7) All exposed main deck plates outside the cargo area and all exposed first tier superstructure deck plates.

3.4.5 Where substantial corrosion is found, the extent of the thickness measurements is to be increased.

3.4.6 The attending surveyors may extend the scope of the thickness measurements as considered necessary, taking into account the condition of the corrosion and coating technical condition. However, sufficient thickness measurements are to be taken, in all cases, to confirm the actual average condition and the maximum observed diminution of the structure, and such thickness measurements to be taken are sufficient to enable the reserve strength calculation in accordance with 4.2 of Chapter 4 in the Guidelines.

3.4.7 Transverse sections are to be chosen where the maximum diminutions are expected to occur or are revealed from deck plating thickness measurements. At least one transverse section is to include a ballast tank within 0.5L amidships.

3.4.8 The thickness measurements are to be recorded using the forms contained in Appendix 2 of Annex 10 of Annex B to resolution A.744(18), as amended, and the thickness measurement report is to be verified and endorsed by the attending surveyors.

3.4.9 The thickness measurement report is to be submitted to a strength evaluation organization designated by the Headquarters for strength evaluation.

<sup>①</sup> If the measurements relate to the thickness measurements of residual fillet weld between deck plating and deck longitudinals and the measurements of clearance which may occur between deck plating and deck longitudinals, such measurements may be carried out in accordance with CCS Circulars.

## Chapter 4 STRUCTURE EVALUATION AND CRITERIA

### 4.1 General requirements

4.1.1 The structure evaluation is to generally be carried out in accordance with the latest results of CAS surveys, taking into account the ship's service areas, routes, recent cargo loading and ballasting records, and the history of previous damages and repairs.

4.1.2 All reports for close-up surveys and thickness measurements are to be accurate and to be signed by the surveyor for confirmation.

4.1.3 The hull structures are to have good structural integrity, the fillet welds between longitudinal internal members and hull envelopes, decks are to be in sound condition. Defects such as cracks, buckling and substantial corrosion found in the survey are to have been repaired as required and to be satisfactory after inspected by the surveyor.

4.1.4 Special attention is to be paid to the close-up survey of the following positions:

- (1) details in way of intersection of side secondary members and primary members between full-load waterline and light-load waterline;
- (2) bracket toes of girders and transverse frames in cargo tank areas;
- (3) details in way of intersection of side, bottom longitudinals and transverse bulkheads.

4.1.5 Where cracks are found in the positions mentioned in 4.1.4, survey is to be extended to the structures of the same type. Where cracks of same type are found, causes of damage are to be found out and recommendation is to be given to improve the structural details.

4.1.6 The structure evaluation is to be carried out by a strength assessment organization designated by the Headquarters. The ship to be evaluated is to submit the following plans and documents:

- (1) Amidship section;
- (2) Expansion of shell plate;
- (3) Construction profile, including deck, bottom and side frames in the cargo tank area;
- (4) Loading calculation, including still water bending moment;
- (5) Report of thickness measurement (the extent as required in Chapter 3);
- (6) Survey report of hull structure, including status of close-up survey and corresponding corrosion conditions or structural damage photographs;
- (7) Illustration of coating protection, corrosion prevention system and inert gas protection system (if any) used in the cargo tank area;
- (8) Range and grade of high-tensile steel used;
- (9) Illustration of hull structure repair or renew.

4.1.7 The tables for transverse sectional area of hull girder flange and for transverse section modulus of hull girder are to be furnished by the strength assessment organization. The forms are referred to in Appendix 5. The calculation sheet of section modulus  $Z_{act}$  is to be attached to the tables.

## 4.2 Criteria for longitudinal strength

4.2.1 On existing oil tankers of 130 m in length and upwards and of over 10 years of age, the longitudinal strength of the ship's hull girder is to be evaluated 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).

4.2.2 The actual transverse sectional area " $A_{act}$ " of deck flange (deck plating and deck longitudinals, ships with expansion deck structure, as a part of strengthened deck, may be included in deck flange) and bottom flange (bottom shell plating and bottom longitudinals) of the ship's hull girder is to be calculated during the SC renewal survey. The diminution of the actual transverse sectional area is not to exceed 10% of the as-built area  $A_c$ .

4.2.3 Where the diminutions of the actual transverse sectional area of deck flange and bottom flange exceed 10% of the as-built area  $A_c$ , either one of the following measures is to be taken:

(1) to renew or reinforce the deck or bottom flanges so that the actual sectional area is to meet the following formula:

$$A_{act} \geq 0.9 A_c; \text{ or}$$

(2) to calculate the actual section moduli ( $Z_{act}$ ) at the strength deck and bottom in accordance with 4.2.4, by using the thickness measured, renewed or reinforced as appropriate, so that the  $Z_{act}$  complies with the requirements of Appendix 1 of PART ONE of CCS Rules for Classification of Sea-going Steel Ships.

4.2.4 Calculation of section moduli ( $Z_{act}$ ) is to be in accordance with the following requirements:

(1) When calculating the transverse section modulus of the ship's hull girder, the sectional area of all continuous longitudinal strength members is to be taken into account;

(2) Large openings, i.e., openings exceeding 2.5 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, ) 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 hole, 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 ( $B-Sb$ ) (where  $B$  = breadth of ship,  $Sb$  = 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  $30^\circ$  ;

(6) The deck modulus is related to the moulded deck line at side;

(7) The bottom modulus is related to the base line;

(8) Continuous trunks and longitudinal hatch coamings are to be included in the longitudinal sectional area provided they are effectively supported by longitudinal bulkheads or deep girders. The deck modulus is then to be calculated by dividing the moment of inertia by the following distance, provided this is greater than the distance to the deck lone at side:

$$y_i = y (0.9 + 0.2 \cdot x/B)$$

where:  $y$ —distance from neutral axis to top of continuous strength member;  
 $x$ —distance from top of continuous strength member to centerline of the ship;  
 $x$  and  $y$  to be measured to the point giving the largest value of  $y_i$ ;

(9) Longitudinal girders between multi-hatchways will be considered by special calculations.

### 4.3 Criteria for local strength

4.3.1 Criteria for local strength are to be in compliance with the related provisions of CCS Rules for Classification of Sea-going Steel Ships in force.

4.3.2 For general corrosion, renewal is required if the results of thickness measurement exceed the value as specified in 4.3.1. For substantial corrosion in local areas with the corrosive thickness exceeding 75% of allowable corrosion margin, the extent of thickness measurement is to be increased. Where it is acceptable, the area is to be identified for focal survey next time.

4.3.3 For pitting corrosion, where its range exceeds 20% of the area of the member, it is to be dealt with in compliance with the requirements of 4.3.2. Where the area does not exceed 20% and the minimum residual thickness  $t_{\min}$  meets the following requirements, it may not be dealt with:

$$t_{\min} \geq 2/3 t_0 \text{ (where } t_0 \text{ is the thickness required by Rules or the original designed thickness, in mm)}$$

Where the residual thickness is less than the above requirements, welding repair by built-up welding to the original thickness or local renewal is required. Where built-up welding is carried out for the pitting corrosion of bottom shell plate when the ship is afloat, the residual thickness is not to be less than 6 mm; where the residual thickness of pitting corrosion of bottom shell plate is less than 6 mm, cutting or welding repair of pitting corrosion area is to be carried out in dry dock.

## **Chapter 5 SURVEY REPORTS AND INTERIM STATEMENT OF COMPLIANCE**

### **5.1 CAS survey reports**

5.1.1 A survey report is to be completed for the CAS survey. The report is to indicate the date, place and where relevant, whether or not the CAS survey was carried out in dry-dock, afloat or at sea. Where the CAS survey is split between different places, an individual report is to be made by the attending surveyors at each place.

5.1.2 Survey records relating to the CAS survey, including actions taken, are to form an auditable documentary trail, which are to be made available to the Administration, if requested.

5.1.3 In addition, the following are to be included in each CAS survey report:

- (1) Extent of the survey:
  - a. identification of the spaces where an overall survey has been carried out;
  - b. identification of location, in each space, where a close-up survey has been carried out, together with the means of access to the inspected locations used; and
  - c. identification of the spaces, and locations in each space, where thickness measurements have been carried out; and
- (2) Results of the survey:
  - a. extent and condition of coating in each space. Identification of spaces fitted with anodes and the overall condition of the anodes;
  - b. structural condition reporting for each space, as applicable, including information such as corrosion (location and type of corrosion), cracks (location, description and extent), buckling (location, description and extent), indents (location, description and extent) and areas of substantial corrosion, etc.; and
- (3) Actions taken with respect to findings:
  - a. details of repairs completed on structural members in identified spaces, including the repair method and extent; and
  - b. list of items to be kept under observation for planning future inspections and surveys including any thickness measurements.

5.1.4 Where no defects are found, this is to be stated in the report for each space.

5.1.5 The narrative report is to be supplemented by photographs showing the general condition of each space, including representative photographs or sketches of any of the above reported items.

5.1.6 The attending surveyor is to sign the CAS survey report.

### **5.2 CAS final report to be submitted to the Administration**

5.2.1 The Headquarters is to carry out a verification review of the CAS survey reports, the documents, photographs, records of thickness measurement, strength evaluation calculations and other records relating to the CAS, such as repairing plan and repair items in a specified period, for the purpose of ascertaining and confirming that the requirements of the CAS have been met. CAS reviewing personnel are not to participate in any survey work intended for review.

5.2.2 The Headquarters will prepare a CAS final report upon completion of the review of CAS survey reports. The CAS final report is to be submitted by the Headquarters to the Administration without delay and:

- (1) in the case of the CAS survey in accordance with 2.3.1 or 2.3.3 of the Guidelines, not later than 3 months after the completion of the CAS survey;
- (2) in the case of the CAS survey in accordance with 2.3.2 of the Guidelines, not later than 3 months after the completion of the CAS survey, or 2 months prior to the date the ship is required to be issued with a Statement of Compliance, whichever occurs earlier.

5.2.3 The CAS final report is to, at least, include:

- (1) the following general particulars:

Ship's name;  
IMO number;  
Flag State;  
Port of registry;  
Gross tonnage;  
Deadweight (tonnes);  
Summer load line draught;  
Date of delivery;  
Category of oil tanker;  
Date for compliance with regulation 19 of MARPOL Annex I;  
Company;  
Report identification reference;

- (2) a summary as to where, when, by whom and how the CAS survey was carried out;
- (3) a statement identifying all survey documentation, including the survey plan;
- (4) a statement as to the condition of the corrosion prevention systems applied to the spaces;
- (5) a statement identifying all thickness measurement reports;
- (6) a summary of the findings of the overall surveys;
- (7) a summary of the findings of the close-up surveys;
- (8) a summary of the hull repairs carried out;
- (9) an identification, together with the location, the extent and the condition, of all areas with substantial corrosion;
- (10) a summary of the results of the evaluation of the thickness measurements, including identification of the areas and sections where thickness measurements were carried out;
- (11) an evaluation of the structural strength of the vessel and an assessment of compliance with the acceptance criteria of CAS;
- (12) a statement as to whether all the applicable requirements of the CAS have been met;
- (13) a recommendation as to whether the ship should be allowed to continue operating until the date envisaged in regulation 20 of MARPOL Annex I for compliance with the requirements of regulation 19 or for the period of validity of the CAS, if earlier; and

(14) conclusions.

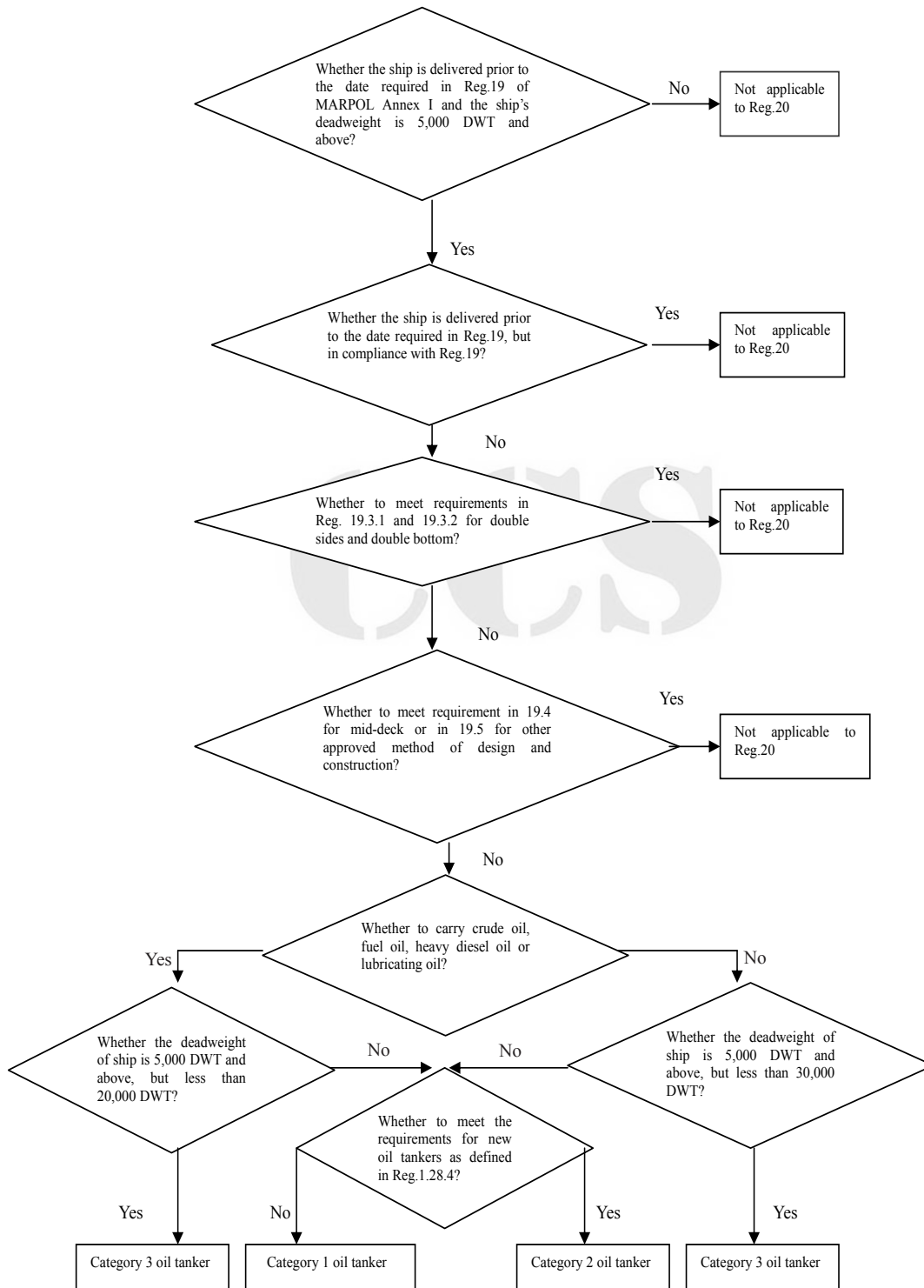
### **5.3 Interim Statement of Compliance**

5.3.1 The survey unit which has carried out the CAS survey in accordance with regulation 2.3.1 or 2.3.3 of the Guidelines is, upon satisfactory completion of the survey, to issue an Interim Statement of Compliance in a form corresponding to the model given in Appendix 9 for a period not exceeding 5 months.

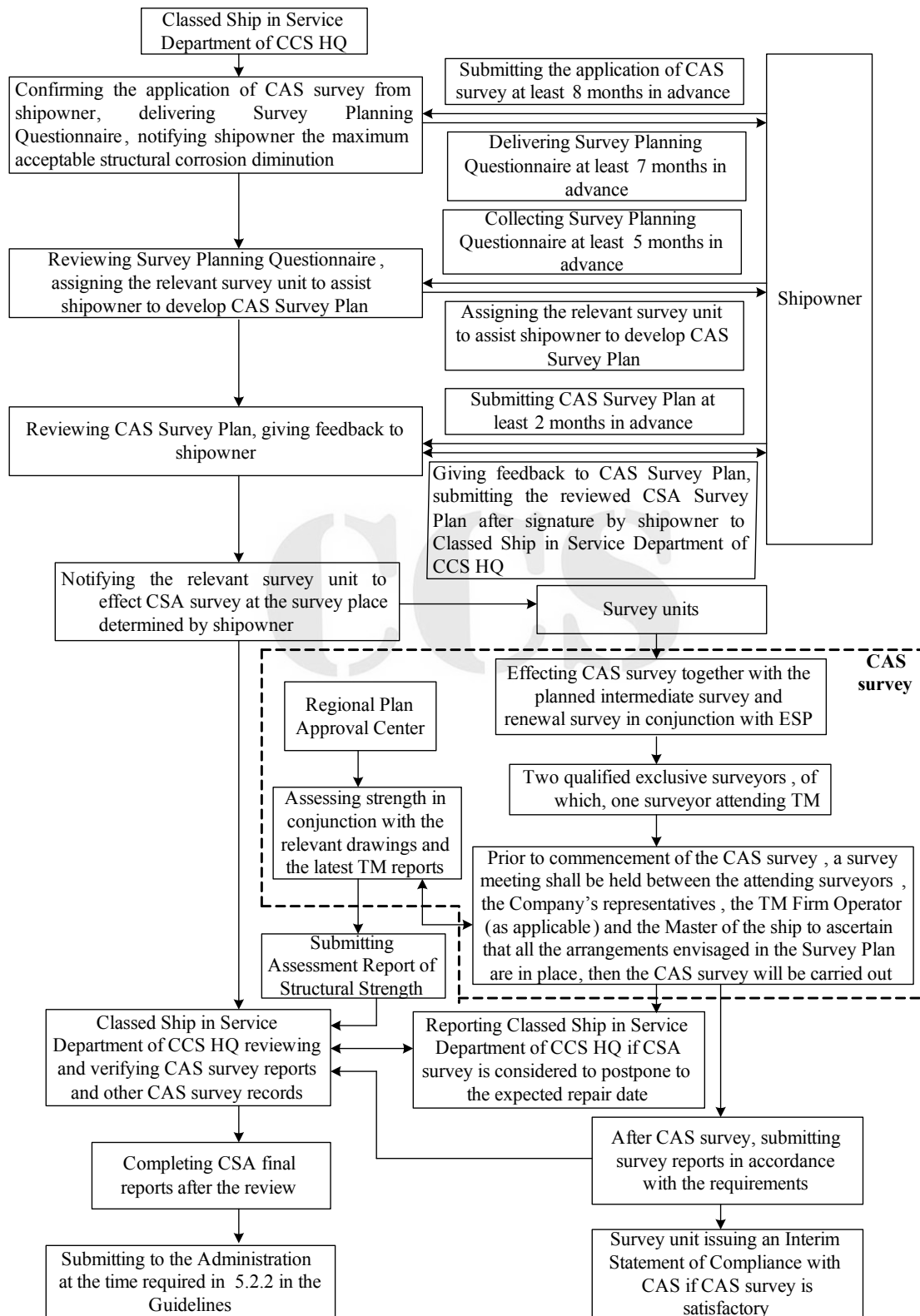
5.3.2 The Interim Statement of Compliance is to remain valid until its expiry date or the date of issue of a Statement of Compliance, whichever is the earlier date, and is to be accepted by other Parties to MARPOL 73/78.

CCS

## Appendix 1 Flow Chart as Specified in Regulation 20 of MARPOL Annex I



## Appendix 2 Flow Chart of CAS Survey



### Appendix 3 Survey Planning Questionnaire

The following information will enable the Company in co-operation with the RO to develop a survey plan complying with the requirements of the CAS.

It is essential that the Company provide, when completing the present questionnaire, up-to-date information.

The present questionnaire, when completed, shall provide all information and material required by the CAS.

#### Particulars

Ship's name:

IMO number:

Flag State:

Port of registry:

Gross tonnage:

Deadweight (tonnes):

Summer load line draught:

Date of delivery:

Category of oil tanker:

Date for compliance with regulation 19 of MARPOL Annex I:

Company:

Report identification reference:

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

The Company is requested to indicate, in the table below, the means of access to the structures subject to close-up survey and thickness measurement.

A close-up survey is an examination where the details of structural components are within the close visual inspection range of the attending surveyors, i.e. preferably within reach of hand.

Space		Temporary staging	Boat or rafts	Ladders	Direct access	Other means (please specify)
Fore peak						
Wing tanks	Under deck					
	Side shell					
	Bottom transverse					
	Longitudinal					
	Transverse					
Center tanks	Under deck					
	Bottom transverse					
	Transverse					

<b>Tank Cleaning Procedures:</b>		
Indicate the frequency of the tank washing especially in way of uncoated tanks:		
Washing medium used:	Crude oil:	Yes/No
	Heated seawater:	Yes/No
	Other medium (specify):	

<b>Inert Gas System installed:</b>	<b>Yes/No</b>
Indicate average oxygen content during inerting:	
Details of use of the inert case plant:	

<b>Cargo history for the last 3 years together with indication as to whether cargo was heated:</b>

<b>Ballast history for the last 3 years:</b>

**Inspections by the Company**

Using a similar to that of the table below (which is given as an example), the Company should provide details of the results of their inspections, for the last 3 years – in accordance with the requirements of resolution A.744(18), as amended, and of the CAS – on all CARGO and BALLAST tanks and VOID spaces within the cargo area.

Spaces (include frame numbers and p or s)	Corrosion protection (1)	Coating extent (2)	Coating condition (3)	Structural deterioration (4)	Tank history (5)
<b>Cargo center tanks</b>					
<b>Cargo wing tanks</b>					
<b>Slop tanks</b>					
<b>Ballast tanks</b>					
Aft peak					
Fore peak					
<b>Miscellaneous spaces</b>					

Notes:

- (1) HC = hard coating; SC = soft coating; A = anodes; NP = no protection.
- (2) U = upper part; M = middle part; L = low part; C: complete.
- (3) G = good; F = fair; P = poor, RC = recoated.
- (4) N = no findings recorded; Y = findings recorded, description of findings is to be attached to the questionnaire.
- (5) DR = damage and repair; L = leakages; CV = conversion; CPS = corrosion protection system (reports to be attached).

Company: _____  Name/signature: _____  Date: _____
--

**Reports of port State control inspections**

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

**Safety Management System**

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

**Name of the Thickness Measurement (TM) firm:**

## Appendix 4 Model Survey Plan for CAS

### Basic Information and Particulars

Name of ship:
IMO number:
Flag State:
Port of registry:
Gross tonnage:
Deadweight (tonnes):
Length between perpendiculars (m):
Breadth (m):
Depth (m):
Summer load line draught (m):
Builder:
Hull number:
Recognized organization (RO): RO identity:
Class notation:
Date of delivery:
Category of oil tanker (1 or 2):
Date for compliance with regulation 19:
Company:
Thickness measurement firm:

### 1 Preamble

#### 1.1 Scope

1.1.1 The present CAS Survey Plan 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 CAS adopted by resolution MEPC.94(46), as amended by resolution MEPC.99(48), as amended, for this ship.

1.1.2 The practical aspects of any part of the CAS survey shall be acceptable to the attending surveyors.

#### 1.2 Documentation

All documents used in the development of the CAS survey plan are to be available onboard during the CAS survey as required by paragraph 6.3.1 of the CAS.

### 2 Arrangement of tanks

This section of the Plan shall provide information (either in the form of plans or text) on the arrangement of tanks that fall within the scope of the CAS survey.

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

This section of the Plan shall indicate any changes relating to (and shall update) the information on the use of the tanks of the ship, the extent of coatings and the corrosion protection system provided in the Survey Planning Questionnaire.

#### **4 Conditions for survey (e.g. information regarding tank cleaning, gas freeing, ventilation, lighting)**

This section of the Plan shall indicate any changes relating to (and shall update) the information on the conditions for survey provided in the Survey Planning Questionnaire.

#### **5 Provisions and method of access to structural locations to be inspected**

This section of the Plan shall indicate any changes relating to (and shall update) the information on the provisions and methods of access to structures provided in the Survey Planning Questionnaire.

The Mandatory Requirements for the Safe Conduct of CAS Surveys are contained in Appendix 3 to this Plan.

#### **6 List of equipment for survey (to be provided by the Company and supplemented by the RO, as necessary)**

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

### **7 Survey requirements**

#### **7.1 Overall survey**

The CAS requirements

Paragraph 7.2.1 (and 5.2) of the CAS require that the hull structures in way of cargo tanks, pump rooms, cofferdams, pipe tunnels, void spaces within the cargo tank area and all ballast tanks shall undergo an overall survey.

The Plan

This section of the Plan shall identify and list the spaces that shall undergo an overall survey for this ship.

#### **7.2 Close-up survey**

The CAS requirements

Paragraph 7.2.2 (and Table 7.2.2) of the CAS state the hull structures that shall undergo a close-up survey. These are:

<b>Close-up survey requirements</b>
All web frame rings, in all ballast tanks (see note 1)
All web frame rings, in a cargo wing tank (see note 1)
A minimum of 30% of all web frame rings, in each remaining cargo wing tank (see notes 1 and 3)
All transverse bulkheads, in all cargo and ballast tanks (see note 2)
A minimum of 30% of the deck and bottom transverses, including adjacent structural members, in each cargo center tank (see note 3)
Additional complete transverse web frame rings or deck and bottom transverse, including adjacent structural members as considered necessary by the surveyor

Notes:

- 1 Complete transverse web frame ring including adjacent structural member;
- 2 Complete transverse bulkhead, including girder and stiffener systems and adjacent members;
- 3 The 30% shall be rounded up to the next whole integer.

In addition, paragraphs 7.2.3 and 7.2.4 of the CAS provide further guidance as far as the extent and scope of the close-up survey.

#### The Plan

This section of the Plan shall identify and list, using paragraph 7.2.2 (and Table 7.2.2) of the CAS, the hull structures that shall undergo a close-up survey for this ship. In particular it shall:

- .1 identify the cargo wing tank in which all web frame rings will undergo close-up survey and indicate the number of web frame rings involved;
- .2 identify the remaining cargo wing tanks in which a minimum of 30% of the web frame rings will undergo a close-up survey and indicate, for each tank, the number of web frame rings involved; and
- .3 identify the cargo center tanks in which a minimum of 30% of the deck and bottom transverses, including adjacent structural members, in each cargo center tank will undergo close-up survey and indicate, for each tank, the number of the deck and bottom transverse, including adjacent structural members, involved.

### 8 Identifications of tanks for tank testing

The CAS requirements

Paragraph 6.2.2.9 of the CAS states that the tank testing shall be as per Annex 3 of Annex B to resolution A.744(18), as amended.

The Plan

This section of the Plan shall identify and list the tanks that shall undergo tank testing for this ship.

### 9 Identification of areas and sections for thickness measurements

The CAS requirements

Paragraph 7.3.3 (and Table 7.3.3) of the CAS specify the minimum requirements for thickness measurements for CAS survey. These are:

Thickness measurement requirements	
1	Within the cargo area: .1 Each deck plate .2 Three transverse sections .3 Each bottom plate
2	Measurements of structural members subject to close-up survey according to the table above (for close-up survey), for general assessment and recording of corrosion pattern
3	Suspect areas
4	Selected wind and water strakes outside the cargo area
5	All wind and water strakes within the cargo area
6	Internal structure in the fore and aft peak tanks
7	All exposed main deck plates outside the cargo area and all exposed first tier superstructure deck plates

Guidance notes:

- 1 The attending surveyors may increase the extent of thickness measurements as deemed necessary (see paragraph 7.3.5 of the CAS);
- 2 Transverse sections for thickness measurements shall be chosen where the largest material reductions are expected to occur or are revealed from deck plating measurements (see paragraph 7.3.8 of the CAS);
- 3 Where substantial corrosion is found, the extent of thickness measurements shall be increased accordingly (see paragraph 7.3.4 of the CAS).

In addition, paragraphs 7.3.4 to 7.3.8 of the CAS provide further guidance on the extent and increase of the thickness measurements to be taken.

### The Plan

This section of the Plan shall identify and list, using paragraph 7.3.3 (and Table 7.3.3) of the CAS, the areas and sections where thickness measurements shall be taken.

### 10 Hull material (to be specified by the RO)

This section of the Plan shall identify, using a format similar to that of the table below, the materials used in the hull structures that fall within the scope of the CAS for the purpose of providing a concise reference.

Location	Plating	Longitudinals and stiffeners	Longitudinal girders/stringers	Transverse girder/web frames/stringers/floors
Deck				
Bottom				
Inner bottom				
Side shell				
Longitudinal bulkhead				
Transverse bulkhead				
Fore peak				
Aft peak				

Guidance notes:

- 1 Material grade is Mild Steel (MS) where not shown otherwise;
- 2 Material grade HTS indicates High Tensile Steel; SS indicates Stainless Steel; and CS indicates Clad Steel;
- 3 In case of repairs material, grade, type and the extent shall be verified from drawings.

### 11 Minimum thickness of hull structures (to be specified by the RO)

This section of the Plan shall specify the minimum thickness for hull structures of this ship that are subject to the CAS (indicate either (a) or preferably (b), if such information is available):

- (a)  Determined from the attached<sup>①</sup> wastage allowance table and the original thickness according to the hull structure plans of the ship;
- (b)  Given in the following table.

<sup>①</sup> The wastage allowance tables shall be attached to the CAS Survey Plan.

Area or location	Original thickness (mm)	Minimum thickness (mm)	Substantial corrosion thickness (mm)
<b>Deck</b>			
Plating			
Longitudinals			
Longitudinal girders			
<b>Bottom</b>			
Plating			
Longitudinals			
Longitudinal girders			
<b>Ship side</b>			
Plating			
Longitudinals			
Longitudinal girders			
<b>Longitudinal bulkhead</b>			
Plating			
Longitudinals			
Longitudinal girders			
<b>Inner bottom</b>			
Plating			
Longitudinals			
Longitudinal girders			
<b>Transverse bulkheads</b>			
Plating			
Stiffeners			
<b>Transverse web frames, floors and stringers</b>			
Plating			
Flanged plate			
Stiffeners			
<b>Cross ties</b>			
Flanged plate			
Webs			

## 12 Thickness measurement (TM) Firm

This section of the Plan shall identify changes, if any, relating to the information on the Thickness Measurement(TM) Firm provided in the Survey Planning Questionnaire.

**13 Damage experience related to the ship**

This section of the Plan shall, using the tables provided below, provide details of the hull damages for at least the last three years in way of the cargo tanks and ballast tanks areas and void spaces within the cargo area. These damages are subject to CAS survey.

**Hull damages sorted by location for this ship**

(to be provided by the Company and supplemented by the RO, as necessary)

Cargo tank 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**

(to be provided by the Company and supplemented by the RO, as necessary)

Cargo tank number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

**14 Areas identified with substantial corrosion from previous surveys (to be provided by the RO)**

This section of the Plan shall identify and list the areas of substantial corrosion from previous surveys.

**15 Critical structural areas and suspected areas** (to be provided by the Company and supplemented by the RO, as necessary)

This section of the Plan shall identify and list the critical structural areas the suspected areas, when such information is available.

**16 Other relevant comments and information** (to be provided by the Company and supplemented by the RO, as necessary)

This section of the Plan shall provide any other relevant, to the CAS survey, comments and information.

## **Appendices**

### **Appendix 1 – List of Plans**

Paragraph 6.2.2.2 of CAS requires that main structural plans of cargo tanks and ballast tanks (scantling drawings), including information on regarding use of high tensile steel (HTS) to be provided.

This Appendix of the Plan shall identify and list the main structural plans which form part of the Plan and which are attached to the Plan.

### **Appendix 2 – Survey Planning Questionnaire**

The Survey Planning Questionnaire, which has been submitted by the Company, shall be appended to the Plan.

### **Appendix 3 – Mandatory Requirements for the Safe Conduct of CAS Surveys**

The Mandatory Requirement for the Safe Conduct of CAS Surveys, which is contained in Annex 4 of resolution MEPC.99(48), shall be appended to the Plan.

### **Appendix 4 – CAS Schedule**

The CAS Schedule, which is contained in Annex 3 of MEPC/Circ.390, shall be attached to the Plan.

### **Appendix 5 – Other documentation**

This part of the Plan shall identify and list any other documentation that forms part of the Plan.

Prepared on behalf of the Company by .....

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

Reviewed by the RO for compliance with paragraph 6.2.2 of the CAS

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

## Appendix 5

### Form of Calculation for Longitudinal Strength

1 Table 1 applies to ships regardless of the date of construction. Transverse sectional areas of hull girder flange in way of three transverse sections and the transverse sectional areas as-built are to be filled in the table and calculated whether to comply with the requirements of 4.2.3(1) of the Guidelines with the conclusions in the remark column.

**Table 1 Transverse sectional area of hull girder flange**

		$A_{act}$ cm <sup>2</sup>	$A_c$ cm <sup>2</sup>	$100A_{act}/A_c$ %	Remark
Transverse section 1	Deck flange				
	Bottom flange				
Transverse section 2	Deck flange				
	Bottom flange				
Transverse section 3	Deck flange				
	Bottom flange				

2 Table 2 applies to ships constructed before 1 July 2002. Section moduli of the hull girder in way of three transverse sections and the required minimum section moduli of ships in service are to be filled in the table separately and calculated whether to comply with the requirements of 4.2.3(2) of the Guidelines with the conclusions in the remark column.

**Table 2 Transverse section modulus of hull girder**

		$Z_{act}$ cm <sup>3</sup>	$Z_{mc}$ cm <sup>3</sup>	Remark
Transverse section 1	Deck flange			
	Bottom flange			
Transverse section 2	Deck flange			
	Bottom flange			
Transverse section 3	Deck flange			
	Bottom flange			

## Appendix 6

### Guidelines on the Assessment of Residual Fillet Weld Between Deck Plating and Longitudinals

#### 1 General

The purpose of the guidelines is to provide an evaluation method and criteria for residual throat thickness for the fillet weld between the deck plate and deck longitudinals in order to prevent collapse accidents of aged oil tankers. To ensure that evaluation of the ship's longitudinal strength is recognized as valid, the fillet weld between longitudinals and deck should be in sound condition.

#### 2 Extent of measurement

Thickness measurement on deck should be carried out according to paragraph 3 of these guidelines i.e. in every other deck longitudinal for three transverse sections, within the cargo area, as given in Table 7.3.3, paragraph 1.2, of the Condition Assessment Scheme (resolution MEPC.94(46), as amended). For areas in tanks where environmental conditions seem to be similar, the extent of this thickness measurement may be specially considered by the attending surveyor.

#### 3 Local thickness measurement and criteria

##### 3.1 Method of local thickness measurement

3.1.1 The extent of local measurement should be set within approximately 50 mm of each side of the baseline, as shown in Figure 1.

3.1.2 Within the extent of local measurement, at least five points should be arranged, including one point on the baseline and with approximately 25 mm spacing at maximum. Thereby, the local thickness distribution for the deck plate can be obtained for the target longitudinal.

3.1.3 From the measured thickness distribution, a representative thickness diminution ( $\Delta t$ ), defined by the following equation (1), should be estimated from the measured data on the baseline and the minimum thickness value among the other points:

$$\Delta t = t_0 - \text{Min.} \{t_1, t_2, t_3, t_4\} \quad (1)$$

where:

$t_0$ : measured thickness on the baseline which is nearly equal to original thickness minus corrosion diminution for deck upper surface ( $\Delta t_0$ ) as shown in Figure 1;

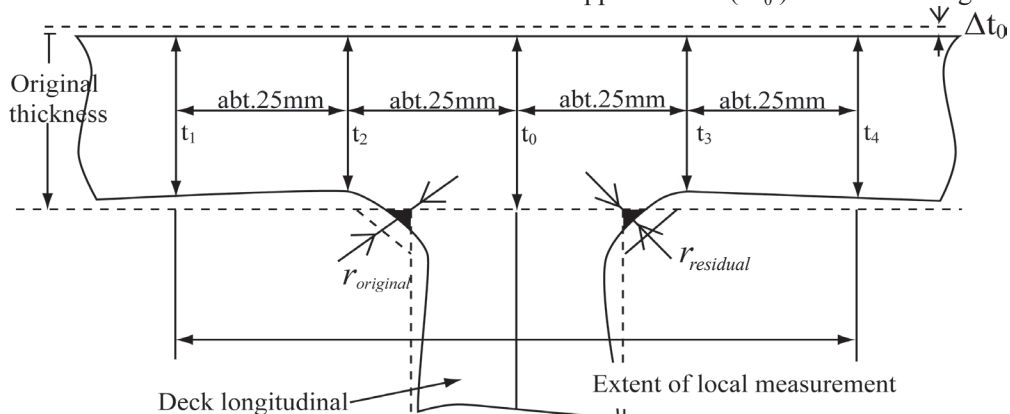


Figure 1 – Thickness measurement at deck plate from upper side

$t_1, t_2, t_3, t_4$ : thickness on each measuring point; and

$\Delta t$ : representative thickness diminution, which is assumed to be nearly equal to the diminution of the fillet weld throat thickness.

3.1.4 An estimated residual throat thickness is determined by:

$$r_{\text{residual}} = r_{\text{original}} - \Delta t$$

where  $r_{\text{original}}$  is the original throat thickness at the weld.

### 3.2 Criteria

When the estimated residual throat thickness is zero or less than zero, repair or renewal of the weld should be considered also based on the result of the close-up survey.

### 4 Alternative method

Detachment of the deck longitudinal member can also be checked using the following procedures. In cases where the longitudinal member is attached in sound condition, when the probe of the ultrasonic equipment is moved from the baseline to the outer side over the welding part, the ultrasonic echo from the bottom surface of the deck plate is not observed just over the welding part. However, in cases where the longitudinal member is detached from the deck plate, when the probe of the ultrasonic equipment is moved from the baseline to the outer side beyond the welding part, the ultrasonic signal echo can be observed continuously, even if the probe is on the detached welding part as shown in Figure 2.

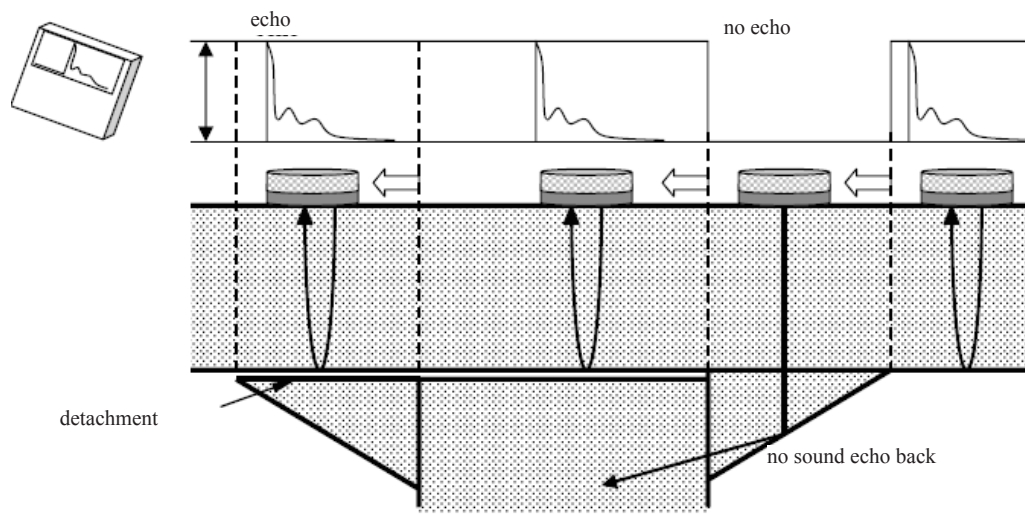


Figure 2 – Alternative method

## **Appendix 7 Mandatory Requirements for the Safe Conduct of CAS Surveys**

### **1 General**

1.1 The present mandatory requirements have been developed for the safe conduct of CAS Surveys. Although the mandatory requirements make explicit reference to the CAS survey and to attending surveyors it shall be used also in connection with any thickness measurement work required by the CAS.

### **2 Conditions for survey**

- 2.1 The Company shall provide the necessary facilities for a safe conduct of the CAS survey.
- 2.2 In cases where the provisions of safety and required access are judged by the attending surveyors not to be adequate, the CAS survey of the spaces involved shall not proceed.
- 2.3 In order to enable the attending surveyors to carry out the CAS survey provisions, for proper and safe access, shall be agreed between Company and Recognized Organization.
- 2.4 Details of the means of access are provided in the Survey Planning Questionnaire.
- 2.5 Tanks and spaces shall be safe for access<sup>①</sup>. Tanks and spaces shall be gas free and shall be ventilated. Prior to entering a tank, void or enclosed space, it shall be verified that the atmosphere in the tank is free from hazardous gas and contains sufficient oxygen.
- 2.6 Tanks and spaces shall be sufficiently clean and free from water, scale, dirt, oil residues, corrosion scale, sediments etc., to reveal significant corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating. In particular this applies to areas that are subject to thickness measurement.
- 2.7 Sufficient illumination shall be provided to reveal significant corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating.
- 2.8 Where soft coating have been applied, safe access shall be provided for the attending surveyors to verify the effectiveness of the coating and to carry out an assessment of the conditions of internal structures which may include spot removal of the coating. When safe access cannot be provided, the soft coating shall be removed.
- 2.9 The attending surveyors shall always be accompanied by at least one responsible person assigned by the Company experienced in tank and enclosed spaces inspection. In addition, a backup team of at least two experienced persons shall be stationed at the hatch opening of the tank or space that is being surveyed. The back-up team shall continuously observe the work in the tank or space and shall keep lifesaving and evacuation equipment ready for use.

### **3 Means of access to structural locations to be inspected**

- 3.1 For overall survey, means shall be provided to enable the attending surveyors to examine the structure in a safe and practical way.
- 3.2 For close-up survey, one or more of the following means for access, acceptable to the attending surveyors, shall be provided:

<sup>①</sup> Reference is made to Chapter 10 of the International Safety Guide for Oil Tankers and Terminals (ISGOTT) – Entry into and working in enclosed spaces.

- permanent staging and passages through structures;
- temporary staging and passages through structures;
- lifts and moveable platforms;
- rafts or boats;
- other equivalent means.

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

3.4 When rafts or boats will be used for close-up survey the following condition shall be observed:

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

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

.3 appropriate lifejackets shall be available for all participants;

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

.7 if the tanks (or spaces) are connected by a common venting system, or Inert Gas system, the tank in which the boat or raft is to be used shall be isolated to prevent a transfer of gas from other tanks (or spaces).

3.5 In addition to the above rafts or boats alone may be allowed for inspection of the under deck areas for tanks or spaces, if the depth of the webs are 1.5 m or less.

3.6 If the depth of the webs is more than 1.5m, 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 is to be direct from the deck via a vertical ladder and a small platform shall be fitted approximately 2 m below the deck.

If neither of the above conditions are met then staging shall be provided for the survey of the under deck area.

#### **4 Equipment for survey**

4.1 Thickness measurement shall normally be carried out by means of ultrasonic test equipment. The accuracy of the equipment shall be proven to the attending surveyors as required.

4.2 One or more of the following fracture detection procedures may be required if deemed necessary by the attending surveyors:

- radiographic equipment;
- ultrasonic equipment;
- magnetic particle equipment;
- dye penetrant;
- other equivalent means.

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

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

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

#### **5 Meetings and communication arrangements**

5.1 The establishment of proper preparation and the close co-operation between the attending surveyors and the Company's representatives onboard prior to and during the CAS survey are an essential part in the safe and efficient conduct of the CAS survey. During the CAS survey on board safety meetings shall be held regularly.

5.2 Prior to commencement of the CAS survey a survey meeting shall be held between the attending surveyors, the Company's representatives in attendance, the TM Firm Operator (as applicable) and the Master of the ship for the purpose to ascertain that all the arrangements envisaged in the Survey Plan are in place, so as to ensure the safe and efficient conduct of the survey work to be carried out.

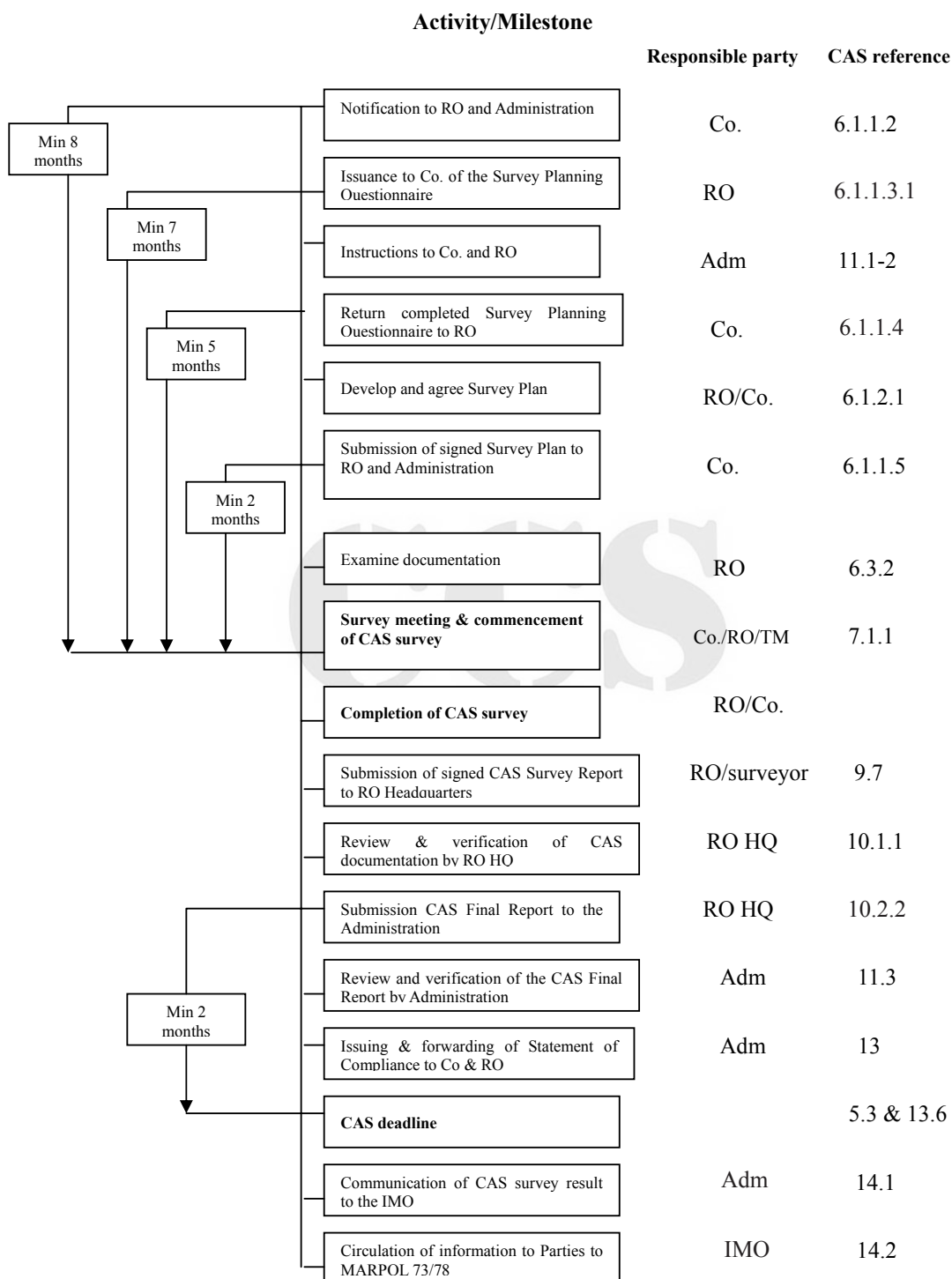
5.3 The following is an indicative list of items that shall be addressed in the meeting:

- .1 schedule of the vessel (i.e. the voyage, docking and unloading 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 lost of minimum thickness);
- .5 extent of close-up survey and thickness measurement considering the coating condition and suspect areas/areas of substantial corrosion;
- .6 execution of thickness measurements;

- .7 taking representative readings in general and where uneven corrosion/pitting is found;
  - .8 mapping of areas of substantial corrosion;
  - .9 communication between attending surveyor(s), the TM operator(s) and Company representative(s) concerning findings.
- 5.4 A communication system shall 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. This system shall also include the personnel in charge of handling the ballast pumps if rafts or boats are used. The communication arrangements shall be maintained throughout the CAS survey.

CCS

## Appendix 8 CAS Schedule



## Appendix 9 Form of Interim Statement of Compliance

### INTERIM STATEMENT OF COMPLIANCE

Issued under the provisions of the Condition Assessment Scheme (resolution MEPC.94(46), as amended) by:

.....  
(full name of the Recognized Organization)

Particular of ship

Name of ship .....

Distinctive number or letters .....

Port of registry .....

Gross tonnage .....

Deadweight of ship (tonnes) .....

IMO number .....

Category of tanker .....

THIS IS TO CERTIFY:

1 That the ship has been surveyed in accordance with the requirements of the Condition Assessment Scheme (CAS) (resolution MEPC.94(46), as amended);

2 That the survey showed that the structural conditions of the ship covered by CAS are in all respects satisfactory and the ship complies with the survey requirements of CAS.

Date of completion of the CAS survey: dd/mm/yyyy.

This Statement is valid until ....., or the date of issue of the Statement of Compliance, whichever is the earlier date.

Issued at .....  
(Place of issue of the Statement)

.....  
(Date of issue)

.....  
(Signature of duly authorized official issuing the Statement)

(Seal or stamp of the Recognized Organization, as appropriate)