

RULES AND REGULATIONS FOR THE CLASSIFICATION OF SHIPS

REGULATIONS

JULY 2007

PART 1

Lloyd's
Register

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■ Section 1

1.1 Lloyd's Register (hereinafter referred to as LR), which is recognized under the laws of the United Kingdom as a Corporation whose business is conducted for the benefit of the community, was founded in 1760. It was established for the purpose of obtaining for the use of Merchants, Shipowners and Underwriters a faithful and accurate Classification of Merchant Shipping and whilst it still continues to fulfil that purpose, it now also:

- (a) approves design, surveys and reports on: hovercraft; ships which embody features of a novel kind; non-mercantile shipping; yachts; amphibious and land and sea and sea bed installations, structures, plant, etc.; machinery, apparatus, materials, components, equipment, production methods and processes of all kinds; for the purpose of testing their compliance with plans, specifications, Rules, Codes of Practice, etc., or their fitness for particular requirements;
 - (b) acts with delegated authority on behalf of numerous governments in respect of Statutory Requirements;
 - (c) provides other technical inspection and advisory services relating to ships and the maritime industry generally and also in respect of land and sea-based undertakings.
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■ Section 2

2.1 LR's affairs are under the overall direction of the General Committee, which is composed of persons nominated or elected to represent the world community and industry which LR serves.

The General Committee (hereinafter referred to as the Committee), which may at its discretion vary the constitution of such representation, is currently composed of:

- The Corporation of Lloyd's (five representatives).
- The International Underwriting Association (two representatives).
- The Chamber of Shipping (five representatives).
- The International Maritime Industries Forum (one representative).
- The Greek Shipping Co-operation Committee (one representative).
- Intercargo (one representative).
- Institute of Quality Assurance (one representative).
- Intertanko (one representative).
- The International Group of P&I Clubs (one representative).

Nominated members of the Committee are elected for a term of service of three years and are eligible for re-election, subject to the membership age limit and unbroken membership of the nominating body they represent during their period of membership.

Six members representing P&I Clubs elected by the Committee for a term of service of one year. P&I Club representatives are eligible for re-election, subject to the membership age limit.

Such persons specially elected by the Committee for a term of service of one year. Specially Elected Members are eligible for re-election, subject to the membership age limit. The number of Specially Elected Members shall be limited not to exceed the balance of the maximum Committee membership of 85 persons. A specially elected member will automatically relinquish his/her membership in this category on being elected as a nominated member of the Committee.

2.2 The Committee is further empowered to elect as Honorary Members of the Committee such persons of distinction and eminence as the Committee shall from time to time think fit.

2.3 With the exception of honorary members, any member of the Committee shall automatically retire from the Committee on reaching the age of seventy years, unless special approval for an additional term of service is recommended by the Committee's Nominations Committee and approved by the Committee each year thereafter.

■ **Section 3**

3.1 The Committee has power to:

- Appoint a Board and delegate thereto such of its powers as it may determine;
- Appoint a General Committee Nominations Committee and determine its powers;
- Appoint a Sub-Committee of Classification and determine its powers and functions;
- Appoint Committees in any country or area to form a liaison between LR and the local maritime, industrial and commercial communities;
- Appoint Technical Committees and determine their functions, powers and duties.

3.2 The Committee has exercised its powers and has appointed such committees and Board.

■ **Section 4**

4.1 National and Area Committees are established in the following:

Countries:	Areas:
Australia (via Lloyd's Register Asia)	Benelux (via Lloyd's Register EMEA)
Canada (via Lloyd's Register North America, Inc.)	Central America (via Lloyd's Register Central and South America Ltd)
China (via Lloyd's Register Asia)	Nordic Countries (via Lloyd's Register EMEA)
Egypt (via Lloyd's Register EMEA)	South Asia (via Lloyd's Register Asia)
Federal Republic of Germany (via Lloyd's Register EMEA)	Asian Shipowners (via Lloyd's Register Asia)
France (via Lloyd's Register EMEA)	
Greece (via Lloyd's Register EMEA)	
Italy (via Lloyd's Register EMEA)	
Japan (via Lloyd's Register Asia)	
New Zealand (via Lloyd's Register Asia)	
Poland (via Lloyd's Register (Polska) Sp zoo)	
Spain (via Lloyd's Register EMEA)	
United States of America (via Lloyd's Register North America, Inc.)	

■ **Section 5**

5.1 The main Technical Committee is at present composed of:

<i>Ex officio:</i>	TOTAL
• The Chairman of LR	1
• The Chairman of the Sub-Committee of Classification	1
<i>Nominated by:</i>	
• The Committee	18
• The Royal Institution of Naval Architects	2
• The Institution of Engineers and Shipbuilders in Scotland	2
• The Institute of Marine Engineers	2
• The Institution of Mechanical Engineers	2
• The Shipbuilders' and Shiprepairers' Association	2
• The Short Sea Group of the Chamber of Shipping	1
• The Society of Consulting Marine Engineers and Ship Surveyors	1
• The Institute of Materials	1
• The UK Steel Association	1
• The Honourable Company of Master Mariners	2
• The Institution of Electrical Engineers	1
• Federation of British Electrotechnical and Allied Manufacturers' Associations	1
• The Technical Committee	18
• The Technical Committee (from other countries)	18
• The Institute of Refrigeration	1
• International Oil Companies	2
• Association of European Shipbuilders and Shiprepairers	1
• Greek Shipping Co-operation Committee	1
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5.2 All nominations are subject to confirmation by the Committee.

5.3 In addition to the foregoing:

- (a) Each National or Area Committee may appoint a representative to attend meetings of the Technical Committee.
- (b) A maximum of five representatives from National Administrations may, with the consent of the Committee, be co-opted to serve on the Technical Committee. Such representatives may also be elected as members of the Technical Committee under one of the categories identified in 5.1.
- (c) Further persons may, with the consent of the Committee, be co-opted to serve on the Technical Committee.

5.4 The function of the Technical Committee is to consider any technical problems connected with LR's business (see 1.1(a)) and with the exception of changes necessitated by mandatory implementation of International Conventions, Codes or Unified Requirements adopted by the International Association of Classification Societies, any proposed alterations in the existing Rules and to frame new Rules for classification as deemed necessary.

5.5 The term of office of the Chairman and of all members of the Technical Committee is five years. Members may serve one additional term of office with the approval of the Committee.

5.6 In the case of continuous non-attendance of a member, the Committee may withdraw his/her membership.

5.7 Meetings of the Technical Committee are convened as often and at such times and places as is necessary, but there is to be at least one meeting in each year.

5.8 Any proposal of the Technical Committee involving any alteration in, or addition to, Rules for classification is referred to the Committee and may be finally approved at the next meeting of the Board if the General Committee so direct.

5.9 The Technical Committee is empowered to:

- (a) appoint sub-Committees or panels of the Committee; and
- (b) co-opt to the Technical Committee, or to its sub-Committees or panels, representatives of any organization or industry or private individuals for the purpose of considering any particular problem.

■ Section 6

6.1 The Naval Ship Technical Committee (hereinafter referred to as NSTC) is at present composed of not more than 50 members to include nominees of:

- The Royal Navy and the UK Ministry of Defence;
- The Defence Evaluation and Research Agency;
- UK Shipbuilders, Ship Repairers and Defence Industry;
- Overseas Governments and Governmental Agencies;
- Overseas Shipbuilders, Ship Repairers and Defence Industries;
- Various maritime bodies and institutions, nominated by the NSTC;
- The Chairman and Chairman of the Sub-Committee of Classification who are *ex officio* members.

6.2 All nominations are subject to confirmation by the Committee.

6.3 All members of the NSTC are to hold security clearance from their National Authority for the equivalent of NATO CONFIDENTIAL. All material is to be handled in accordance with NATO Regulations or, for non-NATO countries, an approved equivalent. No classified material shall be disclosed to any third party without the consent of the originator.

6.4 The term of office of the NSTC Chairman and of all members of the NSTC is five years. Members may serve one additional term of office with the approval of the Committee. The term of the Chairman may be extended with the approval of the General Committee.

6.5 In the case of continuous non-attendance of a member, the Committee may withdraw that person's membership.

6.6 The function of the NSTC is to consider technical issues connected with Naval Ship matters and to approve proposals for new Naval Ship Rules, or amendments to existing Naval Ship Rules.

6.7 Meetings of the NSTC shall be convened as necessary but there shall be at least one meeting per year.

6.8 Following approval by the NSTC, details of new Rules (or amendments) will be submitted to the Committee for adoption.

■ Section 7

7.1 The Committee has power to adopt, and publish as deemed necessary, Rules relating to classification and has (in relation thereto) provided the following:

- (a) Except in the case of a special directive by the Committee, no new Regulation or alteration to any existing Regulation relating to character of classification or to class notations is to be applied to existing ships.
- (b) Except in the case of a special directive by the Committee, or where changes necessitated by mandatory implementation of International Conventions, Codes or Unified Requirements adopted by the International Association of Classification Societies are concerned, no new Rule or alteration in any existing Rule is to be applied compulsorily after the date on which the contract between the ship builder and ship owner for construction of the ship has been signed, nor within six months of its adoption. The date of 'contract for construction' of a ship is the date on which the contract to build the ship is signed between the prospective ship owner and the ship builder. This date and the construction number (i.e. hull numbers) of all the vessels included in the contract are to be declared to the Committee by the party applying for the assignment of class to a newbuilding. The date of 'contract for construction' of a series of sister ships, including specified optional ships for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective ship owner and the ship builder. In this section a 'series of sister ships' is a series of ships built to the same approved plans for classification purposes, under a single contract for construction. The optional ships will be considered part of the same series of sister ships if the option is exercised not later than 1 year after the contract to build the series was signed. If a contract for construction is later amended to include additional ships or additional options, the date of 'contract for construction' for such ships is the date on which the amendment to the contract is signed between the prospective ship owner and the ship builder. The amendment to the contract is to be considered as a 'new contract'. Where it is desired to use existing approved ship or machinery plans for a new contract, written application is to be made to the Committee.

NOTE

Sister ships may have minor design alterations provided that such alterations do not affect matters related to classification.

- (c) All reports of survey are to be made by Surveyors authorised by LR to survey and report (hereinafter referred as the Surveyors) according to the form prescribed, and submitted for the consideration of the Committee, or its Sub-Committee of Classification, but the character assigned by the latter is to be subject to confirmation by the Committee or by the Chairman acting on behalf of the Committee.
- (d) Information contained in the reports of classification and statutory surveys will be made available to the relevant owner, National Administration, Port State Administration, P&I Club, hull underwriter and, if authorized in writing by that owner, to any other person or organization.
- (e) Information relating to the status of classification and statutory surveys and suspensions/withdrawals of class together with any associated conditions of class will be made available as required by applicable legislation or court order.
- (f) Notwithstanding the general duty of confidentiality owed by LR to its clients, LR will participate fully in the IACS Early Warning System which requires each IACS member to provide its fellow IACS members with information on serious hull structural and engineering systems failures, including the name of the ship and its IMO number, to enable such useful information to be shared and utilised to facilitate the proper working of the IACS Early Warning System (which is aimed at enabling (i) 'sister' or similar ships to avoid similar problems and (ii) the shipping industry generally to learn from failures and mistakes).
- (g) A Classification Executive consisting of senior members of LR's Classification Department staff shall carry out whatever duties that may be within the function of the Sub-Committee of Classification that the Sub-Committee of Classification assigns to it.

■ Section 8

8.1 No Lloyd's Register Group employee is permitted under any circumstances, to accept, directly or indirectly, from any person, firm or company, with whom the work of the employee brings the employee into contact, any present, bonus, entertainment or honorarium of any sort whatsoever which is of more than nominal value or which might be construed to exceed customary courtesy extended in accordance with accepted ethical business standards.

■ Section 9

9.1 The Committee has power to:

- (a) determine the amounts to be charged for the services provided by LR or for any of its publications;
- (b) withhold or, if already granted, to suspend or withdraw any class (or to withhold any certificate or report in any other case), in the event of non-payment of any fee.

■ Section 10

10.1 In this section:

- (i) 'Services' means the services provided by LR; and
- (ii) 'Contract' means the contract for supply of the Services; and
- (iii) the 'LR Group' includes LR, its affiliates and subsidiaries, and the officers, directors, employees, representatives and agents of any of them, individually or collectively.

10.2 LR's services do not assess compliance with any standard other than the applicable LR Rules, international conventions, and other standards agreed in writing by LR and the Client.

10.3 In providing Services, information or advice, the LR Group does not warrant the accuracy of any information or advice supplied. Except as set out herein, the LR Group will not be liable for any loss, damage or expense sustained by any person and caused by any act, omission, error, negligence or strict liability of any of the LR Group or caused by any inaccuracy in any information or advice given in any way by or on behalf of the LR Group even if held to amount to a breach of warranty. Nevertheless, if the Client uses LR's Services or relies on any information or advice given by or on behalf of the LR Group and as a result suffers loss, damage or expense that is proved to have been caused by any negligent act, omission or error of the LR Group or any negligent inaccuracy in information or advice given by or on behalf of the LR Group, then LR will pay compensation to the Client for its proved loss up to but not exceeding the amount of the fee (if any) charged for that particular service, information or advice.

10.4 Notwithstanding the previous clause, the LR Group will not be liable for any loss of profit, loss of contract, loss of user or any indirect or consequential loss, damage or expense sustained by any person caused by any act, omission or error or caused by any inaccuracy in any information or advice given in any way by or on behalf of the LR Group even if held to amount to a breach of warranty.

10.5 LR's omission or failure to carry out or observe any stipulation, condition, or obligation to be performed under the Contract will not give rise to any claim against LR or be deemed to be a breach of contract if the failure or omission arises from causes beyond LR's reasonable control.

10.6 Any dispute about the Services or the Contract is subject to the exclusive jurisdiction of the English courts and will be governed by English law.

Section

- 1 **Conditions for classification**
- 2 **Character of classification and class notations**
- 3 **Surveys – General**
- 4 **IACS QSCS Audits**
- 5 **Approval/Type Testing/Quality Control System**
- 6 **Classification of machinery with [X] LMC or MCH notation**

■ Section 1 Conditions for classification

1.1 General

1.1.1 Ships referred to in this Chapter are defined in Parts 3, 4 and 7 of these Rules. Machinery referred to in this Chapter is defined in Parts 5 and 6 of these Rules. Systems referred to in this Chapter are defined in Part 7 of these Rules. Materials are referred to in the *Rules for the Manufacture and Certification of Materials* (hereinafter referred to as the Rules for Materials).

1.1.2 Ships built in accordance with LR's Rules and Regulations, or in accordance with requirements equivalent thereto, will be assigned a class in the *Register Book* and will continue to be classed as long as they are found, upon examination at the prescribed surveys, to be maintained in accordance with the requirements of the Rules. Classification will be conditional upon compliance with LR's requirements for both hull and machinery.

1.1.3 The Committee, in addition to requiring compliance with LR's Rules, may require to be satisfied that ships are suitable for the geographical or other limits or conditions of the service contemplated.

1.1.4 Loading conditions and any other preparations required to permit a ship with a class notation specifying some service limitation to undertake a sea-going voyage, either from port of building to service area or from one service area to another, are to be in accordance with arrangements agreed by LR prior to the voyage.

1.1.5 Any damage, defect, breakdown or grounding, which could invalidate the conditions for which a class has been assigned, is to be reported to LR without delay.

1.1.6 The Rules are framed on the understanding that ships will be properly loaded and handled. They do not, unless stated or implied in the class notation, provide for special distributions or concentrations of loading. The Committee may require additional strengthening to be fitted in any ship which, in their opinion, would otherwise be subjected to severe stresses due to particular features in the design, or where it is desired to make provision for exceptional loaded or ballast conditions. In such cases, particulars are to be submitted for consideration.

1.1.7 When longitudinal strength calculations have been required, loading guidance information is supplied to the Master by means of a Loading Manual and in addition, when required, by means of a loading instrument.

1.1.8 The Rules are framed on the understanding that ships will not be operated in environmental conditions more severe than those agreed for the design basis and approval, without the prior agreement of LR.

1.1.9 For ships, the arrangements and equipment of which are required to comply with the requirements of the:

- Load Line Convention;
- International Convention for the Safety of Life at Sea, 1974 and its Protocol of 1978;
- International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto;
- International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code);
- International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code);

and applicable Amendments thereto, the Committee requires the applicable Convention Certificates to be issued by a National Administration, or by LR, or by an IACS Member when so authorized. Safety Management Certificates in accordance with the provisions of the International Safety Management Code (ISM Code) may be issued by an organization complying with IMO Resolution A.739(18) and authorized by the National Authority with which the ship is registered. Cargo Ship Radio Certificates may be issued by an organization authorized by the National Authority with which the ship is registered. In the case of dual-classed ships, Convention Certificates may be issued by the other Society with which the ship is classed provided this is recognized in a formal Dual Class Agreement with LR and provided the other Society is also authorized by the National Authority.

1.1.10 Where an onboard computer system having longitudinal strength computation capability, which is required by the Rules, is provided on a new ship, or newly installed on an existing ship, then the system is to be certified in respect of longitudinal strength in accordance with LR's document entitled *Approval of Longitudinal Strength and Stability Calculation Programs*, see also Pt 3, Ch 4.8.

1.1.11 Where an onboard computer system having stability computation capability is provided on a new ship, then the system is to be certified in respect of stability aspects in accordance with LR's document entitled, *Approval of Longitudinal Strength and Stability Calculation Programs*. When provided, an onboard computer system having stability computation capability is to carry out the calculations and checks necessary to assess compliance with all the stability requirements applicable to the ship on which it is installed.

1.2 Advisory services

1.2.1 The Rules do not cover certain technical characteristics, such as stability, trim, hull vibration, etc., but the Committee is willing to advise on such matters although it cannot assume responsibility for them.

1.2.2 Where a vessel is so badly damaged that class has to be suspended, LR is prepared to assist the Owner with advice if requested.

■ **Section 2**
Character of classification and class notations

2.1 Definitions

NOTE
For the purpose of class notations, the definitions given in 2.1.1 to 2.1.11 will apply.

2.1.1 **Clear water.** Water having sufficient depth to permit the normal development of wind generated waves.

2.1.2 **Fetch.** The extent of clear water across which a wind has blown before reaching the ship.

2.1.3 **Sheltered water.** Water where the fetch is six nautical miles or less.

2.1.4 **Reasonable weather.** Wind strengths of force six or less in the Beaufort scale, associated with sea states sufficiently moderate to ensure that green water is taken on board the ship's deck at infrequent intervals only or not at all.

2.1.5 **Type notation.** A notation indicating that the ship has been arranged and constructed in compliance with particular Rules intended to apply to that type of ship, e.g. dredger.

2.1.6 **Cargo notation.** A notation indicating that the ship has been designed, modified or arranged to carry one or more particular cargoes, e.g. sulphuric acid. Ships with one or more particular cargo notations are not thereby prevented from carrying other cargoes for which they are suitable.

2.1.7 **Special duties notation.** A notation indicating that the ship has been designed, modified or arranged for special duties other than those implied by the type and cargo notations, e.g. research. Ships with special duties notations are not thereby prevented from performing any other duties for which they may be suitable.

2.1.8 **ShipRight notation.** A notation indicating that one or more of LR's ShipRight procedures have been satisfactorily followed. Class notations or descriptive notes will be assigned according to whether the ShipRight procedures are applied on a mandatory or voluntary basis, i.e.:

- (a) The procedures relating to the design and construction of the hull are mandatory for the classification of large and structurally complex ships. In such cases, the associated ShipRight notation is assigned as a class notation and will appear in column 4 of the *Register Book*, see 2.3.16. When these procedures are applied on a voluntary basis, then the associated ShipRight notation is assigned as a descriptive note and will appear in column 6 of the *Register Book*, see 2.7.
- (b) The remaining ShipRight procedures are voluntary for the purposes of classification, and are assigned as descriptive notes and will appear in column 6 of the *Register Book*, see 2.7.3.

2.1.9 **Special features notation.** A notation indicating that the ship incorporates special features which significantly affect the design, e.g. movable decks.

2.1.10 **Service restriction notation.** A notation indicating that a ship has been classed on the understanding that it will be operated only in suitable areas or conditions which have been agreed by the Committee, e.g. protected waters service.

2.1.11 **Linked** means connected, while in operation, to an attendant ship (which may be on shore, submerged or afloat) by a restraining line, suspension cable or umbilical cord.

2.2 Character symbols

2.2.1 All ships, when classed, will be assigned one or more character symbols as applicable. For the majority of ships, the character assigned will be **100A1** or **⊠ 100A1**.

2.2.2 A full list of character symbols for which ships may be eligible is as follows:

- ⊠ This distinguishing mark will be assigned, at the time of classing, to new ships constructed under LR's Special Survey, in compliance with the Rules, and to the satisfaction of the Committee.
- This distinguishing mark will be assigned, at the time of classing, to new ships constructed under LR's Special Survey in accordance with plans approved by another recognized classification society.
- 100** This character figure will be assigned to all ships considered suitable for sea-going service.

A This character letter will be assigned to all ships which have been built or accepted into class in accordance with LR's Rules and Regulations, and which are maintained in good and efficient condition.

1 This character figure will be assigned to:

- Ships having on board, in good and efficient condition, anchoring and/or mooring equipment in accordance with the Rules.
- Ships classed for a special service, having on board, in good and efficient condition, anchoring and/or mooring equipment approved by the Committee as suitable and sufficient for the particular service.

N This character letter will be assigned to ships on which the Committee has agreed that anchoring and mooring equipment need not be fitted in view of their particular service.

T This character letter will be assigned to ships which are intended to perform their primary designed service function only while they are anchored, moored, towed or linked, and which have, in good and efficient condition, adequately attached anchoring, mooring, towing or linking equipment which has been approved by the Committee as suitable and sufficient for the intended service.

2.2.3 For classification purposes, the character figure **1**, or either of the character letters **N** or **T**, is to be assigned.

2.2.4 In cases where the anchoring and/or mooring equipment is found to be seriously deficient in quality or quantity, the class of the ship will be liable to be withheld.

2.3 Class notations (hull)

2.3.1 When considered necessary by the Committee, or when requested by an Owner and agreed by the Committee, a class notation will be appended to the character of classification assigned to the ship. This class notation will consist of one of, or a combination of: a type notation, a cargo notation, a special duties notation, a special features notation and/or a service restriction notation, e.g. 'A100A1 Oil Tanker F.P. exceeding 60°C in No. 4 tanks ESP Baltic Service Ice Class 1B'.

2.3.2 Details of the ship types and particular cargoes for which special Rules apply are given in those Chapters of Parts 3, 4 and 7 which apply to such ships and cargoes.

2.3.3 Details of the more common special features and the conditions relevant to the assignment of special features notations, together with the form of such notations, are incorporated in Parts 3, 4 and 7 as applicable.

2.3.4 Service restriction notations will generally be assigned in one of the forms shown in 2.3.6 to 2.3.10, but this does not preclude Owners or Shipbuilders requesting special consideration for other forms in unusual cases.

2.3.5 Where a service notation is applicable, certain exemptions may be granted. Where these affect statutory requirements, such as Load Lines, the Owner or shipbuilder is to obtain the authorisation of the flag state. Such exemptions are to be recorded on the Class certificate and any applicable statutory certificate.

2.3.6 **Protected waters service.** Service in sheltered waters adjacent to sand banks, reefs, breakwaters or other coastal features, and in sheltered waters between islands, e.g. 'Protected Waters Service at Storebaelt Bridge'.

2.3.7 **Extended protected waters service.** Service in protected waters and also for short distances (generally less than 15 nautical miles) beyond protected waters in 'reasonable weather', e.g. 'Extended Protected Waters Service from the Port of Lagos'.

2.3.8 **Specified coastal service.** Service along a coast, the geographical limits of which will be indicated in the *Register Book*, and for a distance out to sea generally not exceeding 21 nautical miles, unless some other distance is specified for 'coastal service' by the Administration with which the ship is registered, or by the Administration of the coast off which it is operating, as applicable, e.g. 'Indonesian coastal service'.

2.3.9 **Specified route service.** Service between two or more ports or other geographical features which will be indicated in the *Register Book*, e.g. 'London to Rotterdam service' 'London, Rotterdam and Hamburg service'.

2.3.10 **Specified operating area service.** Service within one or more geographical area(s) which will be indicated in the *Register Book*, e.g. 'Pacific Tropical Zone service' 'Great Lakes and St. Lawrence to Pt. du Monts service' 'Red Sea, Eastern Mediterranean and Black Sea service'.

2.3.11 ***IWS.** This notation (In-water Survey) may be assigned to a ship where the applicable requirements of LR's Rules and Regulations are complied with, see Ch 3,4.3; Pt 3, Ch 1,5.2 and 5.3; Pt 3, Ch 2,3.5; Pt 3, Ch 13,2.8 and Pt 5, Ch 6,3.12.

2.3.12 **ESP.** This notation (Enhanced Survey Programme) will be assigned to oil tankers, combination carriers, chemical tankers, bulk carriers and ore carriers, as defined in Ch 3,1.5 which are subject to an enhanced survey programme as detailed in Ch 3, Sections 3, 6, 7 and 8.

2.3.13 **CSR.** This notation will be assigned to bulk carriers and double hull oil tankers compliant with the *IACS Common Structural Rules*, see Pt 4, Ch 7,1.2.1 and Ch 9,1.2.1.

2.3.14 **ESN.** This notation (Enhanced Survivability Notation) will be assigned to non-**CSR** bulk carriers which are designed to withstand the individual flooding of all cargo holds, see Pt 4, Ch 7,1.3.2.

2.3.15 **LI.** This notation will be assigned where an approved loading instrument has been installed as a classification requirement.

2.3.16 **ShipRight notations.** The following notations are associated with LR's ShipRight procedures and may be assigned in conjunction with the **ShipRight** notation as considered appropriate by the Committee, on application from the Owners. The requirements pertaining to these notations and the (hull) ShipRight procedures are given in Pt 3, Ch 16.

ShipRight

SDA This notation (Structural Design Assessment) will be assigned when direct calculations in accordance with the ShipRight procedures have been applied.

ShipRight

FDA This notation (Fatigue Design Assessment) will be assigned when an appraisal has been made of the fatigue performance of the structure in accordance with the ShipRight procedures.

ShipRight

FDA plus This notation (Fatigue Design Assessment plus) will be assigned when an appraisal has been made for a higher level of fatigue performance than that made for the assignment of **ShipRight FDA**.

ShipRight

CM This notation (Construction Monitoring), which complements the **ShipRight SDA**, **ShipRight FDA** and **ShipRight FDA plus** notations, will be assigned when the controls in construction tolerances detailed in the ShipRight procedures have been applied and verified.

2.3.17 When **ShipRight SDA**, **ShipRight FDA** or **ShipRight FDA plus** are assigned, the precise technical conditions of the appraisal will be made available to Owners.

2.3.18 Where LR's ShipRight SDA procedure has been applied individually or where ShipRight SDA, ShipRight FDA or ShipRight FDA plus and ShipRight CM procedures have all been applied, whether on a voluntary or mandatory basis, these particular class notations will appear in column 4 of the *Register Book*.

2.4 Class notations (machinery)

2.4.1 The following class notations are associated with the machinery construction and arrangement, and may be assigned as considered appropriate by the Committee:

⊠ **LMC** This notation will be assigned when the propelling and essential auxiliary machinery have been constructed, installed and tested under LR's Special Survey and in accordance with LR's Rules and Regulations.

⊠ **LMC**

This notation will be assigned when the propelling and essential auxiliary machinery have been constructed under the survey of a recognized authority in accordance with the Rules and Regulations equivalent to those of LR. In addition, the whole of the machinery will be required to have been installed and tested under LR's Special Survey in accordance with LR's Rules and Regulations.

[⊠] **LMC**

This notation will be assigned when the propelling arrangements, steering systems, pressure vessels and the electrical equipment for essential systems have been constructed, installed and tested under LR's Special Survey and are in accordance with LR's Rules and Regulations. Other items of machinery for propulsion and electrical power generation including propulsion gearing arrangements and other auxiliary machinery for essential services that are in compliance with LR Rules and supplied with the manufacturer's certificate will be acceptable under this notation. The system arrangements of propelling and essential auxiliary machinery are required to be appraised by LR, and found to be acceptable to LR. See 2.8.2.

LMC

This notation (without ⊠) will be assigned when the propelling and essential auxiliary machinery have neither been constructed nor installed under LR's Special Survey but the existing machinery, its installation and arrangement, have been tested and found to be acceptable to LR. This notation is assigned to existing ships in service accepted or transferring into LR class.

MCH

This notation will be assigned when the propelling and essential auxiliary machinery has been installed and tested under LR's survey requirements and found to be acceptable to LR. Items of machinery and equipment for propelling and auxiliary machinery for essential services supplied with the manufacturer's certificate will be acceptable under this class notation. The system arrangements of propelling and essential auxiliary machinery are required to be appraised by LR, and found to be acceptable to LR. See 2.8.3.

IGS

This notation will be assigned when a ship intended for the carriage of oil in bulk, or for the carriage of liquid chemicals in bulk, is fitted with an approved system for producing gas for inerting the cargo tanks.

PMR

This notation will be assigned where the main propulsion systems are arranged such that, in the event of a single failure in equipment, the ship will retain not less than 50 per cent of the installed prime mover capacity and not less than 50 per cent of the installed propulsion systems. It also denotes that the installation has been arranged, installed and tested in accordance with LR Rules.

PMR*	This notation will be assigned where the main propulsion systems are arranged such that, in the event of a single failure in equipment, the ship will retain not less than 50 per cent of the installed prime mover capacity and not less than 50 per cent of the installed propulsion systems and where the machinery is installed in separate compartments such that, in the event of the loss of one compartment, the ship will retain availability of propulsion power. It also denotes that the installation has been arranged, installed and tested in accordance with LR Rules.	2.4.2	The following class notations are associated with the machinery control and automation, and may be assigned as considered appropriate by the Committee:
SMR	This notation will be assigned where the steering systems for manoeuvring are arranged so that steering capability will continue to be available in the event of a single failure in the steering gear equipment or loss of power supply or control system for any steering system. It also denotes that the installation has been arranged, installed and tested in accordance with LR Rules.	UMS	This notation may be assigned when the arrangements are such that the ship can be operated with the machinery spaces unattended. It denotes that the control engineering equipment has been arranged, installed and tested in accordance with LR's Rules, or is equivalent thereto.
SMR*	This notation will be assigned where the steering systems for manoeuvring are arranged so that steering capability will continue to be available in the event of a single failure in the steering gear equipment or loss of power supply or control system for any steering system and where the steering systems are installed in separate compartments such that, in the event of the loss of one compartment, steering capability will continue to be available. It also denotes that the installation has been arranged, installed and tested in accordance with LR Rules.	CCS	This notation may be assigned when the arrangements are such that the machinery may be operated with continuous supervision from a centralized control station. It denotes that the control engineering equipment has been arranged, installed and tested in accordance with LR's Rules, or is equivalent thereto.
PSMR	This notation will be assigned where the main propulsion and steering systems are configured such that, in the event of a single failure in equipment, the ship will retain not less than 50 per cent of the installed prime mover capacity and not less than 50 per cent of the installed propulsion systems and retain steering capability. It also denotes that the installation has been arranged, installed and tested in accordance with LR Rules.	ICC	This notation may be assigned when the arrangements are such that the control and supervision of ship operational functions are computer based. It denotes that the control engineering equipment has been arranged, installed and tested in accordance with LR's Rules, or is equivalent thereto.
PSMR*	This notation will be assigned where the main propulsion and steering systems are configured such that, in the event of a single failure in equipment, the ship will retain not less than 50 per cent of the installed prime mover capacity and not less than 50 per cent of the installed propulsion systems and retain steering capability. The propulsion and steering arrangements are to be installed in separate compartments such that in the event of the loss of one compartment, the ship will retain availability of propulsion power and manoeuvring capability. It also denotes that the installation has been arranged, installed and tested in accordance with LR Rules.	IP	This notation may be assigned to a ship classed with LR when the arrangements of the machinery are such that the propulsion equipment and all the essential auxiliary machinery is integrated with the power unit for operation under all normal sea-going and manoeuvring conditions. The system is to be bridge controlled and the propulsion equipment is to incorporate an emergency means of propulsion in the event of failure in the prime mover. It also denotes that the machinery and control equipment have been arranged, installed and tested in accordance with LR's Rules.
		IFP	This additional notation may be assigned where an integrated fire protection system is fitted to provide control and monitoring of all active fire protection and fixed fire extinguishing systems from a centralized fire-control station. It denotes that the integrated fire protection system has been arranged, installed and tested in accordance with LR's Rules, or is equivalent thereto.
		2.4.3	The following class notations are associated with dynamic positioning arrangements, and may be assigned as considered appropriate by the Committee:
		DP(CM)	This notation may be assigned when a ship is fitted with centralized remote manual controls for position keeping and with position reference system(s) and environmental sensor(s). It denotes that the machinery and control engineering equipment has been arranged, installed and tested in accordance with LR's Rules, or is equivalent thereto.

DP(AM) This notation may be assigned when a ship is fitted with automatic main and manual standby controls for position keeping and with position reference system(s) and environmental sensor(s). It denotes that the machinery and control engineering equipment has been arranged, installed and tested in accordance with LR's Rules, or is equivalent thereto.

DP(AA) This notation may be assigned when a ship is fitted with automatic main and automatic standby controls for position keeping and with position reference system(s) and environmental sensor(s). It denotes that the machinery and control engineering equipment has been arranged, installed and tested in accordance with LR's Rules, or is equivalent thereto.

DP(AAA) This notation may be assigned when a ship is fitted with automatic main and automatic standby controls for position keeping, together with an additional/emergency automatic control unit located in a separate compartment and with position reference systems and environmental sensors. It denotes that the machinery and control engineering equipment has been arranged, installed and tested in accordance with LR's Rules, or is equivalent thereto.

The foregoing dynamic positioning notations may be supplemented with a Performance Capability Rating (PCR). This rating indicates the calculated percentage of time that a ship is capable of holding heading and position under a standard set of environmental conditions (North Sea), see Pt 7, Ch 4.

2.4.4 The following class notations are associated with navigation safety, and may be assigned as considered appropriate by the Committee:

NAV1 This notation will be assigned when the bridge layout and level of equipment are such that the ship is considered suitable for safe periodic operation under the supervision of a single watchkeeper on the bridge. It denotes that the navigational installation has been arranged, installed and tested in accordance with LR's Rules, or is equivalent thereto.

IBS This additional notation will be assigned where an integrated bridge system is fitted to provide electronic chart display, track planning and automatic track following, centralized navigation information display, and bridge alarm management. It denotes that the integrated bridge system has been arranged, installed and tested in accordance with LR's Rules, or is equivalent thereto. For assignment of this notation, the layout of the bridge and the equipment on the bridge are to satisfy the requirements for assignment of the notation **NAV1**. Where the layout of the bridge and the equipment located on the bridge satisfy the requirements of a relevant international or national ergonomic or

human centred design standard or an acceptable equivalent, compliance with the requirements of **NAV1** may be relaxed.

2.4.5 Machinery class notations will not be assigned to ships the hulls of which are not classed or intended to be classed with LR.

2.4.6 The notations \boxtimes LMC, $\overline{\boxtimes}$ LMC, $[\boxtimes]$ LMC, LMC (without \boxtimes) and MCH will in general not be assigned to non-propelled craft, but individual cases will be considered on their merits.

2.5 Class notations (refrigerated cargo installations (RMC), controlled atmosphere (CA) systems and carriage of refrigerated containers (CRC))

2.5.1 The following class notations may be assigned as considered appropriate by the Committee, on application from the Owners:

\boxtimes Lloyd's RMC This notation will be assigned when a refrigerated cargo installation has been constructed, installed and tested under LR's Special Survey and in accordance with the relevant requirements of the Rules.

Lloyd's RMC This notation will be assigned when the arrangements of the refrigerated cargo installation have been found to be equivalent to Rule requirements, and the installation has been tested in accordance with the relevant requirements of the Rules.

‡ This symbol will be assigned to installations considered suitable for the carriage of fruit. It indicates that the following parameters have been assessed and found satisfactory:

- (a) The rate of air circulation and the air refreshing arrangements through the refrigerated spaces or chambers, or to containers.
- (b) The temperature controls and monitoring arrangements.
- (c) The installation's capability to cool down a complete cargo of fruit to its carrying temperature within a specified time. The symbol will also be assigned to fishing vessels that have the refrigerating capacity to freeze down their catch.

\boxtimes Lloyd's RMC (LG) This notation will be assigned to a classed liquefied gas carrier or tanker, in which reliquefaction or refrigeration equipment is approved and fitted for cargo temperature and pressure control where the equipment has been constructed, installed and tested in accordance with the relevant requirements of the Rules.

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Part 1, Chapter 2

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Lloyd's

RMC (LG) This notation will be assigned to a classed liquefied gas carrier or tanker, in which reliquefaction or refrigeration equipment is fitted for cargo temperature and pressure control, where the equipment has been found equivalent to Rule requirements and tested in accordance with the relevant requirements of the Rules.

2.5.2 The following class notations are associated with controlled atmospheres and may be assigned as considered appropriate by the Committee, on application from Owners, see also Pt 7, Ch 1:

(CA) This notation may be assigned when a ship is fitted with arrangements for maintaining airtightness in CA zones and for the ready connection to a gas system in accordance with the relevant requirements of the Rules.

CA (%O₂, %CO₂) This notation may be assigned when a ship is provided with a CA system which will achieve and maintain specified ranges of oxygen and carbon dioxide levels in accordance with the relevant requirements of the Rules.

RH This notation may be assigned when a ship can maintain a specified relative humidity in the CA zones.

Before assignment of any of the above notations it is a prerequisite that the refrigeration installation is assigned an **RMC** class notation.

2.5.3 The following class notation is associated with the carriage of refrigerated cargo containers and may be assigned as considered appropriate by the Committee, on application from Owners, see also Pt 7, Ch 10:

⊠ CRC This notation may be assigned when a ship is provided with a ventilation system which is approved, installed and tested in accordance with the relevant requirements of the Rules.

2.5.4 The class notation assigned will additionally specify the temperature conditions and other relevant characteristics for which the equipment has been approved, see Pt 6, Ch 3.

2.5.5 The class notation assigned will be maintained as long as the installation is found, at the prescribed Periodical Surveys, to be in a fit and efficient condition, and in accordance with the requirements of the Rules.

2.5.6 The Committee will give consideration to ships engaged on voyages of short duration, to installations of small capacity, or to other special circumstances. In such cases the class may include a service limitation or other restriction.

2.5.7 Refrigerating installations designed to supply refrigerated air to insulated containers in ships' holds aboard container ships, are eligible for classification. The installation is to include the refrigerating machinery, supply and return air ducting, and the flexible couplings between containers and the duct system. Where the arrangements are such that cell air conditioning is essential to the carriage of the containers, the air conditioning equipment and/or insulation of the hold, deckheads, sides and tank tops are to be included in the classification.

2.5.8 Other methods of carrying refrigerated cargoes in containers aboard container ships will be considered for classification on application.

2.6 Class notations (Environmental Protection)

2.6.1 The following class notations are associated with the design and operation of a ship and may be assigned as considered appropriate by the Committee, on application from the Owners:

EP This notation will be assigned when a ship is designed and operated in accordance with the relevant requirements of the Rules.

EP This notation will be assigned when the environmental protection arrangements are in accordance with the requirements of another recognized classification society and are essentially equivalent to Rule requirements and the ship is operated in accordance with the relevant requirements of the Rules.

2.6.2 The class notations defined in 2.6.1 will be suspended on change of Owner or Manager until LR can confirm by audit that the necessary operational procedures required by the Rules are established.

2.7 Descriptive notes

2.7.1 In addition to any class notations, an appropriate descriptive note may be entered in column 6 of the *Register Book* indicating the type of ship in greater detail than is contained in the class notation, and/or providing additional information about the ship's design and construction. This descriptive note is not an LR class notation and is provided solely for the information of users of the *Register Book*.

2.7.2 Where evidence exists that supporting calculations have been performed in accordance with hull structural finite element and fatigue analysis procedures of a recognized Classification Society, then, on application from Owners, the descriptive note **ShipRight (E)** may be entered in column 6 of the *Register Book*.

2.7.3 Where LR's ShipRight procedures for the following have been applied on a voluntary basis, then a descriptive note will, at the Owner's request, be entered in column 6 of the *Register Book*, preceded by the word **ShipRight** (see also Pt 3, Ch 16 and Pt 5, Ch 21):

ES	Enhanced Scantlings
PCWBT(date)	Protection Coatings in Water Ballast Tanks
SEA(Hss-n)	Ship Event Analysis (Hull Surveillance Systems)
SERS	Ship Emergency Response Service
SCM	Screwshaft Condition Monitoring
TCM	Main Steam Turbine Condition Monitoring
MCM	Machinery Condition Monitoring
HPMS	Hull Planned Maintenance Scheme
MPMS	Machinery Planned Maintenance Scheme
RCM	Reliability Centred Maintenance
BWMP	Ballast Water Management Plan

2.7.4 Where an approved loading instrument is provided as an Owner's requirement, a descriptive note **LI** may be entered in column 6 of the *Register Book*.

2.8 Application notes

2.8.1 **Propelling and essential auxiliary machinery** includes machinery, equipment and systems installed for the ship to be under seagoing conditions and that are necessary for the following:

- (a) Maintaining the watertight and weathertight integrity of the hull and spaces within the hull.
- (b) The safety of the ship, machinery and personnel on board.
- (c) The functioning and dependability of propulsion, steering and electrical systems.
- (d) The operation and functioning of control engineering systems for the monitoring and safety of propulsion and steering systems.
- (e) The operation and functioning of emergency machinery and equipment.

2.8.2 **Manufacturer's certificate** for assignment of the [X]LMC notation. Acceptance of the manufacturer's certificate for items of machinery for propulsion (including propulsion gearing with single input/output arrangements) and for electrical power generation and for other auxiliary machinery for essential services is subject to the following:

- (a) The ship is a cargo ship of less than 500 gross tonnage or is a ship of 500 gross tonnage or greater and is not required to comply with international conventions applicable to a ship with unrestricted service.
- (b) Propulsion power is provided by oil engines or gas turbines which have been type approved to LR requirements for marine application.
- (c) Electrical power is provided by generators driven by oil engines or gas turbines which have been type approved to LR requirements for marine application.
- (d) The design and manufacture standards for all machinery and associated systems are the applicable LR Rules.
- (e) The machinery and equipment is manufactured under a recognized quality control system.

- (f) Propellers, propulsion shafting and multiple input/output gearboxes are not included within the scope of propulsion arrangements for acceptance of a manufacturer's certificate.

2.8.3 **Manufacturer's certificate** for assignment of the **MCH** notation. Acceptance of the manufacturer's certificate for propelling and essential auxiliary machinery is subject to the following:

- (a) The ship is a cargo ship of less than 500 gross tonnage or is a ship of 500 gross tonnage or greater and is not required to comply with the international conventions applicable to a ship with unrestricted service.
- (b) Propulsion power is provided by oil engines or gas turbines which have been type approved to LR requirements for marine application.
- (c) Electrical power is provided by generators driven by oil engines or gas turbines which have been type approved to LR requirements for marine application.
- (d) The power of any engine or gas turbine is less than 2,250 kW and the cylinder bore or any diesel engine is not greater than 300 mm.
- (e) The design and manufacture standards for machinery and associated systems are the applicable LR Rules or other marine standards acceptable to LR.
- (f) The machinery and equipment is manufactured under a recognized quality control system.

■ **Section 3**
Surveys – General

3.1 Statutory surveys

3.1.1 The Committee will act, when authorized on behalf of Governments, in respect of National and International statutory safety and other requirements for passenger and cargo ships.

3.1.2 The Committee will also act, when authorized, in respect of National Safety and other requirements relating to ships used for offshore mineral exploration and exploitation.

3.2 New construction surveys

3.2.1 When it is intended to build a ship for classification with LR, constructional plans and all necessary particulars relevant to the hull, equipment and machinery, as detailed in the Rules, are to be submitted for the approval of the Committee before the work is commenced. Any subsequent modifications or additions to the scantlings, arrangements or equipment shown on the approved plans are also to be submitted for approval.

3.2.2 Where the proposed construction of any part of the hull or machinery is of novel design, or involves the use of unusual material, or where experience, in the opinion of the Committee, has not sufficiently justified the principle or mode of application involved, special tests or examinations before and during service may be required. In such cases a suitable notation may be entered in the *Register Book*.

3.2.3 The materials used in the construction of hulls and machinery intended for classification are to be of good quality and free from defects and are to be tested in accordance with the requirements of the Rules for Materials (Part 2). The steel is to be manufactured by an approved process at works recognized by the Committee. Alternatively, tests to the satisfaction of the Committee will be required to demonstrate the suitability of the steel.

3.2.4 New ships intended for classification are to be built under LR's Special Survey. From the commencement of the work until the completion of the ship, the Surveyors are to be satisfied that the materials, workmanship and arrangements are satisfactory and in accordance with the Rules. Any items found not to be in accordance with the Rules or the approved plans, or any material, workmanship or arrangements found to be unsatisfactory, are to be rectified.

3.2.5 For compliance with 3.2.4, LR is prepared to consider methods of survey and inspection for hull construction which formally include procedures involving the shipyard management, organization and quality systems. The minimum requirements for the approval of any such proposed Quality Assurance methods are laid down in Pt 3, Ch 15.

3.2.6 Each offshore supply ship, offshore tug/supply ship, dredger, hopper dredger, sand carrier, hopper barge or reclamation craft, proceeding to sea is to comply with the draught and stability requirements of the National Authority and is to have on board sufficient stability data to enable it to be properly loaded and handled, or, where appropriate, to be properly towed. This data is to take full account of any intended special distribution or concentration of loading. In the case of an unmanned ship under tow, the data is to be made available to the tug master.

3.2.7 Copies of approved plans (showing the ship as built), essential certificates and records, required loading and other instruction manuals are to be readily available for use when required by LR's Surveyors, and may be required to be kept on board.

3.2.8 When the machinery is constructed under LR's Special Survey, this survey is to relate to the period from the commencement of the work until the final test under working conditions. Any items found not to be in accordance with the Rules or the approved plans, or any material, workmanship or arrangements found to be unsatisfactory, are to be rectified.

3.2.9 When arrangements are such that essential machinery can be operated by remote and/or automatic control equipment, the control equipment is to be arranged, installed and tested in accordance with LR's Rules and Regulations.

3.2.10 The date of completion of the Special Survey during construction of ships built under LR's inspection will normally be taken as the date of build to be entered in the *Register Book*. If the period between launching and commissioning is, for any reason, unduly prolonged, the dates of launching and completion or commissioning may be separately indicated in the *Register Book*.

3.2.11 When a ship, upon completion, is not immediately commissioned but is laid-up for a period, the Committee, upon application by the Owner, prior to the ship proceeding to sea, will direct an examination to be made by LR's Surveyors which may include a survey in dry-dock. If, as the result of such a survey, the hull and machinery be reported in all respects free from deterioration, the subsequent Special Survey and Complete Survey of the machinery will date from the time of such examination.

3.3 Existing ships

3.3.1 **Classification of ships not built under survey.** The requirements of the Committee for the classification of ships which have not been built under LR's Survey are indicated in Ch 3,19. Special consideration will be given to ships transferring class to LR from another recognized Classification Society.

3.3.2 **Reclassification.** When reclassification or class reinstatement is desired for a ship for which the class previously assigned by LR has been withdrawn or suspended, the Committee will direct that a survey, appropriate to the age of the ship and the circumstances of the case, be carried out by LR's Surveyors. If, at such a survey, the ship be found or placed in a good and efficient condition in accordance with the requirements of the Rules and Regulations, the Committee will be prepared to consider reinstatement of the original class or the assignment of such other class as may be deemed necessary.

3.3.3 A similar arrangement will apply in the case of reclassification of refrigerated cargo installations.

3.3.4 The Committee reserves the right to decline an application for classification or reclassification where the prior history or condition of the ship indicates this to be appropriate.

3.4 Damages, repairs and alterations

3.4.1 All repairs to hull, equipment and machinery which may be required in order that a ship may retain her class, (see 1.1.5), are to be carried out to the satisfaction of LR's Surveyors. When repairs are effected at a port, terminal or location where the services of a Surveyor to LR are not available, the repairs are to be surveyed by one of LR's Surveyors at the earliest opportunity thereafter.

3.4.2 When, at any survey, the Surveyors consider repairs to be immediately necessary, either as a result of damage, or wear and tear, they are to communicate their recommendations at once to the Owner, or his representative. When such recommendations are not complied with, immediate notification is to be given to the Committee by the Surveyors.

3.4.3 When, at any survey, it is found that any damage, defect or breakdown (see 1.1.5) is of a nature that does not require immediate permanent repair, but is sufficiently serious to require rectification by a prescribed date in order to maintain class, a suitable condition of class is to be imposed by the Surveyors and recommended to the Committee for consideration.

3.4.4 If a ship which is classed with LR is to leave harbour limits or protected waters under tow, the Owner is to advise LR of the circumstances prior to her departure.

3.4.5 If a ship which is classed with LR is taken in tow whilst at sea, the Owner is to advise LR of the circumstances at the first practicable opportunity.

3.4.6 Plans and particulars of any proposed alterations to the approved scantlings and arrangements of hull, equipment, or machinery are to be submitted for approval, and such alterations are to be carried out to the satisfaction of LR's Surveyors.

3.5 Existing ships – Periodical Surveys

3.5.1 Annual Surveys are to be held on all ships within three months, before or after each anniversary of the completion, commissioning or Special Survey in accordance with the requirements given in Chapter 3. The date of the last Annual Survey will be recorded on the ClassDirect Live website.

3.5.2 Intermediate Surveys are to be held on all ships instead of the second or third Annual Survey after completion, commissioning or Special Survey. The Intermediate Survey may be commenced at the second Annual Survey and progressed with completion at the third Annual Survey. The date of the last Intermediate Survey will be recorded on the ClassDirect Live website.

3.5.3 The Owner should notify LR whenever a ship can be examined in dry-dock or on a slipway. A minimum of two Docking Surveys are to be held in each five-year Special Survey period and the maximum interval between successive Docking Surveys is not to exceed three years. One of the two Docking Surveys required in each five year period is to coincide with the Special Survey. Consideration may be given in exceptional circumstances to an extension of this interval not exceeding three months beyond the due date. The Committee may accept an In-water Survey in lieu of the intermediate docking between Special Surveys, see Ch 3, 4.3.

An In-water Survey shall not be permitted for ships over 15 years of age that are assigned the notation **ESP**. A Docking Survey is considered to coincide with the Special Survey when held within the 15 months prior to the due date of the Special Survey.

Where the Special Survey of the hull is carried out on a Continuous Survey basis, as given in 3.5.14, the survey in dry-dock may be held at any time within the five-year cycle.

In this context 'exceptional circumstances' means unavailability of dry-docking facilities, repair facilities, essential materials, equipment or spare parts or delays incurred by action taken to avoid severe weather conditions.

3.5.4 The interval between dry-dockings for ships operating in fresh water and for certain non-self-propelled craft may be greater than that given in 3.5.3.

3.5.5 Attention is to be given to any relevant statutory requirements of the National Authority of the country in which the ship is registered.

3.5.6 The date of the last examination in dry-dock or on a slipway will be recorded on the ClassDirect Live website.

3.5.7 As an alternative to Annual Surveys and Docking Surveys, according to 3.5.1 and 3.5.3 respectively, ships classed '100A1 shipborne barge' may be subjected to Intermediate Surveys. These surveys become due 30 months after the previous Special Survey. The survey is to be in accordance with the requirements given in Ch 3,2, as applicable. Intermediate Surveys are to be completed within three months of the due date.

3.5.8 Survey requirements for In-water Surveys are given in Ch 3,4.3. The date of the last In-water Survey will be recorded on the ClassDirect Live website.

3.5.9 All ships classed with LR are also to be subjected to Special Surveys in accordance with the requirements given in Chapter 3. These Surveys become due at five-yearly intervals, the first one five years from the date of build or date of Special Survey for Classification as recorded in the *Register Book*, and thereafter five years from the date recorded for the previous Special Survey. Consideration may be given at the discretion of the Committee to any exceptional circumstances justifying an extension of the hull classification to a maximum of three months beyond the fifth year. If an extension is agreed, the next period of hull classification will start from the due date of the Special Survey before the extension was granted. A definition of 'exceptional circumstances' is given in 3.5.3.

3.5.10 Where, on shipborne barges, Intermediate Surveys are permitted as an alternative to Annual and Docking Surveys, Special Surveys become due five years after the previous Special Survey.

3.5.11 Special Surveys may be commenced at the fourth Annual Survey after completion, commissioning, or previous Special Survey, and be progressed during the succeeding year with a view to completion by the due date of the Special Survey.

3.5.12 When Special Surveys are commenced prior to the fourth Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited towards the Special Survey.

3.5.13 Ships which have satisfactorily passed a Special Survey will have a record entered in the *Register Book* indicating the date and the notation **ESP** if this is applicable (see 2.3.12). Where the Special Survey is completed more than three months before the due date, the new record of Special Survey will be the final date of survey. In all other cases the date recorded will be the fifth anniversary.

Classification Regulations

Part 1, Chapter 2

Section 3

3.5.14 At the request of an Owner, the Committee may agree that the Special Survey of the hull, for ships other than general dry cargo ships, bulk carriers, combination carriers, chemical tankers and oil tankers, be carried out on the Continuous Survey basis, all compartments of the hull being opened for survey and testing, in rotation, with an interval of five years between consecutive examinations of each part. In general, approximately one fifth of the Special Survey is to be completed each year and all the requirements of the particular hull Special Survey must be completed at the end of the five year cycle. For examination of items listed in Ch 3,2.2.19 to 2.2.20, 2.2.24 and Ch 3,3.2.6, 3.2.7 and 3.2.9, the intervals for inspection will require to be specially agreed. For ships more than 10 years of age, an examination of the ballast tanks is to be carried out twice in each five year cycle, i.e. once within the scope of the Intermediate Survey and once within the scope of the Continuous Survey. Ships which have satisfactorily completed the cycle will have a record entered in the *Register Book* indicating the date of completion which will not be later than five years from the last assigned date of Complete Survey of the hull. The agreement for surveys to be carried out on Continuous Survey basis may be withdrawn at the discretion of the Committee.

3.5.15 Machinery is to be submitted to the surveys detailed in Ch 3,11 to 17.

3.5.16 Complete Surveys of machinery become due at five-yearly intervals, the first one five years from the date of build or date of first classification as recorded in the *Register Book*, and thereafter five years from the date recorded for the previous Complete Survey. Consideration can be given at the discretion of the Committee to any exceptional circumstances justifying an extension of machinery class to a maximum of three months beyond the fifth year. If an extension is agreed, the next period of machinery class will start from the due date of Complete Survey of machinery before extension was granted. Surveys which are commenced prior to their due date are not to extend over a period greater than 12 months, except with the prior approval of the Committee. Where the complete survey is completed more than three months before the due date, the recorded date of completion will be the final date of survey. In all other cases the date recorded will be the fifth anniversary.

3.5.17 Upon application by an Owner, the Committee may agree to an extension of the survey requirements for main engines, which, by the nature of the ship's normal service, do not attain the number of running hours recommended by the engines' manufacturer for major overhauls within the survey periods given in 3.5.16.

3.5.18 If it is found desirable that any part of the machinery should be examined again before the due date of the next survey, a certificate for a limited period will be granted in accordance with the nature of the case.

3.5.19 When, at the request of an Owner, it has been agreed by the Committee that the Complete Survey of the machinery may be carried out on the Continuous Survey basis, the various items of machinery are to be opened for survey in rotation, as far as practicable, to ensure that the interval between consecutive examinations of each item will not exceed five years. In general, approximately one-fifth of the machinery is to be examined each year.

3.5.20 If any examination during Continuous Survey reveals defects, further parts are to be opened up and examined as considered necessary by the Surveyor, and the defects are to be made good to his satisfaction.

3.5.21 Upon application by an Owner, the Committee may agree to an arrangement whereby, subject to certain conditions, some items of machinery may be examined by the Chief Engineer of the ship at ports where LR is not represented, or, where practicable, at sea, followed by a limited confirmatory survey carried out at the next port of call where an Exclusive Surveyor is available. Particulars of this arrangement may be obtained from LR's Headquarters. Where an approved planned maintenance scheme is in operation the confirmatory surveys may be held at annual intervals, at which time the records will be checked and the operation of the scheme verified. Particulars of this arrangement may be obtained from any of LR's Offices.

3.5.22 Where condition monitoring equipment is fitted, the Committee, upon application by the Owner, will be prepared to amend applicable Periodical Survey requirements where details of the equipment are submitted and found satisfactory. Where machinery installations are accepted for this method of survey, it will be a requirement that an Annual Survey be held, at which time monitored records will be analyzed and the machinery examined under working conditions. An acceptable lubricating oil trend analysis programme may be required as part of the condition monitoring procedures.

3.5.23 Boiler Surveys, examination of steam pipes and Screwshaft Surveys are to be carried out as stated in Ch 3,15 to 17.

3.5.24 Where any inert gas system is fitted for the protection of cargo tanks on board a ship intended for the carriage of oil or liquid chemicals in bulk, the system is to be surveyed annually in accordance with the requirements of Ch 3,2.2.22. In addition, on ships to which an **IGS** notation has been assigned, a Special Survey of the inert gas plant is to be carried out at intervals not exceeding five years, in accordance with the requirements of Ch 3,18.

3.5.25 Where the ship is fitted with classed dynamic positioning equipment, the system is to be examined annually in accordance with the requirements of Ch 3,2.2.16. In addition, a Special Survey is to be carried out at intervals not exceeding five years in accordance with Ch 3,11.2.9.

3.5.26 Where the ship is fitted with a classed refrigerated cargo installation, the installation is to be surveyed annually in accordance with the requirements of Ch 3,20.1. In addition, a Special Survey is to be carried out at intervals not exceeding five years in accordance with the requirements of Ch 3,20.2. At the request of the Owner, consideration will be given to the Survey of the installation being carried out on the Continuous Survey basis.

3.5.27 Where the ship is fitted with a classed refrigerated cargo installation, a Loading Port Survey, as detailed in Ch 3,20.4, may be carried out at the request of the Owner. On completion, a certificate will be issued recording, in addition to other details, the temperatures in the various refrigerated spaces at the time of the survey. The certificate issued by LR is not in respect of the cargo to be loaded or the manner in which it is to be stowed. A Loading Port Survey is not mandatory for classification, but may be carried out concurrently with the Annual, Continuous or Special Surveys if so desired.

3.6 Certificates

3.6.1 When the required reports, on completion of the survey of new or existing ships which have been submitted for classification, have been received from the Surveyors and approved by the Committee, a certificate of First Entry of Classification, signed by the Chairman, or the Deputy Chairman and Chairman of the Sub-Committee of Classification, will be issued to Builders or Owners.

3.6.2 A Certificate of Class valid for five years subject to endorsement for Annual and Intermediate Surveys will also be issued to the Owners.

3.6.3 LR's Surveyors are permitted to issue provisional (interim) certificates to enable a ship classed with LR to proceed on her voyage (or to continue her service in the case of a fixed or tethered ship) provided that in their opinion it is in a fit and efficient condition. Such certificates will embody the Surveyors' recommendations for continuance of class, but in all cases are subject to confirmation by the Committee.

3.6.4 The full class notation and abbreviated descriptive notes shall be stated on the Certificate of Class and provisional (interim) certificate.

3.7 Notice of surveys

3.7.1 It is the responsibility of the Owners to ensure that all surveys necessary for the maintenance of class are carried out at the proper time and in accordance with the instructions of the Committee. Information is available to Owners on the ClassDirect Live website.

3.7.2 LR will give timely notice to an Owner about forthcoming surveys by means of a letter or a computer printout of a ship's Quarterly Listing of Surveys, Conditions of Class and Memoranda. The omission of such notice, however, does not absolve the Owner from his responsibility to comply with LR's survey requirements for maintenance of class, all of which are available to Owners on the ClassDirect Live website.

3.8 Withdrawal/Suspension of class

3.8.1 When the class of a ship, for which the Regulations as regards surveys on hull, equipment and machinery have been complied with, is withdrawn by the Committee in consequence of a request from the Owner the notation 'Class withdrawn at Owner's request' (with date) will be assigned.

3.8.2 When the Regulations as regards surveys on hull, equipment or machinery have not been complied with and the ship is thereby not entitled to retain class, the class will be suspended or withdrawn, at the discretion of the Committee, and a corresponding notation will be assigned.

3.8.3 Class will be automatically suspended and the Certificate of Class will become invalid if the Annual or Intermediate Survey is not completed within three months of the due date of the survey.

3.8.4 Class will be automatically suspended from the expiry date of the Certificate of Class in the event that the Special Survey has not been completed by the due date and an extension has not been agreed (see 3.5.9), or is not under attendance by the Surveyors with a view to completion prior to resuming trading.

3.8.5 When, in accordance with 3.4.3 of the Regulations, a condition of class is imposed, this will be assigned a due date for completion and the ship's class will be subject to a suspension procedure if the condition of class is not dealt with, or postponed by agreement, by the due date.

3.8.6 When it is found, from the reported condition of the hull or equipment or machinery of a ship, that an Owner has failed to comply with Regulations 1.1.5, 1.1.9, 3.4.1 or 3.4.5, the class will be liable to be suspended or withdrawn, at the discretion of the Committee, and a corresponding notation assigned. When it is considered that an Owner's failure to comply with these requirements is sufficiently serious, the suspension or withdrawal of class may be extended to include other ships controlled by the same Owner, at the discretion of the Committee.

3.8.7 When any ship proceeds to sea with less freeboard than that approved by the Committee, or when the freeboard marks are placed higher on the sides of the ship than the position assigned or approved by the Committee, or, in cases of ships where freeboards are not assigned, the draught is greater than that approved by the Committee, the class will be liable to be withdrawn or suspended.

3.8.8 When it is found that a specialized ship is being operated in a manner contrary to that agreed at the time of classification, or is being operated in environmental conditions which are more onerous or in areas other than those agreed by the Committee, the class will be liable to be automatically withdrawn or suspended.

3.8.9 Where a ship has been detained following a Port State Control inspection on two or more occasions in a two year period, with serious deficiencies found, then the class will be liable to be suspended or withdrawn, at the discretion of the Committee, and a corresponding notation will be assigned. In these cases, a period of notice, not exceeding 3 months, may be given prior to any suspension or withdrawal of class.

3.8.10 In all instances of class withdrawal or suspension, the assigned notation, with date of application, will appear in the *Register Book*. In cases where class has been suspended by the Committee and it becomes apparent that the Owners are no longer interested in retaining LR's class, the notation will be amended to withdrawn status. After class withdrawn status has been established in the *Register Book* for one year, it will be automatically amended to 'classed LR until' (with date).

3.8.11 For reclassification and reinstatement of class, see 3.3.2.

3.9 Appealing against Surveyors' recommendations

3.9.1 If the recommendations of LR's Surveyors are considered in any case to be unnecessary or unreasonable, an appeal may be made to the Committee, who may direct a Special Examination to be held.

3.10 Force majeure

3.10.1 If due to circumstances reasonably beyond the Owner's or LR's control, as defined below, the ship is not in a port when surveys become overdue the Committee may allow the ship to sail, in class, directly to an agreed discharge port and then, if necessary, in ballast to an agreed repair facility at which the survey can be completed. In this context 'Force Majeure' means damage to the ship, unforeseen inability of Surveyors to attend the ship due to governmental restrictions on right of access or movement of personnel, unforeseen delays in port or inability to discharge cargo due to unusually lengthy periods of severe weather, strikes, civil strife, acts of war or other force majeure.

3.11 Ownership details

3.11.1 It is the responsibility of each Owner to inform LR in writing of any change to its contact details and in the event of a ship sale to supply details of the new Owners. If the new Owner of a ship cannot be properly identified and the contact details established then the class of that ship will be specially considered by the Committee.

■ Section 4 **IACS QSCS Audits**

4.1 Audit of surveys

4.1.1 The surveys required by the Regulations may be subject to audit in accordance with the requirements of the International Association of Classification Societies Quality System Certification Scheme.

■ Section 5 **Approval/Type Testing/Quality Control System**

5.1 LR Type Approval – Marine Applications

5.1.1 LR Type Approval is an impartial certification system that provides independent third-party Type Approval Certificates attesting to a product's conformity with specific standards or specifications. It is based on design review and type testing or where testing is not appropriate, a design analysis.

5.1.2 The LR Type Approval System is a process whereby a product is assessed in accordance with a specification, standard or code to check that it meets the stated requirements and through selective testing demonstrates compliance with specific performance requirements. The testing is carried out on a prototype or randomly selected product(s) which are representative of the manufactured product under approval. Thereafter, the producer is required to use Quality Control procedures and processes to ensure that each item delivered is in conformity with that which has been Type Approved.

5.1.3 The selective testing required by 5.1.2 is to include environmental testing applicable to the product's installation on board a ship classed or intended to be classed with LR.

5.1.4 LR Type Approval does not remove the requirements for inspection and survey procedures required by the Rules for equipment to be installed in ships classed or intended to be classed with LR. Also, LR Type Approval does not remove the requirement for plan appraisal of a system that incorporates Type Approved equipment where required by the Rules.

5.1.5 LR Type Approval is subject to the understanding that the producer's recommendations and instructions for the product and any relevant requirements of the Rules for the Classification of Ships are fulfilled.

5.1.6 The producer supplying equipment or components under Quality Control procedures and processes is to have a recognized quality management system certified by an IACS member or Notified Body. The Quality Control procedures and processes are to address the production of the product consistent with 5.3.

5.1.7 Where equipment or components have been Type Approved in accordance with specifications and procedures other than LR's, details of the product, certification and testing are to be submitted for consideration where appropriate.

5.2 Type testing

5.2.1 Type testing is an impartial process that provides independent third-party verification that an item of machinery or equipment has satisfactorily undergone a functional type test.

5.2.2 Type testing is carried out against defined performance and test standards for a defined period of time with test conditions varying between minimum and maximum declared design conditions.

5.2.3 Type testing is carried out on a prototype or randomly selected product(s) which are representative of the manufactured product under assessment.

5.2.4 After type testing, mechanical equipment is to be opened out and inspected for damage or excessive wear.

5.2.5 On application from the manufacturer, type tests may be waived for equipment and machinery that has been proven to be reliable in marine service and where compliance with the current applicable standards can be demonstrated. Equipment and machinery that has been previously type tested with satisfactory testing evidence and certification need not have the type tests repeated where previous testing is in accordance with current testing standards.

5.2.6 The acceptance of type testing certification is subject to the understanding that the manufacturer's recommendations and instructions for the product and any relevant requirements of the applicable Rules are fulfilled.

5.3 Quality Control System

5.3.1 A quality control system for the purposes of LR acceptance of materials and machinery refers to a scheme that covers the operational techniques and activities that is used to demonstrate that the quality requirements for a product are in accordance with declared standards.

5.3.2 The quality control system for a particular product extends to all parties involved in the supply chain from manufacture and testing through to delivery of the product.

5.3.3 LR acceptance of machinery and equipment manufactured under a quality control scheme is dependent on the scheme being maintained through a traceable process involving planned audits and spot inspections at the discretion of LR Surveyors. The purpose of the audits and spot inspections is to ensure that the procedures for manufacture and quality control are being maintained in a satisfactory manner.

5.3.4 The use of a quality control system does not remove the requirements for inspection processes that may be required by the Rules applicable to the equipment being supplied with a manufacturer's certificate. Also the use of a quality control system does not remove the requirement for plan appraisal of equipment or systems where required by the Rules.

■ Section 6 Classification of machinery with [⊗] LMC or MCH notation

6.1 General

6.1.1 After delivery of machinery and equipment with the manufacturer's certificate to the shipyard, Survey at the Shipyard and Periodical Surveys are to be in accordance with the requirements for ships built or accepted into class with the ⊗ LMC notation.

6.2 Appraisal and records

6.2.1 To facilitate survey and compilation of classification records, plans and information required for a ship being accepted into class with the ⊗ LMC notation are to be submitted for appraisal and information. Plans are not required where machinery and equipment has previously been type approved; in these cases it is only necessary to submit details of the machinery and equipment together with details of previous approval.

6.3 Survey and inspection

6.3.1 The manufacturer's certificate for acceptance of machinery and equipment for assignment of the [⊗] LMC or MCH notation is to be in the English language and include the following information:

- (a) Design and manufacturing standard(s) used.
- (b) Materials used for construction of key components and their sources.
- (c) Details of the quality control system applied during design, manufacture and testing and of any software maintenance.
- (d) Details of any type approval or type testing.
- (e) Details of installation and testing recommendations for the machinery or equipment.

The manufacturer is to have a recognized quality management system certified by an IACS member or a Notified Body.

6.3.2 The installation and testing of machinery and equipment at the build yard which has been supplied with a manufacturer's certificate is to be in accordance with the requirements applicable to a ship having the ⊗ LMC notation.

Section

1	General
2	Annual Surveys – Hull and machinery requirements
3	Intermediate Surveys – Hull and machinery requirements
4	Docking Surveys and In-water Surveys – Hull and machinery requirements
5	Special Survey – General – Hull requirements
6	Special Survey – Bulk carriers – Hull requirements
7	Special Survey – Oil tankers (including ore/oil ships and ore/bulk/oil ships) – Hull requirements
8	Special Survey – Chemical tankers – Hull requirements
9	Ships for liquefied gases
10	Dredgers, hopper dredgers, sand carriers, hopper barges and reclamation craft
11	Machinery surveys – General requirements
12	Turbines and steam engines – Detailed requirements
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14	Electrical equipment
15	Boilers
16	Steam pipes
17	Screwshafts, tube shafts and propellers
18	Inert gas systems
19	Classification of ships not built under survey
20	Refrigerated cargo installations
21	Controlled atmosphere systems

■ Section 1 General

1.1 Frequency of surveys

1.1.1 The requirements of this Chapter are applicable to the Periodical Surveys set out in Ch 2,3.5. Except as amended at the discretion of the Committee, the periods between such surveys are as follows:

- (a) Annual Surveys, as required by Ch 2,3.5.1.
- (b) Intermediate Surveys, as required by Ch 2,3.5.2.
- (c) Docking Surveys, as required by Ch 2,3.5.3 and 3.5.4.
- (d) When ships classed **100A1 shipborne barge** are subjected to Intermediate Surveys, those surveys become due 30 months after the previous Special Survey, see Ch 2,3.5.7.
- (e) Special Surveys at five-yearly intervals, see Ch 2,3.5.9. For alternative arrangements, see also Ch 2,3.5.10, 3.5.11, 3.5.12 and 3.5.14.
- (f) Complete Surveys of machinery at five-yearly intervals, see Ch 2,3.5.16.

1.1.2 When it has been agreed that the complete survey of the hull and machinery may be carried out on the Continuous Survey basis, all compartments of the hull and all items of machinery are to be opened for survey in rotation to ensure that the interval between consecutive examinations of each part will not exceed five years, see Ch 2,3.5.14 and 3.5.19.

1.1.3 For the frequency of surveys of boilers, steam pipes, screwshafts, tube shafts, propellers and inert gas systems, see Sections 15 to 18.

1.1.4 For the requirements for surveys of refrigerated cargo installations, see Pt 6, Ch 3.

1.2 Surveys for damage or alterations

1.2.1 At any time when a ship is undergoing alterations or damage repairs, any exposed parts of the structure normally difficult to access are to be specially examined, e.g. if any part of the main or auxiliary machinery, including boilers, insulation or fittings, is removed for any reason, the steel structure in way is to be carefully examined by the Surveyor, or when cement in the bottom or covering on decks is removed, the plating in way is to be examined before the cement or covering is relaid.

1.3 Unscheduled surveys

1.3.1 In the event that Lloyd's Register (hereinafter referred to as LR) has cause to believe that its Rules and Regulations are not being complied with, LR reserves the right to perform unscheduled surveys of the hull or machinery.

1.3.2 In the event of significant damage or defect affecting any ship, LR serves the right to perform unscheduled surveys of the hull or machinery of other similar ships classed by LR and deemed to be vulnerable.

Periodical Survey Regulations

Part 1, Chapter 3

Section 1

1.4 Surveys for the issue of Convention certificates

1.4.1 Surveys are to be held by LR when so appointed, or by the Exclusive Surveyors to a National Administration or by an IACS Member when so authorized by the National Authority, or, in the case of Cargo Ship Safety Radio Certificates or Safety Management Certificates, by any organization authorized by the National Authority. In the case of dual classed ships, Convention Certificates may be issued by the other Society with which the ship is classed provided this is recognized in a formal Dual Class Agreement with LR and provided the other Society is also authorized by the National Authority.

1.5 Definitions

1.5.1 An **Oil Tanker** is a sea going self-propelled ship which is constructed generally with integral tanks and is intended primarily to carry oil in bulk and includes ship types such as combination carriers (ore/oil and ore/bulk/oil ships, etc.). Where referred to in this Chapter, it shall also include double hull oil tankers as well as tankers with alternative structural arrangements, e.g. mid-deck designs, except where specified.

1.5.2 A **Double Hull Oil Tanker** is a sea going self-propelled ship which is constructed primarily for the carriage of oil in bulk, where the cargo tanks are protected by a double hull extending for the entire length of the cargo area, consisting of double side and double bottom spaces for the carriage of salt-water ballast.

1.5.3 A **Bulk Carrier** is a sea going self-propelled ship which is constructed generally with single deck, double bottom, topside tanks and hopper side tanks and with single side skin construction in the cargo length area, and is intended primarily to carry dry cargo in bulk and includes ship types such as ore carriers. Where referred to in this Chapter, it shall also include double skin bulk carriers except where specified.

1.5.4 A **Double Skin Bulk Carrier** is a sea going self-propelled ship which is constructed generally with single deck, double bottom, topside tanks and hopper side tanks and with double side skin construction in the cargo length area (regardless of the width of the wing space), and is intended primarily to carry dry cargo in bulk and includes such types as ore carriers.

1.5.5 An **Ore Carrier** is a sea going self-propelled ship which is constructed generally with single deck, two longitudinal bulkheads and a double bottom throughout the cargo length area and intended primarily to carry ore cargoes in the centre holds only.

1.5.6 A **Chemical Tanker** is a sea going self-propelled ship constructed generally with integral tanks and being single or double hull construction, or having alternative structural arrangements, used primarily for the carriage in bulk of any liquid product listed in Chapter 17 of the *International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, IBC Code*.

1.5.7 A **Gas Carrier** is a cargo ship constructed or adapted and used for the carriage in bulk of any liquefied gas or other products of flammable nature listed in Chapter 19 of the *International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk*.

1.5.8 A **Ballast Tank** is a tank which is used solely for the carriage of salt-water ballast. For bulk carriers, a space which is used for both cargo and salt-water ballast will be treated as a salt-water ballast tank when substantial corrosion has been found in that space. For double skin bulk carriers, the double side tank is to be considered as a separate tank even if it is connected to either the topside or hopper side tank. For oil tankers and chemical tankers, a combined tank which is used for both cargo and salt-water ballast as a routine part of the ship's operation will be treated as a ballast tank. A cargo tank which in exceptional cases may carry salt-water ballast during severe weather conditions and is not designated as a combined cargo/ballast tank will be treated as a cargo tank.

1.5.9 **Spaces** are separate compartments such as holds and tanks.

1.5.10 An **Overall Survey** is a survey intended to report on the overall condition of the hull structure and to determine the extent of additional Close-up Surveys.

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

1.5.12 A **Transverse Section** includes all longitudinal members such as plating, longitudinals and girders at the deck, side, bottom, inner bottom, inner side, hopper side, top wing side and longitudinal bulkhead, where fitted. For transversely framed ships, a transverse section includes adjacent frames and their end connections in way of transverse sections.

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

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

1.5.15 **Substantial Corrosion** is wastage of individual plates and stiffeners in excess of 75 per cent of allowable margins, but within acceptable limits. For ships built in accordance with the Common Structural Rules (CSR), substantial corrosion is as an extent of corrosion such that the assessment of the corrosion pattern indicates a gauged (or measured) thickness between $t_{net} + 0,5 \text{ mm}$ and t_{net} .

1.5.16 **A Corrosion Prevention System** is normally considered a full hard protective coating. This is usually to be an epoxy coating or equivalent. Other systems (e.g. soft coatings) may be considered acceptable as alternatives provided they are applied and properly maintained in compliance with the manufacturer's specification.

1.5.17 For the application of requirements outlined in Sections 2, 3, 4 and 5, a general dry cargo ship is a self-propelled ship of 500 gross tonnes or above, constructed generally with a 'tween deck and intended to carry solid cargoes. This excludes bulk carriers, refrigerated cargo ships, roll on-roll off ships, livestock carriers, dock/deck ships and ships dedicated for the carriage of containers, forest products (but not log or timber carriers), wood chips and cement.

1.5.18 **Coating Condition** is defined as follows:

- GOOD condition with only minor spot rusting affecting not more than 20 per cent of areas under consideration, e.g. on a deck transverse, side transverse, on the total area of platings and stiffeners on the longitudinal structure between these components, etc.
- FAIR condition with local breakdown at edges of stiffeners and weld connections and/or light rusting affecting 20 per cent or more of areas under consideration.
- POOR condition with general breakdown of coating affecting 20 per cent or more of areas under consideration or hard scale affecting 10 per cent or more of area under consideration.

1.5.19 **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 class.

1.5.20 Bulk carriers with hybrid cargo hold arrangements are to have single skin cargo holds surveyed in accordance with the requirements for single skin bulk carriers and the double skin cargo holds surveyed in accordance with the requirements for double skin bulk carriers.

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

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

1.5.23 The **Cargo Area** or **Cargo Length Area** is that part of the ship which contains all cargo holds and adjacent areas including fuel tanks, cofferdams, ballast tanks and void spaces. For oil tankers and chemical tankers, the **Cargo Area** is that part of the ship which contains cargo tanks, slop tanks and cargo/ballast pump-rooms, cofferdams, ballast tanks and void spaces adjacent to cargo tanks and also deck areas throughout the entire length and breadth of the part of the ship over the above mentioned spaces.

1.6 Preparation for survey and means of access

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

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

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

1.6.4 Means are to be provided to enable the Surveyor to examine the structure in a safe and practical way.

1.6.5 For surveys, including close-up survey where applicable, in cargo spaces and ballast tanks, one or more of the following means of access, is to be provided:

- (a) Permanent staging and passages through structures.
- (b) Temporary staging and passages through structures.
- (c) Lifts and movable platforms.
- (d) Boats or rafts.
- (e) Other equivalent means.

Portable ladders may be used, at the discretion of the Surveyor, for survey of the hull structure of single skin bulk carriers, except for the close-up survey of cargo hold shell frames, see 1.6.6 and 1.6.7.

1.6.6 For close-up surveys of the cargo hold shell frames of single skin bulk carriers with a deadweight less than 100,000 tonnes, one or more of the following means of access is to be provided:

- (a) Permanent staging and passages through structures.
- (b) Temporary staging and passages through structures.
- (c) Portable ladder restricted to not more than 5 m in length may be accepted for surveys of the lower section of a shell frame including bracket.
- (d) Hydraulic arm vehicles such as conventional cherry pickers, lifts and movable platforms.
- (e) Boats or rafts, provided the structural capacity of the hold is sufficient to withstand static loads at all levels of water.
- (f) Other equivalent means.

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1.6.7 For close-up surveys of the cargo hold shell frames of single skin bulk carriers with a deadweight equal to or greater than 100,000 tonnes the use of portable ladders is not accepted and one or more of the following means of access, is to be provided:

- (a) At Annual Surveys, Intermediate Surveys held before the ship is 10 years old and Special Survey I:
 - (i) Permanent staging and passages through structures.
 - (ii) Temporary staging and passages through structures.
 - (iii) Hydraulic arm vehicles such as conventional cherry pickers, lifts and movable platforms.
 - (iv) Boats or rafts, provided the structural capacity of the hold is sufficient to withstand static loads at all levels of water.
 - (v) Other equivalent means.
- (b) At Special Survey II and all subsequent surveys:
 - (i) Either permanent or temporary staging and passage through structures for close-up survey of at least the upper part of hold frames.
 - (ii) Hydraulic arm vehicles such as conventional cherry pickers for surveys of lower and middle part of shell frames as alternative to staging.
 - (iii) Lifts and movable platforms.
 - (iv) Boats or rafts, provided the structural capacity of the hold is sufficient to withstand static loads at all levels of water.
 - (v) Other equivalent means.
- (c) Notwithstanding the above requirements, for single skin bulk carriers greater than 10 years old, at Annual Survey the use of a portable ladder fitted with a mechanical device to secure the upper end of the ladder is acceptable for the close-up survey of cargo hold shell frames.

1.6.8 Survey at sea or anchorage may be undertaken when the Surveyor is fully satisfied with the necessary assistance from the personnel onboard and provided the following conditions and limitations are met:

- (a) Surveys of tanks by means of boats or rafts is at the sole discretion of the attending Surveyor, who is to take into account the safety arrangements provided, including weather forecasting and ship response under foreseeable sea conditions and provided the expected rise of water within the tank does not exceed 0,25 m. Appropriate life jackets are to be available for all participants. The boats or rafts are to have satisfactory residual buoyancy and stability even if one chamber is ruptured. A safety checklist is also to be provided. An oxygen-meter, breathing apparatus, lifeline and whistles are to be at hand during the survey. For oil tankers and chemical tankers, an explosimeter is also to be provided.
- (b) A communication system is to be arranged between the survey party in the tank and the responsible officer on deck. This system must include the personnel in charge of ballast pump handling if boats or rafts are to be used.
- (c) Rafts or boats may be permitted for the survey of the under deck areas of tanks or spaces, if the depth of the under deck web plating is 1,5 m or less. If the depth of the under deck web plating is greater than 1,5 m, then rafts or boats may be permitted only when the coating of the under deck structure is in GOOD condition and there is no evidence of wastage or if a permanent means of access is provided in each bay to allow safe entry and

exit. A permanent means of access is considered to mean:

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

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

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

1.6.10 A survey planning meeting is to be held prior to the commencement of Intermediate Survey and Special Survey.

1.6.11 For ships assigned the quotation **ESP**, the owner is to respond to a Survey Planning Questionnaire and to prepare a Survey Programme, see 6.3, 7.3 and 8.3.

- (a) The Survey Planning Questionnaire is to be submitted to LR prior to the preparation of the Survey Programme. This is to include information on access provisions for close-up Surveys and thickness measurements; cargo history; the results of inspections carried out by the Owner; a list of reports of Port State Control Inspection containing hull structural deficiencies; a list of Safety Management System non-conformities related to hull maintenance and details of the thickness measurement company.
- (b) The Survey Programme is to be submitted prior to the commencement of any part of the Intermediate Survey on ships over 10 years of age and Special Survey. This is to be in a written format and submitted to LR at least six months in advance of the survey. The Survey Programme at Intermediate Survey may consist of the Survey Programme agreed for the previous Special Survey supplemented by the Executive Hull Summary of that Special Survey and later relevant survey reports. The survey programme is to be worked out taking into account any amendments to the survey requirements implemented after the previous Special Survey.

1.7 Thickness measurement at surveys

1.7.1 This Section is applicable to the thickness measurement of the hull structure where required by Sections 2, 3, 5, 6, 7, 8 and 9.

1.7.2 Further to the requirements of 1.6.8 a survey planning meeting is to be held between the attending Surveyor(s), the Owner's representative and the thickness measurement firm's representative, so as to ensure the safe and efficient execution of the surveys and thickness measurements to be carried out on board.

1.7.3 For non-ESP ships less than 500 gross tons and all fishing vessels, the designated Surveyor, who has received training and been qualified by LR, may carry out thickness measurements. The Owner is to respond to a Survey Planning Questionnaire and to prepare a Survey Programme, see 6.3, 7.3 and 8.3.

1.7.4 Thickness measurements are normally to be taken by means of ultrasonic test equipment and are to be carried out by a firm approved in accordance with Lloyd's Register's *Approval for Thickness Measurement of Hull Structure*.

1.7.5 The Surveyor may require to measure the thickness of the material in any portion of the structure where signs of wastage are evident or wastage is normally found. Any parts of the structure which are found defective or excessively reduced in scantlings are to be made good by materials of the approved scantlings and quality. Attention is to be given to the structure in way of discontinuities. If a corrosion control (cc) notation, as defined in the *Register Book*, is assigned, surfaces are to be re-coated as necessary.

1.7.6 Thickness measurements are to be witnessed by the Surveyor. This requires the Surveyor is to be on board, while the measurements are carried out, to the extent necessary to control the process. This also applies to thickness measurements carried out while the ship is at sea.

1.7.7 The Surveyor may extend the scope of thickness measurement if deemed necessary.

1.7.8 Where it is required as part of the survey to carry out thickness measurements for the structural areas subject to Close-up Survey, then these measurements are to be carried out simultaneously with the Close-up Survey.

1.7.9 Thickness measurements are to be taken in the forward and aft areas of all plates. Where plates cross ballast/cargo tank boundaries separate measurements for the area of plating in way of each type of tank are to be reported. In all cases the measurements are to represent the average of multiple measurements taken on each plate and/or stiffener. Where measured plates are renewed, the thicknesses of adjacent plates in the same strake are to be reported.

1.7.10 A report is to be prepared by the approved firm or surveyor carrying out the thickness measurements. The report is to give the location of measurement, the thickness measured as well as the corresponding original thickness. The report is to give the date when measurement was carried out, the type of measuring equipment, names of personnel and their qualifications and is to be signed by the operator.

1.7.11 The thickness measurement report is to be verified and signed by the Surveyor and countersigned by an authorising Surveyor.

1.8 Repairs

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

- side shell frames, their end attachments and adjacent shell plating;
- deck structure and deck plating;
- bottom structure and bottom plating;
- side structure and side plating;
- inner bottom structure and inner bottom plating;
- inner side structure and inner side plating;
- watertight or oiltight bulkheads;
- hatch covers and hatch coamings.

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

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

Section 2 Annual Surveys – Hull and machinery requirements

2.1 General

2.1.1 Annual Surveys are to be held concurrently with statutory annual or other relevant statutory surveys, wherever practicable.

2.1.2 At Annual Surveys, the Surveyor is to examine the ship and machinery, so far as necessary and practicable, in order to be satisfied as to their general condition.

2.1.3 For additional requirements for ships for liquefied gases, see Section 9.

2.1.4 For ships which are required by International Convention to comply with the International Safety Management Code (ISM Code), the Surveyor is to review the overall effectiveness of the Code onboard ship. This is to be undertaken regardless of the organisation issuing the Safety Management Certificate (SMC).

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2.2 Annual Surveys

2.2.1 The Surveyor is to be satisfied regarding:

- (a) The efficient condition of hatchways on freeboard and superstructure decks, weather deck plating, ship side plating above the waterline, ventilator coamings and air pipes, exposed casings, fiddley openings, skylights, flush deck scuttles, deckhouses and companionways, superstructure bulkheads, side, bow and stern doors, side scuttles and deadlights, chutes and other openings, together with all closing appliances and flame screens. In addition, the Surveyor is to externally examine all air pipe heads installed on exposed decks and examine the weld connection between air pipes and deck plating.
- (b) The efficient operating condition of mechanically-operated hatch covers including stowage and securing in open condition; proper fit and efficiency of sealing in closed condition; operational testing of hydraulic and power components, wires, chains and link drives.
- (c) The efficient condition of scuppers and sanitary discharges (so far as practicable); valves on discharge lines (so far as practicable) and their controls; guard rails and bulwarks; freeing ports, gangways and life-lines; fittings and appliances for timber deck cargoes.
- (d) The efficient condition of bilge level detection and alarm systems on ships assigned a **UMS** notation.

2.2.2 The Surveyor is to obtain confirmation that no unapproved changes have been made to the hatch covers, hatch coamings and their securing and sealing devices since the previous survey:

- (a) Mechanically-operated steel covers are to be tested to confirm the satisfactory condition of:
 - hatch covers;
 - tightness devices of longitudinal, transverse and intermediate cross junctions (gaskets, gasket lips, compression bars, drainage channels);
 - clamping devices, retaining bars, cleating;
 - chain or rope pulleys;
 - guides;
 - guide rails and track wheels;
 - stoppers, etc;
 - wires, chains, gypsies, tensioning devices;
 - hydraulic system essential to closing and securing;
 - safety locks and retaining devices.
- (b) Cargo hatch covers of the portable type (i.e. wood or steel pontoons) are to be examined to confirm the satisfactory condition where applicable, of:
 - wooden covers and portable beams, carriers or sockets for the portable beam, and their securing devices;
 - steel pontoons;
 - tarpaulins;
 - cleats, battens and wedges;
 - hatch securing bars and their securing devices;
 - loading pads/bars and the side plate edge;
 - guide plates and chocks;
 - compression bars, drainage channels and drain pipes (if any).
- (c) The Surveyor is to confirm the satisfactory condition of hatch coaming plating and their stiffeners, where applicable.

- (d) For **general dry cargo ships** and **bulk carriers**, in addition to the above, the steel cargo hatch covers, coamings and stiffeners are to be subjected to a close-up examination.

2.2.3 The Surveyor is to confirm that, where required, an approved loading instrument together with its operation manual is available on board, see Pt 3, Ch 4.8. The operation of the loading instrument is to be verified in accordance with LR's certification procedure.

2.2.4 The anchoring and mooring equipment is to be examined so far as practicable.

2.2.5 The watertight doors in watertight bulkheads, their indicators and alarms, are to be examined and tested (locally and remotely), together with an examination of watertight bulkhead penetrations, so far as practicable.

2.2.6 The Surveyor is to examine and test in operation all main and auxiliary steering arrangements including their associated equipment and control systems, and verify that log book entries have been made in accordance with statutory requirements where applicable.

2.2.7 The Surveyor is to be satisfied regarding the freeboard marks on the ship's side.

2.2.8 The Surveyor is to generally inspect the machinery and boiler spaces, with particular attention being given to the propulsion system, auxiliary machinery and to the existence of any fire and explosion hazards. Emergency escape routes are to be checked to ensure that they are free of obstruction.

2.2.9 The means of communication between the navigating bridge and the machinery control positions, as well as the bridge and the alternative steering position, if fitted, are to be tested.

2.2.10 The bilge pumping systems and bilge wells, including operation of extended spindles and level alarms, where fitted, are to be examined so far as practicable. Satisfactory operation of the bilge pumps is to be proven.

2.2.11 Piping systems containing oil fuel, lubricating oil or other flammable liquids are to be generally examined and operated as far as practicable, with particular attention being paid to tightness, fire precaution arrangements, flexible hoses and sounding arrangements.

2.2.12 The Surveyor is to be satisfied regarding the condition of non-metallic joints in piping systems which penetrate the hull, where both the penetration and the non-metallic joint are below the deepest load waterline.

2.2.13 The boilers, other pressure vessels and their appurtenances, including safety devices, foundations, controls, relieving gear, high pressure and waste steam piping, insulation and gauges, are to be generally examined. Surveyors should confirm that Periodical Surveys of boilers and other pressure vessels have been carried out as required by the Rules and that the safety devices have been tested.

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2.2.14 The electrical equipment and cabling forming the main and emergency electrical installations are to be generally examined under operating conditions so far as practicable. The satisfactory operation of the main and emergency sources of power and electrical services essential for safety in an emergency is to be verified; where the sources of power are automatically controlled they should be tested in the automatic mode. Bonding straps for the control of static electricity and earthing arrangements are to be examined where fitted.

2.2.15 The electrical installation in areas which may contain flammable gas or vapour and/or combustible dust is to be examined in order to verify that it is in good condition and has been properly maintained.

2.2.16 For ships having **UMS** or **CCS** notation, a General Examination of automation equipment is to be carried out. Satisfactory operation of safety devices and control systems is to be verified.

2.2.17 For ships fitted with a classed dynamic positioning system and/or classed thruster assisted positional mooring system, the control system and associated machinery items are to be generally examined and tested under operating conditions to an approved Test Schedule.

2.2.18 For ships fitted with positional mooring equipment in accordance with Pt 7, Ch 8, a schedule or rota of moorings to be examined at Annual Survey should be agreed for component parts of the positional moorings.

2.2.19 For ships to which Pt 6, Ch 4 applies, the arrangements for fire protection, detection and extinction are to be examined and are to include:

- (a) Verification, so far as practicable, that no significant changes have been made to the arrangement of structural fire protection.
- (b) Verification of the operation of manual and/or automatic doors where fitted.
- (c) Verification that fire-control plans are properly posted.
- (d) Examination, so far as possible, and testing as feasible, of the fire and/or smoke detection and alarm system(s).
- (e) Examination of fire main system, and confirmation that each fire pump, including the emergency fire pump can be operated separately so that the two required powerful jets of water can be produced simultaneously from different hydrants.
- (f) Verification that fire-hoses, nozzles, applicators and spanners are in good working condition and situated at their respective locations.
- (g) Examination of fixed fire-fighting systems controls, piping, instructions and marking, checking for evidence of proper maintenance and servicing, including date of last systems tests.
- (h) Verification that all portable and semi-portable fire-extinguishers are in their stowed positions, checking for evidence of proper maintenance and servicing, conducting random checks for evidence of discharged containers.
- (j) Verification, so far as practicable, that the remote control for stopping fans and machinery and shutting-off fuel supplies in machinery spaces and, where fitted, the remote controls for stopping fans in accommodation spaces and the means of cutting off power to the galley are in good working order.

- (k) Examination of the closing arrangements of ventilators, funnel annular spaces, skylights, doorways and tunnels, where applicable.
- (l) Verification that the firemen's outfits are complete and in good condition.

2.2.20 The requirements of 3.2.4, 3.2.5, 5.3.3 and 5.3.4 regarding the survey of water ballast spaces are also to be complied with as applicable.

2.2.21 The Surveyor is to carry out an examination and thickness measurement of structure identified at the previous Special Survey or Intermediate Survey as having substantial corrosion, as defined in 1.5. This requirement does not apply to cargo tanks of oil tankers and chemical tankers. The extent of thickness measurements is to be increased in accordance with the appropriate tables in Sections 5, 6, 7 or 8, as applicable, to determine the full extent of the corrosion pattern. The survey will not be considered complete until these additional thickness measurements have been carried out.

2.2.22 For **oil tankers** (including ore/bulk/oil ships and ore/oil ships), in addition to the applicable requirements of 2.2.1 to 2.2.21, the following are to be dealt with where applicable:

- (a) Examination of cargo tank openings including gaskets, covers, coamings and screens.
- (b) Examination of cargo tank venting arrangements including secondary means of venting, or over/under pressure alarms where fitted, with associated pressure/vacuum valves and flame screens.
- (c) Examination of flame screens on vents to all bunker, oily ballast and oily slop tanks and void spaces, so far as practicable.
- (d) Examination of cargo, crude oil washing, bunker, ballast and vent piping systems together with flame arrestors and pressure/vacuum valves, as applicable above the upper deck within the cargo tank area, including vent masts and headers.
- (e) Verification that no potential sources of ignition such as loose gear, excessive products in the bilges, excessive vapours, combustible materials, etc., are present in or near the cargo pump room and that access ladders are in good condition.
- (f) Examination of cargo pump rooms and pipe tunnels (where fitted) and examination of all pump room bulkheads for signs of leakage or fractures and, in particular, the sealing arrangements of all penetrations in these bulkheads.
- (g) Verification that the pump room ventilation system is operational, ducting intact, dampers operational and screens are clean.
- (h) For ships to which Pt 6, Ch 4 applies, the external examination of the piping and cut-out valves of cargo tank and cargo pump room fixed fire-fighting system.
- (j) For ships to which Pt 6, Ch 4 applies, verification that the deck foam system and deck sprinkler system are in good operating condition.
- (k) Examination of the condition of all piping systems in the cargo pump room so far as practicable.

- (l) Examination, so far as practicable, of cargo, bilge, ballast and stripping pumps for excessive gland seal leakage, verification of proper operation of electrical and mechanical remote operating and shutdown devices and operation of pump room bilge system, and checking that pump foundations are intact.
- (m) Verification that installed pressure gauges on cargo discharge lines and level indicator systems are operational.
- (n) Verification that at least one portable instrument for measuring flammable vapour concentrations is available, together with a sufficient set of spares and a suitable means of calibration.
- (o) Examination of any inert gas system, see 2.2.24.
- (p) For single hull oil tankers, ballast tanks adjacent to (i.e. with a common plane boundary) a cargo tank with any means of heating are to be examined. Thickness measurement is to be carried out where considered necessary by the Surveyor. Special consideration may be given by the Surveyor to those tanks where the coatings was found in GOOD condition, as defined in 1.5, at the previous Intermediate or Special Survey.
- (q) For ballast tanks, in areas where substantial corrosion, as defined in 1.5, has been noted then additional measurements are to be carried out in accordance with Tables 3.7.7 to 3.7.15, as applicable. The survey will not be considered complete until these additional thickness measurements have been carried out.
- (r) Verification that any special arrangements made for bow or stern loading and unloading are in good condition.
- (m) Verification that arrangements are made for sufficient medium to be carried where drying agents are used on air inlets to cargo tanks.
- (n) Verification that suitable protective clothing is available for crew engaged in loading and discharging operations and that suitable storage is maintained.
- (o) Verification that the requisite safety equipment and associated breathing apparatus with requisite air supplies and emergency escape respiratory and eye protection, if required, are in good condition and are properly stowed.
- (p) Verification that medical first aid equipment including stretchers and oxygen resuscitation is in good condition and that satisfactory arrangements are made for antidotes for cargoes actually carried to be on board.
- (q) Verification that decontamination arrangements are operational.
- (r) Verification that the requisite gas detection instruments are on board and that satisfactory arrangements are made for the supply of any required vapour detection tubes.
- (s) Verification that the cargo sample stowage arrangements are in good condition.
- (t) Verification that, if applicable, the provisions made for chemicals which have special requirements listed in Chapter 17 of the *Rules for Ships for Liquid Chemicals* are in order.
- (u) For ballast tanks, in areas where substantial corrosion, as defined in 1.5, has been noted then additional measurements are to be carried out in accordance with Tables 3.8.4, 3.8.5, 3.8.6 and 3.8.7. The survey will not be considered complete until these additional thickness measurements have been carried out.

2.2.23 For **chemical tankers**, in addition to the applicable requirements of 2.2.1 to 2.2.22, the following are to be dealt with, where applicable:

- (a) Examination of gauging devices, high level alarms and valves associated with overflow control.
- (b) Verification that any devices provided for measuring the temperature of the cargo and any associated alarms are satisfactory.
- (c) Examination of the cargo heating/cooling system sampling arrangements where fitted.
- (d) Verification that wheelhouse doors and windows, side scuttles and windows in superstructure and deckhouse ends facing the cargo area are in good condition.
- (e) Verification that pump discharge pressure gauges fitted outside the cargo pump rooms are satisfactory.
- (f) Verification that pumps, valves and pipelines are identified and distinctively marked.
- (g) Verification that the remote operation of the cargo pump room bilge system is satisfactory.
- (h) Verification that cargo pump room rescue arrangements are in order.
- (j) Verification that removable pipe lengths or other approved equipment necessary for cargo separation are available, and satisfactory.
- (k) Verification that the ventilation system including portable equipment, if any, of all spaces in the cargo area is operational.
- (l) Verification that arrangements are made for sufficient inert/padding/drying gas to be carried to compensate for normal losses and that means are provided for monitoring of ullage spaces.

2.2.24 For **inert gas systems**, where fitted, the following are to be dealt with:

- (a) External examination of the condition of piping including vent piping above the upper deck in the cargo tank area and overboard discharges through the shell so far as practicable, together with components for signs of corrosion or gas leakage/effluent leakage.
- (b) Verification of the proper operation of both inert gas blowers.
- (c) Checking the scrubber room ventilation system.
- (d) Checking, so far as practicable, of the deck water seal for automatic filling and draining and checking for presence of water carry-over. Checking the operation of the non-return valve.
- (e) Testing of all remotely operated or automatically controlled valves including the flue gas isolating valve(s).
- (f) Checking the interlocking features of soot blowers.
- (g) Checking that the gas pressure regulating valve automatically closes when the inert gas blowers are secured.
- (h) Checking, so far as practicable, the following alarms and safety devices of the inert gas system using simulated conditions where necessary:
 - (i) high oxygen content of gas in the inert gas main;
 - (ii) low gas pressure in the inert gas main;
 - (iii) low pressure in the supply to the deck water seal;
 - (iv) high temperature of gas in the inert gas main;
 - (v) low water pressure to the scrubber;
 - (vi) accuracy of portable and fixed oxygen measuring equipment by means of calibration gas.

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2.2.25 For **bulk carriers**, in addition to the applicable requirements of 2.2.1 to 2.2.21, the following are to be dealt with, where applicable:

- (a) Examination of cargo holds in accordance with Table 3.2.1 is required.
- (b) Where substantial corrosion, as defined in 1.5, has been noted then additional measurements are to be carried out in accordance with Tables 3.6.4, 3.6.5, 3.6.6, 3.6.7, 3.6.8 and 3.6.9. The survey will not be considered complete until these additional thickness measurements have been carried out.
- (c) For ships fitted with water level detectors in cargo holds, ballast tanks forward of the collision bulkhead and any dry or void space which extends forward of the foremost cargo hold, an examination and a test, at random, of the water ingress detection systems and of their alarms is to be carried out.
- (d) For ships fitted with a means for draining and pumping ballast tanks forward of the collision bulkhead and the bilges of dry spaces, any part of which extends forward of the foremost cargo hold, an examination and a test of the draining and pumping systems, including their controls, is to be carried out.

2.2.26 For **general dry cargo ships**, in addition to the applicable requirements of 2.2.1 to 2.2.21, the following are required for ships over 10 years of age:

- (a) Overall survey of one forward and one after cargo hold and their associated 'tween deck spaces.
- (b) Where considered necessary by the Surveyor, thickness measurement is to be carried out. Where the results of thickness measurement indicate substantial corrosion, the extent of thickness measurement should be in accordance with Section 5, Table 3.5.6. The survey will not be considered complete until these additional thickness measurements have been carried out.

2.2.27 For **general dry cargo ships**, in addition to the applicable requirements of 2.2.1 to 2.2.21, the following are required for ships over 15 years of age:

- (a) Overall survey of all cargo holds and 'tween deck spaces.
- (b) Close-up Survey of at least 25 per cent of shell frames, including their end attachments and adjacent shell plating in a forward lower cargo hold and one other selected lower cargo hold. Close-up Survey is to include the lower one third length of the shell frames.
- (c) Where the survey reveals the need for remedial measures, then the survey is to be extended to include the Close-up Survey of all shell frames and adjacent shell plating in those cargo holds and associated 'tween deck spaces, as well as a Close-up Survey of sufficient extent of all remaining cargo holds and 'tween deck spaces.
- (d) Where the protective coatings in cargo holds are found in GOOD condition, as defined in 1.5, the extent of Close-up Survey may be specially considered.
- (e) Where considered necessary by the Surveyor, thickness measurement is to be carried out. Where the results of thickness measurement indicate substantial corrosion, the extent of thickness measurement should be in accordance with Table 3.5.6 in Section 5. The survey will not be considered complete until these additional thickness measurements have been carried out.

2.2.28 For **ship-borne barges** where surveys are permitted in accordance with Pt 1, Ch 2,3.5.7, see Section 3.

Table 3.2.1 Bulk Carriers – Annual Surveys

Ships less than 10 years old	Ships between 10 and 15 years old	Ships greater than 15 years old
An Overall Survey of the forward cargo hold and an aft cargo hold on single skin ships See Note 1	(a) Overall Survey of (i) all cargo holds on single skin ships (ii) two selected cargo holds on double skin ships (b) Close-up Survey of at least 25 per cent of the cargo hold side shell frames, their lower end attachments and adjacent shell plating in the forward cargo hold on single skin ships. See Notes 2, 3, 4 and 5.	(a) Overall Survey of all cargo holds (b) Close-up Survey of at least 25 per cent of the cargo hold side shell frames, their lower end attachments and adjacent shell plating in the forward cargo hold and one other selected cargo hold on single skin ships See Notes 2, 3, 4 and 5.

NOTES

The requirements in this Table apply to both single skin and double skin ships, unless stated otherwise.

1. Where the Survey reveals the need for remedial measures, then the Survey is to be extended to include all cargo holds.
2. Close-up Survey is required within the area of the lower one-third of the length of the cargo hold side shell frames.
3. Where the Survey reveals the need for remedial measures, the Survey is to be extended to include a Close-up Survey of all of the cargo hold side shell frames and adjacent shell plating of that cargo hold, as well as a Close-up Survey of sufficient extent of all remaining cargo holds.
4. When considered necessary by the Surveyor, thickness measurement is to be carried out. Where the results of thickness measurement indicate substantial corrosion, the extent of thickness measurement should be in accordance with Section 6, Tables 3.6.4, 3.6.5, 3.6.6, 3.6.7, 3.6.8 and 3.6.9 as applicable. The survey will not be considered complete until these additional thickness measurements have been carried out.
5. Where protective coatings are found in good condition, as defined in 1.5, the extent of the Close-up Survey and thickness measurement may be specially considered. Prior to any coating or recoating of cargo holds, scantlings are to be confirmed by thickness measurement with the Surveyor in attendance.

2.2.29 For **roll on-roll off ships** and **other ship types** fitted with bow doors, inner doors, side doors and stern doors, in addition to the requirements of 2.2.1, the following are to be satisfactorily dealt with as applicable:

- (a) Verification of the freedom of movement of doors, and operation of their power units.
- (b) Examination of the door structure and surrounding ship structure.
- (c) Examination of the door sealing arrangements including gaskets and retaining bars.
- (d) Examination of the door cleating, locking and securing arrangements.
- (e) Examination of the door hinging arrangements.
- (f) Verification of the local and/or remote control of the securing devices/cleats.
- (g) Examination of all equipment associated with the opening, closing and securing of the door, e.g. wire ropes, chains, sheaves, rollers, guides, shackles, etc.
- (h) Verification of the tightness of the doors.
- (j) Examination and testing of remote control panels and associated indicator lights, closed circuit television systems, water leakage indicator lights and alarm systems.
- (k) Examination of the required notice boards and verification of log entries.
- (l) Verification of the satisfactory testing of the bilge systems for the space between the inner and outer bow doors and of the vehicle deck.
- (m) Verification that the approved Operation and Maintenance Manual is on board and satisfactorily maintained.

2.2.30 For **navigational arrangements for periodic one man watch**, and where applicable **integrated bridge systems**, Annual Surveys are to be carried out in accordance with the approved test schedule as required by Pt 7, Ch 9, 1.2.1 to ascertain that the equipment and arrangements required for the applicable class notation are being maintained in good working order. At the time of the survey, relevant statutory certificates may be accepted as evidence of satisfactory operation.

2.2.31 For **liquefied gas ships**, see also Section 9.

2.2.32 Where a special features notation 'certified container securing arrangements' is assigned, the Surveyor is to examine the securing arrangements so far as necessary and practicable in order to be satisfied as to their general condition.

2.2.33 For single hold general dry cargo ships, other than bulk carriers, fitted with water level detectors in the cargo hold, an examination and a test, at random, of the water ingress detection system and alarms are to be carried out.

Section 3 Intermediate Surveys – Hull and machinery requirements

3.1 General

3.1.1 Intermediate Surveys are to be held concurrently with statutory annual or other relevant statutory surveys wherever practicable.

3.2 Intermediate Surveys

3.2.1 The requirements of Section 2 are to be complied with so far as applicable.

3.2.2 A general examination of salt-water ballast tanks is to be carried out as required by 3.2.6 and 3.2.7. For ships other than oil tankers and chemical tankers, if such examinations reveal no visible structural defects then the examination may be limited to a verification that the protective coating remains in GOOD or FAIR condition as defined in 1.5. When considered necessary by the Surveyor, thickness measurement of the structure is to be carried out.

3.2.3 In application of 3.2.12, 3.2.15 and 3.2.17 respectively for **oil tankers** (including ore/oil and ore/bulk/oil ships), **chemical tankers** and **bulk carriers** over 15 years of age a survey in dry-dock is to be a part of the Intermediate Survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of cargo tanks/holds and water ballast tanks are to be surveyed in accordance with the applicable requirements for Intermediate Surveys, if not already surveyed.

3.2.4 For **oil tankers** (including ore/oil and ore/bulk/oil ships) and **chemical tankers**, salt-water ballast tanks are to be examined and gauged as necessary at Annual Surveys where:

- (a) A hard protective coating has not been applied from the time of construction; or
- (b) A soft coating has been applied; or
- (c) Substantial corrosion is found within the tank, or
- (d) The hard protective coating is found to be in less than GOOD condition, as defined in 1.5, and the hard protective coating is not repaired to the satisfaction of the Surveyor; or
- (e) For **single hull oil tankers**, the tank has a common plane boundary with a cargo tank with any means of heating.

3.2.5 For salt-water ballast tanks on those ships not listed in 3.2.4, where a hard protective coating is found to be in POOR condition, as defined in 1.5, and it has not been repaired, where a soft coating has been applied or where a protective coating was not applied from the time of construction the following requirements are applicable:

- (a) For salt-water ballast tanks, other than independent double bottom tanks, maintenance of class will be subject to the spaces in question being examined and gauged as necessary at Annual Surveys.

- (b) For independent salt-water double bottom tanks, maintenance of class may, at the discretion of the Surveyor, be subject to the spaces in question being examined and gauged as necessary at Annual Surveys.

NOTE

Independent double bottom tanks are those double bottom tanks which are separate from topside tank, side tanks or deep tanks.

3.2.6 For ships over 5 years of age and up to 10 years of age, representative salt-water ballast tanks are to be examined. In addition to this, the following requirements are applicable:

- (a) For **general dry cargo ships**, an Overall Survey of representative salt-water ballast tanks, as selected by the Surveyor is to be carried out.
- (b) For **bulk carriers**, an Overall Survey of representative salt-water ballast tanks, as selected by the Surveyor is to be carried out. The selected tanks are to include the fore peak tank, aft peak tank and a number of other tanks, taking into account the total number and type of ballast tanks.
- (c) For **single hull oil tankers** (including ore/oil and ore/bulk/oil ships), an examination of all salt-water ballast tanks is to be carried out. Where considered necessary by the Surveyor, thickness measurement and testing are to be carried out to ensure the structural integrity remains effective.
- (d) For **double hull oil tankers** and **chemical tankers**, an Overall Survey of representative salt-water ballast tanks, as selected by the Surveyor is to be carried out. If the survey reveals no visible defects, the examination may be limited to a verification that the hard protective coating remains in GOOD condition, as defined in 1.5.

3.2.7 For all ships over 10 years of age, the following are required:

- (a) All salt-water ballast tanks are to be examined.
- (b) The anchors are to be partially lowered and raised using the windlass.

3.2.8 The Surveyor is to carry out an examination and thickness measurement of structure identified at the previous Special Survey as having substantial corrosion, see *also* Sections 5, 6, 7 and 8.

3.2.9 For all ships, the electrical generating sets are to be examined under working conditions to verify compliance with Pt 6, Ch 2,2.2.

3.2.10 In addition to the foregoing, in the case of all **oil tankers** (including ore/oil and ore/bulk/oil ships) the following are to be dealt with where applicable:

- (a) An examination of cargo, crude oil washing, bunker, ballast, steam and vent piping on the weather decks, 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, gauged, or both.

- (b) A General Examination within the areas deemed as dangerous, such as cargo pump rooms and spaces adjacent to and zones above cargo tanks, for defective and non-certified safe-type electrical equipment, improperly installed, defective and dead-end wiring. An electrical insulation resistance test of the circuits terminating in, or passing through, the dangerous areas is to be carried out. If the ship is not in a gas free condition the results of previously recorded test readings may be accepted.

3.2.11 For **oil tankers** (including ore/oil and ore/bulk/oil ships), in addition to 3.2.10, the following are required for ships over 10 years of age:

- (a) A survey to the same extent as the previous Special Survey (applicable only to ESP surveys, see 7.1.2).
- (b) Pressure testing of cargo and ballast tanks and the requirements for the longitudinal strength evaluation (see 7.7.3) are to be carried out if deemed necessary by the attending Surveyor.

3.2.12 For **chemical tankers**, in addition to the applicable requirements of 3.2.1 to 3.2.9 the following are to be dealt with where applicable:

- (a) Examination of vent line drainage arrangements.
- (b) Verification that the cargo heating/cooling system is in good condition.
- (c) Verification that the ship's cargo hoses are approved and in good condition.
- (d) Verification that, where applicable, pipelines and independent cargo tanks are electrically bonded to the hull.
- (e) An examination of cargo, cargo washing, bunker, ballast, steam and vent piping on the weather decks, as well as vent masts and headers. If upon examination there is any doubt as to the condition of the piping, the piping may require to be pressure tested, gauged or both.
- (f) A General Examination within the areas deemed as dangerous, such as cargo pump rooms and spaces adjacent to and zones above cargo tanks, for defective and non-certified safe-type electrical equipment, improperly installed, defective and dead-end wiring. An electrical insulation resistance test of the circuits terminating in, or passing through, the dangerous areas is to be carried out. If the ship is not in a gas free condition the results of previously recorded test readings may be accepted.

3.2.13 For **chemical tankers**, in addition to 3.2.12, the following are required for ships over 10 years of age:

- (a) A survey to the same extent as the previous Special Survey (applicable only to ESP surveys, see 8.1.2).
- (b) Pressure testing of cargo and ballast tanks is to be carried out if deemed necessary by the attending Surveyor.

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3.2.14 For **bulk carriers**, in addition to the applicable requirements of 3.2.1 to 3.2.9, the following are to be dealt with on ships over five years of age:

- (a) Examination of holds in accordance with Table 3.3.1.
- (b) The thickness measurement requirements of 3.2.8 are to be complied with. In areas where substantial corrosion, as defined in 1.5, has been noted then additional measurements are to be carried out in accordance with Tables 3.6.3, 3.6.4, 3.6.5 and 3.6.6. The survey will not be considered complete until these additional thickness measurements have been carried out.
- (c) Thickness measurement of those areas subject to Close-up Survey, to determine both general and local corrosion levels. The extent of thickness measurement may be specially considered provided the Surveyor is satisfied that there is no structural diminution and the protective coating, where provided, remains in GOOD condition, as defined in 1.5.
- (d) For ore carriers, in addition to the requirements of 3.2.7, the examination of salt-water ballast tanks is to include the following:
 - (i) All web frame rings in one ballast wing tank.
 - (ii) One deck transverse in each remaining ballast wing tank.
 - (iii) Both transverse bulkheads in one ballast wing tank.
 - (iv) One transverse bulkhead in each remaining ballast wing tank.

3.2.15 For **bulk carriers**, in addition to the applicable requirements of 3.2.1 to 3.2.9, the following is required for ships over 10 years of age:

- (a) A survey to the same extent as the previous special Survey (applicable to ESP surveys, see 6.1.2).
- (b) Pressure testing of all tanks and the internal examination of fuel oil tanks are to be carried out if deemed necessary by the Surveyor.

3.2.16 For **dry cargo ships** over 15 years old (other than bulk carriers and general dry cargo ships), in addition to the applicable requirements of 3.2.1 to 3.2.8, an Overall Survey of selected cargo holds is to be carried out.

3.2.17 For **general dry cargo ships**, in addition to the applicable requirements of 3.2.1 to 3.2.9, the following is required for ships over 5 years of age:

- An overall survey of one forward and one after cargo hold and their associated 'tween deck spaces.

3.2.18 For **general dry cargo ships**, in addition to the applicable requirements of 3.2.1 to 3.2.9, the following are required for ships over 10 years of age:

- (a) An overall survey of all cargo holds and 'tween deck spaces.
- (b) Where considered necessary by the Surveyor, thickness measurement is to be carried out. Where the results of thickness measurement indicate substantial corrosion, the extent of thickness measurement should be in accordance with Table 3.5.6 in Section 5. The survey will not be considered complete until these additional thickness measurements have been carried out.

3.2.19 For **general dry cargo ships**, in addition to the applicable requirements of 3.2.1 to 3.2.9, the following are required for ships over 15 years of age:

- (a) A survey to the same extent as the previous special Survey (applicable only to surveys of the hull structure and piping systems in way of the cargo holds, cofferdams, pipe tunnels and void spaces within the cargo area and all salt water ballast tanks).
- (b) Tank testing, survey of automatic air pipe heads and internal examination of fuel oil, lubricating oil and fresh water tanks are to be carried out if deemed necessary by the Surveyor.

Table 3.3.1 Bulk carriers – Intermediate Surveys

Ships between 5 and 10 years old	Ships between 10 and 15 years old	Ships greater than 15 years old
(a) Overall Survey of all cargo holds, see Notes 1, 2, 3 and 4 (b) Close-up Survey to establish the condition of at least 25 per cent of the cargo hold side shell frames including their upper and lower end attachments, adjacent shell plating and the transverse bulkheads in the forward cargo hold and one other selected cargo hold on single skin hips, see Notes 1, 3 and 4.	A survey to the same extent as the previous Special Survey (applicable only to ESP surveys, see 6.1.2), see Note 3.	A survey to the same extent as the previous Special Survey (applicable only to ESP surveys, see 6.1.2), see Note 3.
NOTES The requirements in this Table apply to both single skin and double skin ships, unless stated otherwise.		
1. For single skin ships, where considered necessary by the Surveyor as a result of the Overall and Close-up Survey, the Survey is to be extended to include a Close-up Survey of all of the side shell frames and adjacent shell plating of that cargo hold, as well as a Close-up Survey of sufficient extent of all remaining cargo holds.		
2. For double skin ships, where considered necessary by the Surveyor as a result of the Overall Survey, the Survey is to be extended to include a Close-up Survey of those areas of structure in cargo holds selected by the Surveyor.		
3. Thickness measurement is to be carried out of sufficient extent to determine the level of corrosion of those areas subject to Close-up Survey. Where the results of thickness measurement indicate substantial corrosion, the extent of thickness measurement should be in accordance with Section 6, Tables 3.6.4, 3.6.5, 3.6.6, 3.6.7, 3.6.8 and 3.6.9 as applicable. The survey will not be considered complete until these additional thickness measurements have been carried out.		
4. For ships between 5 and 10 years old where hard protective coatings in cargo holds are found to be in GOOD condition, as defined in 1.5, the extent of Close-up Survey and thickness measurement may be specially considered. Prior to any coating or recoating of cargo holds, scantlings are to be confirmed by thickness measurement with the Surveyor in attendance.		

3.2.20 For **ship-borne barges**, where Intermediate Surveys are permitted as an alternative to Annual Surveys and Docking Surveys, all the hatch covers are to be hose tested at every survey. The external surfaces of the barges are to be surveyed at these surveys.

3.2.21 For **liquefied gas ships**, see Section 9.

Section 4 Docking Surveys and In-water Surveys – Hull and machinery requirements

4.1 General

4.1.1 At Docking Surveys or In-water Surveys the Surveyor is to examine the ship and machinery, so far as necessary and practicable, in order to be satisfied as to the general condition.

4.1.2 For **oil tankers** (including ore/oil and ore/bulk/oil ships), **chemical tankers** and **bulk carriers** over 15 years of age the intermediate docking between Special Surveys is to be held in dry-dock. Further, this survey is to be held as part of the Intermediate Survey.

4.2 Docking Surveys

4.2.1 Where a ship is in dry-dock or on a slipway it is to be placed on blocks of sufficient height, and proper staging is to be erected as may be necessary, for the examination of the shell including bottom and bow plating, keel, stern, stern-frame and rudder. The rudder is to be lifted for examination of the pintles if considered necessary by the Surveyor.

4.2.2 The shell plating is to be examined for excessive corrosion, deterioration due to chafing or contact with the ground and for undue unfairness or buckling. Special attention is to be given to the connection between the bilge strakes and the bilge keels.

4.2.3 The clearances in the rudder bearings are to be measured. Where applicable, pressure testing of the rudder may be required if deemed necessary by the Surveyor.

4.2.4 The sea connections and overboard discharge valves and cocks and their attachments to the hull are to be examined.

4.2.5 The propeller, sternbush and sea connection fastenings and the gratings at the sea inlets are to be examined.

4.2.6 The clearance in the sternbush or the efficiency of the oil glands is to be ascertained.

4.2.7 When chain cables are ranged, the anchors and cables are to be examined by the Surveyor, see *also* 5.3.13, 5.3.14 and Table 3.5.1.

4.2.8 For electrical equipment survey requirements of oil tankers five years old and over, see 14.3.

4.3 In-water Surveys

4.3.1 The Committee will accept an In-water Survey in lieu of the intermediate docking between Special Surveys required in a five year period on ships other than those covered in 4.1.2 and where an ***IWS** notation is assigned, see Ch 2,2.3.11.

4.3.2 The Committee may accept an In-water Survey in lieu of the intermediate docking between Special Surveys required in a five year period on ships where suitable protection is applied to the underwater portion of the hull. If requested, an ***IWS** notation may be assigned on satisfactory completion of the Survey, provided that the applicable requirements of LR's Rules and Regulations are complied with, see *also* Ch 2,2.3.11.

4.3.3 The In-water Survey is to provide the information normally obtained from the Docking Survey.

4.3.4 Special consideration shall be given to ascertaining rudder bearing clearances and sternbush clearances based on a review of the operating history, on board testing and stern bearing oil analysis. These considerations are to be included in the proposals. In-water Surveys which are to be submitted in advance of the survey being required, so that satisfactory arrangements can be agreed with LR.

4.3.5 The In-water Survey is to be carried out at an agreed geographical location under the surveillance of a Surveyor to LR, with the ship at a suitable draught in sheltered waters and with weak tidal streams and currents. The in-water visibility is to be good and the hull below the waterline is to be clean. The Surveyor is to be satisfied that the method of pictorial presentation is satisfactory. There is to be good two-way communication between the Surveyor and the diver.

4.3.6 Prior to commencing the In-water Survey, the equipment and procedures for both observing and reporting the survey are to be agreed between the Owners, the Surveyor and the diving firm

4.3.7 The In-water Survey is to be carried out by a qualified diver employed by a firm approved by LR.

4.3.8 If the In-water Survey reveals damage or deterioration that requires early attention, the Surveyor may require that the ship be dry-docked in order that a fuller survey can be undertaken and the necessary work carried out.

4.3.9 Where a vessel has an ***IWS** notation, the conditions of the high resistant paint is to be confirmed at each dry-docking in order that the ***IWS** notation can be maintained.

4.3.10 Some National Administrations may have requirements additional to those of 4.3.1 to 4.3.9.

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Section 5 Special Survey – General – Hull requirements

5.1 General

5.1.1 The survey is to be of sufficient extent to ensure that the hull and related piping are in satisfactory condition and are fit for the intended purpose for the new period of class of five years to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out as required by the Regulations.

5.1.2 The requirements of Section 2 are to be complied with as applicable for all ships.

5.1.3 Additional requirements for **general dry cargo ships** are given in this Section; **dry bulk cargo ships bulk carriers** in Section 6; **oil tankers** (including ore/oil ships and ore/bulk/oil ships) in Section 7; **chemical tankers** in Section 8; **ships for liquefied gases** in Section 9.

5.1.4 A Docking Survey in accordance with the requirements of Section 4 is to be carried out as part of the Special Survey.

5.1.5 During the Docking Survey, for general dry cargo ships, oil tankers (including ore/oil ships and ore/bulk/oil ships), chemical tankers and bulk carriers, the overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo spaces and ballast tanks are to be carried out as required, if not already surveyed.

5.2 Preparation

5.2.1 The ship is to be prepared for Overall Survey in accordance with the requirements of Table 3.5.1. The preparation should be of sufficient extent to facilitate an examination to ascertain any significant corrosion, deformation, fractures, damages and other structural deterioration.

5.3 Examination and testing

5.3.1 All spaces within the hull and superstructure are to be examined.

5.3.2 The requirements for tank internal examination are given in Table 3.5.2.

5.3.3 For **oil tankers** (including ore/oil and ore/bulk/oil ships) and **chemical tankers**, the condition of the corrosion prevention system, where provided, is to be examined in cargo tanks and salt-water ballast tanks. Thickness measurements are to be carried out as deemed necessary by the Surveyor. Ballast tanks are to be examined and gauged as necessary at Annual Surveys where:

- (a) A hard protective coating has not been applied from the time of construction, or
- (b) A soft coating has been applied, or
- (c) Substantial corrosion is found within the tank, or

- (d) The hard protective coating is found to be in less than GOOD condition, as defined in 1.5, and the hard protective coating is not repaired to the satisfaction of the Surveyor, or
- (e) For **single hull oil tankers**, the tank has a common plane boundary with a cargo tank with any means of heating.

5.3.4 For those ships not listed in 5.3.3, the condition of the corrosion prevention system, where provided, in salt-water ballast tanks is to be examined. Thickness measurements are to be carried out as deemed necessary by the Surveyor. Where a hard protective coating is found to be in POOR condition, as defined in 1.5, and it has not been repaired, where a soft coating has been applied or where a protective coating was not applied from the time of construction the following requirements are applicable:

- (a) For salt-water ballast tanks, other than independent double bottom tanks, maintenance of class will be subject to the spaces in question being examined and gauged as necessary at Annual Surveys.
- (b) For independent salt-water double bottom tanks, maintenance of class may, at the discretion of the Surveyor, be subject to the spaces in question being examined and gauged as necessary at Annual Surveys.

NOTE

Independent double bottom tanks are those double bottom tanks which are separate from topside tank, side tanks or deep tanks.

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

5.3.6 Where repairs are effected to the shell plating or bulkheads, any tanks in way are to be tested to the Surveyor's satisfaction on completion of these repairs.

5.3.7 On ship-borne barges, in lieu of water testing, tanks and cofferdams may be air tested.

5.3.8 In cases where the inner surface of the bottom plating is covered with cement, asphalt, or other composition, the removal of this covering may be dispensed with, provided that it is inspected, tested by beating or chipping, and found sound and adhering satisfactorily to the steel.

5.3.9 All decks, casings and superstructures are to be examined.

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Table 3.5.1 Survey preparation

Special Survey I (Ships 5 years old)	Special Survey II (Ships 10 years old)	Special Survey III (Ships 15 years old)
<p>(1) The holds, 'tween decks, peaks, deep tanks, engine and boiler spaces, and other spaces, are to be cleared and cleaned as necessary, and the bilges and limbers all fore and aft are to be cleaned and prepared for examination. Platform plates in engine and boiler spaces are to be lifted as may be necessary for the examination of the structure below. Where necessary, close and spar ceiling, lining and pipe casings are to be removed for examination of the structure</p> <p>(2) In ships having a single bottom, a sufficient amount of close ceiling is to be lifted all fore and aft on each side from the bottom and bilges to permit the structure below to be examined</p> <p>(3) In ships having a double bottom, a sufficient amount of ceiling is to be removed from the bilges and inner bottom to enable the condition of the plating to be ascertained. If it is found that the plating is clean and in good condition, and free from rust, the removal of the remainder of ceiling may be dispensed with. The Surveyor may waive the removal of heavy reinforced compositions if there is no evidence of leakages, cracking or other faults in the composition</p> <p>(4) Where holds are insulated for the purpose of carrying refrigerated cargoes, and the hull in way of the insulation was examined by LR's Surveyors at the time such insulation was fitted, it will be sufficient to remove the limbers and hatches to enable the framing and plating in way to be examined; in other cases, additional insulation is to be removed as necessary to satisfy the Surveyor as to the condition of the structure, see also Pt 6, Ch 3</p> <p>(5) The steelwork is to be exposed and cleaned and rust removed as may be required for its proper examination by the Surveyor</p> <p>(6) All tanks are to be cleaned as necessary to permit examination, where this is required by Table 3.5.2</p> <p>(7) Casings or covers of air, sounding, steam and other pipes, spar ceiling and lining in way of the side scuttles are to be removed, as required by the Surveyor</p>	<p>In addition to the requirements for Special Survey I, the following are to be complied with:</p> <p>(1) A sufficient amount of ceiling in the holds and other spaces is to be removed from the bilges and inner bottom to enable the condition of the structure in the bilges, the inner bottom plating, pillar feet, and the bottom plating of bulkheads and tunnel sides to be examined. If the Surveyor deems it necessary, the whole of the ceiling is to be removed</p> <p>(2) In ships having a single bottom, the limber boards and ceiling equal to not less than three strakes, all fore and aft on each side are to be removed, one such strake being taken from the bilges. Where the ceiling is fitted in hatches, the whole of the hatches and at least one strake of ceiling in the bilges are to be removed. If the Surveyor deems it necessary the whole of the ceiling and limber boards are to be removed</p> <p>(3) The chain locker is to be cleaned internally. The chain cables are to be ranged for inspection. The anchors are to be cleaned and placed in an accessible position for inspection</p>	<p>In addition to the requirements for Special Survey II the following are to be complied with:</p> <p>(1) Ceiling in holds is to be removed in order to ascertain that the steelwork is in good condition, free from rust and coated. If the Surveyor is satisfied, after removal of portions of the ceiling then it need not all be removed</p> <p>(2) Portions of wood sheathing, or other covering, on steel decks are to be removed, as considered necessary by the Surveyor, in order to ascertain the condition of the plating</p> <p>(3) Where the holds are insulated for the purpose of carrying refrigerated cargoes, the limbers and hatches are to be lifted and sufficient insulation is to be removed in each of the chambers to enable the Surveyor to satisfy himself of the condition of the framing and plating, see also Pt 6, Ch 3</p> <p style="text-align: center;">All subsequent Special Surveys</p> <p>In addition to the requirements for Special Survey III the following are to be complied with:</p> <p>(1) Where the holds are insulated for the purpose of carrying refrigerated cargoes, the limbers and hatches are to be lifted, and sufficient additional insulation is to be removed in each of the chambers to enable the Surveyor to be satisfied as to the condition of the steel structure, and to enable the thickness of the shell plating to be ascertained as required by 5.4</p>

5.3.10 Wood decks or sheathing are to be examined. If decay or rot is found or the wood is excessively worn, the wood is to be renewed. When a wood deck, laid on stringers and ties, has worn by 15 mm or more, it is to be renewed. Attention is to be given to the condition of the plating under wood decks, sheathing or other deck covering. If it is found that such coverings are broken, or are not adhering closely to the plating, sections are to be removed as necessary to ascertain the condition of the plating, see also 1.2.1.

5.3.11 Mechanically-operated hatch covers are to be tested to confirm satisfactory operation including stowage; and securing in open condition; proper fit and efficiency of sealing in closed conditions; operational testing of hydraulic and power components, wires, chains and link drives. The effectiveness of sealing arrangements of all hatch covers is to be checked by carrying out hose testing or equivalent.

5.3.12 The masts and standing rigging are to be examined.

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Table 3.5.2 Tank internal examination requirements

Tank	Special Survey I (Ships 5 years old)	Special Survey II (Ships 10 years old)	Special Survey III (Ships 15 years old)	Special Survey IV and subsequent (Ships 20 years old and over)
(1) Peaks	All tanks	All tanks	All tanks	All tanks
(2) Salt water ballast	All tanks	All tanks	All tanks	All tanks
(3) Lubricating oil	None	None	None	One tank
(4) Fresh water	None	One tank	All tanks	All tanks
(5) Oil fuel - in way of (i) Engine Room (ii) Cargo Area	None None	None One tank	One tank Two tanks (Note 3)	One tank 50% of tanks – Notes 3 and 4
<p>NOTES</p> <p>1. The above requirements apply to integral tanks only.</p> <p>2. Where a selected number of tanks are examined, then different tanks are to be examined at each Special Survey on a rotational basis.</p> <p>3. To include one deep tank, if any.</p> <p>4. Where 50% of tanks are to be examined, a minimum of two tanks are required to be examined depending upon the overall number of tanks.</p>				

5.3.13 The anchors are to be examined. If the chain cables are ranged they are to be examined. If any length of chain cable is found to be reduced in mean diameter at its most worn part by 12 per cent or more from its nominal diameter, it is to be renewed. The windlass is to be examined. For equipment forming part of a positional mooring system, see 5.3.16.

5.3.14 The chain cables are to be ranged and examined on all ships over five years old.

5.3.15 The Surveyor is to be satisfied that there are suitable mooring ropes when these are a Rule requirement.

5.3.16 On ships fitted with positional mooring equipment in accordance with Pt 7, Ch 8, the anchors are to be cleaned and examined. Wire rope anchor cables are to be examined. If cables are found to contain broken, badly corroded or birdcaging wires they are to be renewed. Chain cables are to be ranged and examined. If any length of chain cable is found to be reduced in mean diameter at its most worn part by 12 per cent or more from its nominal diameter it is to be renewed. The windlass(es) or winches are to be examined.

5.3.17 The hand pumps, suction, watertight doors, air and sounding pipes are to be examined. In addition, the Surveyor is to internally and externally examine air pipe heads in accordance with the requirements of Table 3.5.7.

5.3.18 The Surveyor is to be satisfied as to the efficient condition of the following:

- (a) For ships to which Pt 6, Ch 4 applies, means of escape from crew and passenger spaces, and spaces in which crew are normally employed.
- (b) Helm indicator, protection of aft steering wheel and gear.

5.3.19 Where a special features notation 'certified container securing arrangements' is assigned, the Surveyor is to be satisfied as to the efficient condition of:

- (a) Cell guide structure including the connections between vertical cell guides and cross ties.
- (b) Cell guide entry devices.

- (c) Portable frameworks or other forms of structural restraints.
- (d) Fittings attached to the ship structure, with special attention to any signs of leakage in way of tanks or deck and shell plating.
- (e) End connecting pieces for lashings, twist locks and other loose fittings, which are to be examined and verified with the Register.
- (f) All lashings, rods, wire ropes, and chains, together with turn buckles and other tightening devices, which are to be examined and verified with the Register.
- (g) Lashing wire ropes, which are to be renewed where more than five per cent of the wires are broken, worn or corroded in any length of 10 diameters of the wire rope.
- (h) Chains, which are to be renewed where worn or damaged. Where renewals are required, the new item is to be of approved type and manufacture. Where test certificates are not available, the item is to be tested in accordance with Pt 3, Ch 14.3.

5.3.20 All bilge and ballast piping systems are to be examined and operationally tested to working pressure, to the satisfaction of the Surveyor, to ensure that tightness and condition remain satisfactory.

5.4 Overall Survey

5.4.1 The following requirements are applicable to **general dry cargo ships**.

5.4.2 All cargo holds, salt-water ballast tanks including double bottom tanks, pipe tunnels, cofferdams and void spaces bounding cargo holds, decks and outer hull are to be examined, and this is to be supplemented by Close-up Survey, thickness measurement and testing as deemed necessary, to ensure that the structural integrity remains effective.

5.4.3 The examination is to be sufficient to ascertain substantial corrosion, significant deformation, fractures, damages or other structural deterioration and, if deemed necessary by the Surveyor, suitable non-destructive examination may be required.

5.4.4 All piping systems within the tanks and spaces indicated in 5.4.2 are to be examined and operationally tested to working pressure to the satisfaction of the Surveyor, to ensure that conditions remain satisfactory.

5.4.5 Where the salt-water ballast tanks have been converted to void spaces, the survey extent is to be specially considered based upon salt-water ballast tank requirements.

5.4.6 For single hold general dry cargo ships, other than bulk carriers, fitted with water level detectors in the cargo hold, an examination and a test of the water ingress detection system and alarms are to be carried out.

5.5 Close-up Survey

5.5.1 The following requirements are applicable to **general dry cargo ships**.

5.5.2 The minimum requirements for Close-up Survey are given in Table 3.5.4. The Close-up Survey may be extended, as deemed necessary by the Surveyor, after taking into account the maintenance of the spaces under survey, the condition of the corrosion prevention system and where spaces have structural arrangements or details which have suffered defects in similar spaces or on similar ships according to available information.

5.5.3 For areas in tanks and cargo holds where coatings are found to be in GOOD condition, as defined in 1.5, the extent of Close-up Surveys may be specially considered.

5.6 Thickness measurement

5.6.1 The general minimum requirements for thickness measurement are given in Table 3.5.3. For **general dry cargo ships**, the minimum requirements for thickness measurement are given in Table 3.5.5. The Surveyor may extend the thickness measurements as deemed necessary.

5.6.2 Thickness measurements may be carried out in association with the fourth Annual Survey.

5.6.3 In areas where substantial corrosion, as defined in 1.5, has been noted, then additional measurements are to be carried out, as applicable, in accordance with Table 3.5.6 to determine the full extent of the corrosion pattern. The survey will not be considered complete until these additional thickness measurements have been carried out.

5.6.4 Where substantial corrosion is identified and not rectified, this will be subject to re-examination and gauging as necessary at Annual and Intermediate Surveys.

5.6.5 At each Special Survey, thickness measurements are to be taken in way of critical areas, as considered necessary by the Surveyor. Critical areas are to include locations throughout the ship that show substantial corrosion and/or are considered prone to rapid wastage.

5.6.6 Where required by LR, a check of the buckling capacity of the upper deck is to be carried out for tankers having a length greater than 90 m.

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Table 3.5.3 Thickness measurement – General

Special Survey I (Ships 5 years old)	Special Survey III (Ships 15 years old)	Special Survey IV and subsequent (Ships 20 years old and over)
(1) Critical areas, as required by the Surveyor	(1) Within 0,5L amidships; 2 transverse sections in way of two different cargo spaces, see Notes 2, 3 and 4 (2) All cargo hold hatch covers and coamings (plating and stiffeners)	(1) Within 0,5L amidships; a minimum of 3 transverse sections in way of cargo spaces, see Notes 2, 3 and 4 (2) All cargo hold hatch covers and coamings (plating and stiffeners)
Special Survey II (Ships 10 years old)	(3) All transverse webs with associated plating and longitudinals, and the transverse bulkhead complete in the fore peak tank (see Notes 3 and 5)	(3) All exposed main deck plating over full length of ship (4) All wind and water strakes over the full length of the ship, port and starboard.
(1) Within 0,5L amidships; 1 transverse section of deck plating in way of a cargo space (2) Critical areas, as required by the Surveyor	(4) Critical areas, as required by the Surveyor	(5) Representative exposed superstructure deck plating (i.e. poop, bridge and forecastle deck) (6) Lowest strake and strakes in way of 'tween deck of all transverse bulkheads in cargo spaces together with internals in way, see Note 3 (7) All transverse webs with associated plating and longitudinals, and the transverse bulkhead complete in the fore peak tank and aft peak tank, see Notes 3 and 5 (8) All keel plates over the full length of the ship. Also additional bottom plates in way of cofferdams, machinery space and aft end of tanks (9) Plating of seachests. Also side shell plating in way of overboard discharges, as considered necessary by the Surveyor (10) Critical areas, as required by the Surveyor
<p>NOTES</p> <ol style="list-style-type: none"> 1. Thickness measurement locations are to be selected to provide the best representative sampling of areas likely to be most exposed to corrosion, considering cargo and ballast history and arrangement, and condition of protective coatings. 2. A transverse section is to include all longitudinal members such as plating, longitudinals and girders at the deck, sides, bottom, inner bottom, hopper side and longitudinal bulkheads, where fitted. 3. Where the protective coating is in GOOD condition, then the extent of thickness measurements of internals may be specially considered at the discretion of the Surveyor. 4. For ships having length <i>L</i> less than 100 m: <ol style="list-style-type: none"> (a) the number of transverse sections required at Special Survey III may be reduced to one; (b) the number of transverse sections required at Special Survey IV and subsequent surveys may be reduced to two; (c) at Special Survey III, thickness measurements of exposed deck plating within 0,5L amidships may be required. 5. Transverse bulkhead complete including stiffening system. 6. The requirements for thickness measurement for bulk carriers, oil tankers (including ore/oil and ore/bulk/oil ships), chemical tankers and ships for liquefied gases are given in Sections 6, 7, 8 and 9 respectively. 		

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Table 3.5.4 Close-up Survey – General dry cargo ships

Special Survey I (Ships 5 years old)	Special Survey II (Ships 10 years old)	Special Survey III (Ships 15 years old)	Special Survey IV and subsequent (Ships 20 years old and over)
<p>(1) Selected shell frames in one forward and one aft cargo hold and associated 'tween deck spaces.</p> <p>(2) One selected cargo hold transverse bulkhead.</p> <p>(3) All cargo hold hatch covers and coamings (plating and stiffeners).</p>	<p>(1) Selected shell frames in all cargo holds and 'tween deck spaces.</p> <p>(2) One transverse bulkhead in each cargo hold, including stiffening system.</p> <p>(3) Forward and aft transverse bulkhead in one side ballast tank, including stiffening system.</p> <p>(4) One transverse web with associated plating and framing in two representative water ballast tanks of each type (i.e. topside, hopper side, side tank or double bottom tank).</p> <p>(5) All cargo hold hatch covers and coamings (plating and stiffeners).</p> <p>(6) Selected areas of all deck plating and underdeck structure inside the line of hatch openings between cargo hold hatches.</p> <p>(7) Selected areas of inner bottom plating.</p>	<p>(1) All shell frames in the forward lower cargo hold and 25% of shell frames in each remaining cargo hold and 'tween deck spaces, including their end attachments and adjacent shell plating.</p> <p>(2) All cargo hold transverse bulkheads, including stiffening system.</p> <p>(3) All transverse bulkheads in ballast tanks, including stiffening system.</p> <p>(4) All transverse webs with associated plating and framing in each water ballast tank.</p> <p>(5) All cargo hold hatch covers and coamings (plating and stiffeners).</p> <p>(6) All deck plating and underdeck structure inside the line of hatch openings between cargo hold hatches.</p> <p>(7) All areas of inner bottom plating.</p>	<p>(1) All shell frames in all cargo holds and 'tween deck spaces, including their end attachments and adjacent shell plating.</p> <p>(2) All cargo hold transverse bulkheads, including stiffening system.</p> <p>(3) All transverse bulkheads in ballast tanks, including stiffening system.</p> <p>(4) All transverse webs with associated plating and framing in each water ballast tank.</p> <p>(5) All cargo hold hatch covers and coamings (plating and stiffeners).</p> <p>(6) All deck plating and underdeck structure inside the line of hatch openings between cargo hold hatches.</p> <p>(7) All areas of inner bottom plating.</p>
<p>NOTES</p> <p>1. Close-up survey of cargo hold transverse bulkheads to be carried out at the following areas:</p> <p>(i) Immediately above the inner bottom and immediately above the 'tween decks, as applicable.</p> <p>(ii) Mid-height of the bulkhead for holds without 'tween decks.</p> <p>(iii) Immediately below the main deck plating and 'tween deck plating.</p> <p>2. Ballast tank includes peak tanks.</p>			

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Table 3.5.5 Thickness measurement – General dry cargo ships

Special Survey I (Ships 5 years old)	Special Survey III (Ships 15 years old)	Special Survey IV and subsequent (Ships 20 years old and over)
(1) Critical areas, as required by the Surveyor.	(1) Within 0,5L amidships; 2 transverse sections in way of two different cargo spaces, see Notes 2, 3 and 4.	(1) Within 0,5L amidships; a minimum of 3 transverse sections, see Notes 2, 3 and 4.
Special Survey II (Ships 10 years old)	(2) Measurements for the general assessment and recording of corrosion pattern of those structural members subject to Close-up Survey in accordance with Table 3.5.4, see Note 5.	(2) Measurements for the general assessment and recording of corrosion pattern of those structural members subject to Close-up Survey in accordance with Table 3.5.4, see Note 5.
(1) Within 0,5L amidships; 1 transverse section of deck plating in way of a cargo space. (2) Measurements for the general assessment and recording of corrosion pattern of those structural members subject to Close-up Survey in accordance with Table 3.5.4, see Note 5. (3) Critical areas, as required by the Surveyor.	(3) Within the cargo length area; (i) Each deck plate outside the line of cargo hatch openings. (ii) All wind and water strakes. (4) Selected wind and water strakes outside the cargo length area. (5) All cargo hold hatch covers and coamings (plating and stiffeners). (6) All transverse webs with associated plating and longitudinals, and the transverse bulkhead complete in the fore peak tank, see Notes 3 and 6. (7) Critical areas, as required by the Surveyor	(3) Within the cargo length area; (i) Each deck plate outside the line of cargo hatch openings. (ii) Each bottom plate, including turn of bilge. (iii) Duct keel or pipe tunnel plating and internals. (4) All wind and water strakes over the full length of the ship, port and starboard. (5) All cargo hold hatch covers and coamings (plating and stiffeners). (6) Representative exposed superstructure deck plating (i.e. poop, bridge and forecastle deck). (7) Lowest strake and strakes in way of 'tween decks of all transverse bulkheads in cargo spaces together with internals in way, see Note 3. (8) All transverse webs with associated plating and longitudinals, and the transverse bulkhead complete in the fore peak tank and aft peak tank, see Notes 3 and 6. (9) All keel plates over the full length of the ship. Also additional bottom plates in way of cofferdams, machinery spaces and aft end of tanks. (10) Plating of seachests. Also side shell plating in way of overboard discharges, as considered necessary by the Surveyor. (11) Critical areas, as required by the Surveyor.

NOTES

1. Thickness measurement locations are to be selected to provide the best representative sampling of areas likely to be most exposed to corrosion, considering cargo and ballast history and arrangement, and condition of protective coatings.
2. A transverse section is to include all longitudinal members such as plating, longitudinals and girders at deck, sides, bottom, inner bottom, hopper side and longitudinal bulkheads, where fitted.
3. Where the protective coating is in GOOD condition, then the extent of thickness measurements of internals may be specially considered at the discretion of the attending Surveyor.
4. For ships having length *L* less than 100 m:
 - (a) the number of transverse sections required at Special Survey III may be reduced to one.
 - (b) the number of transverse sections required at Special Survey IV and subsequent surveys may be reduced to two.
5. For areas in cargo holds and salt-water ballast tanks subject to Close-up Survey, the thickness measurements may be dispensed with provided the Surveyor is satisfied with the Close-up Survey examination, that there is no structural diminution and the protective coating remains effective.
6. Transverse bulkhead complete including stiffening system.

Table 3.5.6 Thickness measurement – Additional requirements in way of structure identified with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
Plating	Suspect areas and adjacent plates	5 point pattern over 1 m ²
Stiffeners	Suspect areas	3 measurements each in line across web and flange

Table 3.5.7 Air pipe head internal examination requirements (applicable for automatic air pipe heads installed on exposed decks of all ships except passenger ships)

Special Survey I (Ships 5 years old)	Special Survey II (Ships 10 years old)	Special Survey III (Ships 15 years old) and subsequent
(1) Two air pipe heads (one port and one starboard) on exposed decks in the forward 0,25L. (See Notes 1 to 5)	(1) All air pipe heads on exposed decks in the forward 0,25L. (See Notes 1 to 5)	All air pipe heads on exposed decks. (See Notes 1 to 6)
(2) Two air pipe heads (one port and one starboard) on the exposed decks, serving spaces aft of 0,25L. (See Notes 1 to 5)	(2) At least 20% of air pipe heads on exposed decks, serving spaces aft of 0,25L. (See Notes 1 to 5)	
<p>NOTES</p> <ol style="list-style-type: none"> 1. Air pipe heads serving ballast tanks are to be selected where available. 2. The Surveyor is to select which air pipe heads are to be examined. 3. Where considered necessary by the Surveyor as a result of the examinations, the extent of examinations may be extended to include other air pipe heads on exposed decks. 4. Where the inner parts of air pipe head cannot be properly examined due to its design, it is to be removed in order to allow an internal examination. 5. Particular attention is to be given to the condition of the zinc coating in heads constructed from galvanised steel. 6. Exemption may be considered for air pipe heads where there is documented evidence of their replacement within the previous five years. 		

■ **Section 6**
Special Survey – Bulk carriers – Hull requirements

6.1 General

6.1.1 The requirements of Sections 2, 4 and 5 are to be complied with as applicable.

6.1.2 In order to maintain and/or assign the **ESP** notation, the following requirements apply to the surveys of the hull structure and piping systems in way of the cargo holds, cofferdam, pipe tunnels, void spaces, topside tanks and double bottom tanks in way of the cargo hold area and all salt-water ballast tanks.

6.2 Documentation

6.2.1 The Owner is to maintain documentation on board as follows:

- (a) A survey file comprising reports of structural surveys, thickness measurement and executive hull summary in accordance with IMO Resolution A.744(18).
- (b) Supporting documentation consisting of:
 - (i) Main structural plans of cargo holds and ballast tanks.
 - (ii) Previous repair history.
 - (iii) Cargo and ballast history.
 - (iv) Reports on structural defects/deterioration in general.
 - (v) Reports on leakage in bulkheads and piping systems.
 - (vi) Condition of corrosion prevention system, if any.
 - (vii) Information that may help to identify critical areas.
 - (viii) Survey Programme as required by 6.3.

The complete documentation in 6.2.1 is to be readily available for examination by the Surveyor and should be used as a basis for survey.

6.2.2 The documentation is to be kept on board for the lifetime of the ship.

6.3 Planning for survey

6.3.1 A Survey Programme is to be submitted by the Owner and is to include the proposals for survey, including the means of providing access for Close-up Survey, thickness measurement and tank testing and should take account of the information detailed in 6.2.1.

6.3.2 Prior to the development of the Survey Programme, a Survey Planning Questionnaire is to be completed and submitted by the Owner, see 1.6.9.

6.4 Overall Survey

6.4.1 All cargo holds, salt-water ballast tanks including double bottom tanks, pipe tunnels, cofferdams and void spaces bounding cargo holds, decks and outer hull are to be examined, and this examination is to be supplemented by Close-up Survey, thickness measurement and testing as deemed necessary, to ensure that the structural integrity remains effective.

6.4.2 The examination is to be sufficient to ascertain substantial corrosion, significant deformation, fractures, damages or other structural deterioration and, if deemed necessary by the Surveyor, suitable non-destructive examination may be required.

6.4.3 Where substantial corrosion, as defined in 1.5, is identified and is not rectified, this will be subject to re-examination at Annual and Intermediate Surveys.

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6.4.4 All piping systems within the tanks and spaces indicated in 6.4.1 are to be examined and tested under working conditions to ensure that the conditions remain satisfactory.

6.4.5 The extent of survey of combined salt-water ballast cargo holds is to be evaluated based on the records of ballast history, the extent and condition of the corrosion protection system provided, and the extent of structural diminution (corrosion).

6.4.6 Where salt-water ballast tanks have been converted to void spaces the survey extent is to be based upon salt-water ballast tank requirements.

6.4.7 Where provided, in association with a corrosion control (c.c.) notation as defined in the *Register Book*, the condition of the protective coating or corrosion prevention system is to be examined.

6.4.8 For ships fitted with water level detectors in cargo holds, ballast tanks forward of the collision bulkhead and any dry or void space which extends forward of the foremost cargo hold, an examination and a test of the water ingress detection systems and of their alarms is to be carried out.

6.4.9 For ships fitted with a means for draining and pumping ballast tanks forward of the collision bulkhead and the bilges of dry spaces, any part of which extends forward of the foremost cargo hold, an examination and a test of the draining and pumping systems including their controls is to be carried out.

6.5 Testing

6.5.1 The minimum requirements for tank testing, as applicable, are given in 5.3.5. Where required, the Surveyor may extend the tank testing if deemed necessary.

6.6 Close-up Survey

6.6.1 The minimum requirements for Close-up Survey are given in Table 3.6.1.

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

6.6.3 For areas in tanks and cargo holds where coatings are found to be in GOOD condition, as defined in 1.5, the extent of Close-up Surveys may be specially considered.

6.7 Thickness measurement

6.7.1 The minimum requirements for thickness measurements are given in Table 3.6.2, see *also* 5.4.

6.7.2 In areas where substantial corrosion, as defined in 1.5, has been noted then additional measurements are to be carried out, as applicable, in accordance with Tables 3.6.4, 3.6.5, 3.6.6, 3.6.7, 3.6.8 and 3.6.9 to determine the full extent of the corrosion pattern. The survey will not be considered complete until these additional thickness measurements have been carried out.

6.7.3 Thickness measurement is required to determine both general and local levels of corrosion in salt-water ballast tanks and in the shell frames and their end attachments in all cargo holds. Thickness measurements are also to be carried out to determine the corrosion levels on the transverse bulkhead plating.

6.7.4 Single skin bulk carriers contracted for construction prior to 1 July 1998 are to undergo a re-assessment and evaluation of their cargo hold shell frames in accordance with the Provisional Rules for Existing Ships. The number of shell frames to be measured is equivalent to number of shell frames subject to close-up survey (see Table 3.6.1), with representative measurements to be taken at specific areas for each frame. The extent of thickness measurement may be specially considered by the Surveyor, provided the structural members indicate no thickness diminution with respect to the Rule thickness and the coating is found in 'as-new' condition (i.e. without breakdown or rusting). Repairs to shell frames are to be based upon the minimum thickness values shown in the evaluation records.

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Table 3.6.1 Close-up Survey – Single skin bulk carriers

Special Survey I (Ships 5 years old)	Special Survey II (Ships 10 years old)	Special Survey III (Ships 15 years old)	Special Survey IV (Ships 20 years old and over)
<p>(1) 25% of shell frames and their end attachments in the forward cargo hold at representative positions.</p> <p>(2) Selected shell frames and their end attachments in remaining cargo holds.</p> <p>(3) 1 transverse web with associated plating and longitudinals in 2 representative water ballast tanks of each type (i.e. topside or hopper side tank).</p> <p>(4) 2 selected cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted. This is to include the aft bulkhead of the forward hold.</p> <p>(5) All cargo hold hatch covers and coamings (plating and stiffeners).</p>	<p>(1a) For bulk carriers with a deadweight less than 100,000 tonnes, all shell frames in the forward cargo hold and 25% of frames in each of the remaining cargo holds, including their end attachments and adjacent shell plating.</p> <p>(1b) For bulk carriers with a deadweight equal to or greater than 100,000 tonnes, all shell frames in the forward cargo hold and 50% of frames in each of the remaining cargo holds, including their end attachments and adjacent shell plating.</p> <p>(2) 1 transverse web with associated plating and longitudinals in each water ballast tank.</p> <p>(3) Forward and aft transverse bulkhead in 1 side ballast tank, including stiffening system.</p> <p>(4) All cargo hold transverse bulkheads including internal structure of upper and lower stools, where fitted.</p> <p>(5) All cargo hold hatch covers and coamings (plating and stiffeners).</p> <p>(6) All deck plating and underdeck structure inside line of hatch openings between all cargo hold hatches.</p>	<p>(1) All shell frames in the forward and one other selected cargo hold and 50% of frames in each of the remaining cargo holds, including their end attachments and adjacent shell plating.</p> <p>(2) All transverse webs with associated plating and longitudinals in each water ballast tank.</p> <p>(3) All transverse bulkheads in ballast tanks, including stiffening system.</p> <p>(4) All cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted.</p> <p>(5) All cargo hold hatch covers and coamings (plating and stiffeners).</p> <p>(6) All deck plating and underdeck structure inside line of hatch openings between all cargo hold hatches.</p>	<p>(1) All shell frames in all cargo holds, including their end attachments and adjacent shell plating.</p> <p>(2) All transverse webs with associated plating and longitudinals in each water ballast tank (i.e. topside, hopper side or side tank).</p> <p>(3) All transverse bulkheads in ballast tanks, including stiffening system.</p> <p>(4) All transverse webs with associated plating and longitudinals in each water ballast tank.</p> <p>(5) All cargo hold hatch covers and coamings (plating and stiffeners).</p> <p>(6) All deck plating and underdeck structure inside line of hatch openings between all cargo hold hatches.</p>

NOTES

The requirements in this Table apply to all single skin bulk carriers unless stated otherwise.

1. Ballast tank includes peak tanks.
2. Close-up Survey of transverse bulkheads to be carried out at four levels:
 - Level (a) Immediately above the inner bottom and immediately above the line of gussets (if fitted) and shedders for ships without lower stool.
 - Level (b) Immediately above and below the lower stool shelf plate (for those ships fitted with lower stools), and immediately above the line of the shedder plates.
 - Level (c) About mid-height of the bulkhead.
 - Level (d) Immediately below the upper deck plating and immediately adjacent to the upper wing tank and immediately below the upper stool shelf plate for those ships fitted with upper stools, or immediately below the topside tanks.

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Table 3.6.2 Close-up Survey – Double skin bulk carriers

Special Survey I (Ships 5 years old)	Special Survey II (Ships 10 years old)	Special Survey III (Ships 15 years old)	Special Survey IV (Ships 20 years old and over)
<p>(1) 1 transverse web with associated plating and longitudinals in 2 representative water ballast tanks of each type. This is to include the foremost topside and double side ballast tanks on either side</p> <p>(2) 2 selected cargo hold transverse bulkheads including internal structure of upper and lower stools, where fitted</p> <p>(3) All cargo hold hatch covers and coamings (plating and stiffeners)</p>	<p>(1) 1 transverse web with associated plating and longitudinals in each water ballast tank</p> <p>(2) Forward and aft transverse bulkheads, including stiffening system, in a complete ballast tank, see Note 1</p> <p>(3) 25% of ordinary transverse web frames in the foremost double side tanks</p> <p>(4) One transverse bulkhead in each cargo hold including internal structure of upper and lower stools, where fitted</p> <p>(5) All cargo hold hatch covers and coamings (plating and stiffeners)</p> <p>(6) All deck plating and under-deck structure inside line of hatch openings between all cargo hold hatches</p>	<p>(1) All transverse webs with associated plating and longitudinals in each water ballast tank</p> <p>(2) All transverse bulkheads in ballast tanks, including stiffening system</p> <p>(3) 25% of ordinary transverse web frames in all double side tanks</p> <p>(4) All cargo hold transverse bulkheads including internal structure of upper and lower stools, where fitted</p> <p>(5) All cargo hold hatch covers and coamings (plating and stiffeners)</p> <p>(6) All deck plating and under-deck structure inside line of hatch openings between all cargo hold hatches</p>	<p>(1) All transverse webs with associated plating and longitudinals in each water ballast tank</p> <p>(2) All transverse bulkheads in ballast tanks, including stiffening system</p> <p>(3) All ordinary transverse web frames in all double side tanks</p> <p>(4) All cargo hold transverse bulkheads including internal structure of upper and lower stools, where fitted</p> <p>(5) All cargo hold hatch covers and coamings (plating and stiffeners)</p> <p>(6) All deck plating and under-deck structure inside line of hatch openings between all cargo hold hatches</p>
<p>NOTES</p> <p>1. Complete ballast tank means topside tank, hopper tank, double bottom tank and double side tank, even if these are separate.</p> <p>2. Ballast Tank includes peak tanks.</p> <p>3. Close-up survey of transverse bulkheads to be carried out at four levels:</p> <p>Level (a) Immediately above the inner bottom and immediately above the line of gussets (if fitted) and shedders for ships with out lower stool.</p> <p>Level (b) Immediately above and below the lower stool shelf plate (for those ships fitted with lower stools), and immediately above the line of the shedder plates.</p> <p>Level (c) About mid-height of the bulkhead.</p> <p>Level (d) Immediately below the upper deck plating and immediately adjacent to the upper wing tank and immediately below the upper stool shelf plate for those ships fitted with upper stools, or immediately below the topside tanks.</p>			

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Table 3.6.3 Thickness measurement – Single skin and double skin bulk carriers

Special Survey I (Ships 5 years old)	Special Survey III (Ships 15 years old)	Special Survey IV and subsequent (Ships 20 years old and over)
(1) Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey in accordance with Table 3.6.1 or Table 3.6.2. (2) Critical areas, as required by the Surveyor.	(1) Within the cargo length area: (a) Each deck plate outside line of cargo hatch openings. (b) 2 transverse sections, outside line of cargo hatch openings. (A minimum of 1 of the above transverse sections is to be within 0,5L amidships). (2) Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey in accordance with Table 3.6.1 or Table 3.6.2.	(1) Within the cargo length area: (a) Each deck plate outside line of cargo hatch openings. (b) 3 transverse sections, outside line of cargo hatch openings. (A minimum of 2 of the above transverse sections is to be within 0,5L amidships). (c) Each bottom plate. (2) Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey in accordance with Table 3.6.1 or Table 3.6.2.
Special Survey II (Ships 10 years old)	(3) All wind and water strakes within the cargo length area.	(3) All wind and water strakes over the full length of the ship, port and starboard.
(1) Within the cargo length area: (a) 2 sections of deck plating outside line of cargo hatch openings. (2) Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey in accordance with Table 3.6.1 or Table 3.6.2. (3) Wind and water strakes in way of the transverse sections considered in item (1). (4) Cargo hold shell frames on single skin ships, see Note 5. (5) Critical areas, as required by the Surveyor.	(4) Selected wind and water strakes outside the cargo length area. (5) All cargo hatch covers and coamings (plating and stiffeners). (6) All transverse webs with associated plating and longitudinals, and the transverse bulkhead complete in the fore peak tank see Notes 1 and 3. (7) The aft bulkhead of the forward cargo hold on single skin ships (see Note 4). (8) Cargo hold shell frames on single skin ships, see Note 5. (9) Critical areas, as required by the Surveyor.	(4) All cargo hatch covers and coamings (plating and stiffeners). (5) Remaining exposed main deck plates not considered in item (1) and representative exposed superstructure deck plating (i.e. poop, bridge and forecastle deck). (6) All transverse webs with associated plating and longitudinals, and the transverse bulkhead complete in the fore peak tank and aft peak tank, see Notes 1 and 3. (7) All keel plates outside the cargo length area. Also additional bottom plates in way of cofferdams. Machinery space and aft end of tanks. (8) Plating of seachests. Also side shell plating in way of overboard discharges, as considered necessary by the Surveyor. (9) The aft bulkhead of the forward cargo hold on single skin ships (see Note 4). (10) Cargo hold shell frames on single skin ships, see Note 5. (11) Critical areas, as required by the Surveyor.

NOTES

The requirements in this table apply to both single skin and double skin ships unless stated otherwise.

1. For areas in spaces where coatings are found to be in GOOD condition, as defined in 1.5, the extent of thickness measurement may be specially considered. Prior to any coating or re-coating of cargo holds, scantlings are to be confirmed by thickness measurement with the Surveyor in attendance.
2. Transverse sections should be chosen where the largest reductions are likely to occur, or as revealed by deck plating measurement.
3. Transverse bulkhead complete including stiffening system.
4. For ships assigned the notation ESN, the corrugated part of the aft transverse bulkhead of the forward cargo hold is to be subject to thickness measurement. This is to include each vertical corrugation at its lower and middle level including shedder plates and gusset plates, where applicable.
5. Single skin bulk carriers contracted for construction prior to 1 July 1998 are to undergo a re-assessment of their cargo hold shell frames in accordance with the Provisional Rules for Existing Ships. The number of shell frames to be measured is equivalent to the number of shell frames subject to Close-up survey (see Table 3.6.1), with representative measurements to be taken at specific areas for each frame.

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Table 3.6.4 Thickness measurement – Single skin bulk carriers – Shell plating and stiffening, with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Bottom and side shell plating	Suspect plate, plus four adjacent plates	5 point pattern for each panel between longitudinals
(2) Bottom/side shell longitudinals	Minimum of three longitudinals in way of suspect areas	3 measurements in line across web and 3 measurements on flange
(3) Side shell frames	Suspect frame and each adjacent	(a) At each end and mid-span: 5 point pattern on both web and flange (b) 5 point pattern within 25 mm of welded attachment to both shell and hopper sloping plate

Table 3.6.5 Thickness measurement – Single skin bulk carriers – Double bottom and hopper structure, with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Inner bottom plating	Suspect plate plus all immediately adjacent plates	5 point pattern for each panel between longitudinals over 1 m length
(2) Inner bottom longitudinals	Three longitudinals in way of plates measured	3 measurements in line across web and 3 measurements on flange
(3) Transverse floors and longitudinal girders	Suspect plates	5 point pattern over approximately 1 m ² of plating
(4) Watertight floors and girders	(a) lower 1/3 of tank (b) upper 2/3 of tank	(a) 5 point pattern over 1 m ² of plating (b) 5 point pattern alternate plates over 1 m ² of plating
(5) Transverse web frames	Suspect plate	5 point pattern over 1 m ² of plating

Table 3.6.6 Thickness measurement – Single skin and double skin bulk carriers – Transverse bulkheads in cargo holds, with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Lower stool	(a) Transverse band within 25 mm of welded connection to inner-bottom	(a) 5 point pattern between stiffeners over 1 m length
	(b) Transverse band within 25 mm of welded connection to shelf plate	(b) as above
(2) Transverse bulkhead	(a) Transverse band immediately above lower stool shelf plate	(a) 5 point pattern over 1 m length
	(b) Transverse band at approximately mid-height	(b) 5 point pattern over 1 m ² of plating
	(c) Transverse band at part of bulkhead adjacent to upper deck or below upper stool shelf plate (for those ships fitted with upper stools)	(c) 5 point pattern over 1 m ² of plating

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Table 3.6.7 Thickness measurement – Single skin and double skin bulk carriers – Deck structure including cross strips, main cargo hatchways, hatch covers, coamings and topside tanks, with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Cross deck strip plating	Suspect cross deck strip plating	5 point pattern between underdeck stiffeners over 1 m length
(2) Underdeck stiffeners	(a) Transverse members (b) Longitudinal member	(a) 5 point pattern at each end and mid-span (b) 5 point pattern on both web and flange
(3) Hatch covers	(a) Each side and end plate 3 locations (b) Top plate, 3 longitudinal bands – 2 on outboard strakes and 1 on centreline strake	(a) 5 point pattern at each location (b) 5 point measurement at each band
(4) Hatch coamings	Each side and end of coaming, one upper and one lower band	5 point measurement at each band
(5) Topside salt water ballast tanks	(a) Watertight transverse bulkheads (i) lower 1/3 of bulkhead (ii) upper 2/3 of bulkhead (iii) stiffeners (b) Swash transverse bulkheads (i) lower 1/3 of bulkhead (ii) upper 2/3 of bulkhead (iii) stiffeners (c) 3 representative bays of the topside sloping plate (i) lower 1/3 of tank (ii) upper 2/3 of tank (d) suspect longitudinals and adjacent longitudinals	(i) 5 point pattern over 1 m ² of plating (ii) 5 point pattern over 1 m ² of plating (iii) 5 point pattern over 1 m length (i) 5 point pattern over 1 m ² of plating (ii) 5 point pattern over 1 m ² of plating (iii) 5 point pattern over 1 m length (i) 5 point pattern over 1 m ² of plating (ii) 5 point pattern over 1 m ² of plating 5 point pattern both web and flange over 1 m length
(6) Main deck plating	Suspect plates and 4 immediately adjacent plates	5 point pattern over 1 m ² of plating
(7) Main deck longitudinals	Minimum of 3 longitudinals where plating measured	5 point pattern on both web and flange over 1 m length
(8) Web frames/transverses	Suspect plates	5 point pattern over 1 m ² of plating

Table 3.6.8 Thickness measurement – Double skin bulk carriers – Bottom, inner bottom and hopper structure, with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Bottom, inner bottom and hopper structure plating	(a) Minimum of 3 bays across double bottom tank, including aft bay (b) Measurements around and under all suction bell mouths	5 point pattern for each panel between longitudinals and floors
(2) Bottom, inner bottom and hopper structure longitudinals	Minimum of 3 longitudinals in each bay where bottom plating measured	3 measurements in line across flange and 3 measurements on the vertical web
(3) Bottom girders, including watertight girders	At fore and aft watertight floors and in centre of tanks	Vertical line of single measurements on girder plating with 1 measurement between each panel stiffener, or a minimum of 3 measurements
(4) Bottom floors, including watertight floors	3 floors in the bays where bottom plating measured, with measurements at both ends and middle	5 point pattern over 2 m ² area
(5) Hopper structure web frame ring	3 floors in bays where bottom plating measured	5 point pattern over 1 m ² of plating and single measurements on flange
(6) Hopper structure transverse watertight bulkhead or swash bulkhead	(a) lower 1/3 of bulkhead (b) upper 2/3 of bulkhead (c) stiffeners (minimum of 3)	(a) 5 point pattern over 1 m ² of plating (b) 5 point pattern over 2 m ² of plating (c) For web, 5 point pattern over span (2 measurements across web at each end and 1 at centre of span). For flange, single measurements at each end and centre of span
(7) Panel stiffening	Where applicable	Single measurements

Table 3.6.9 Thickness measurement – Double skin bulk carriers – Double side ballast tank structure, with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Side shell and inner plating: (i) Upper strake and strakes in way of horizontal girders (ii) All other strakes	(i) Plating between each pair of transverse frames/longitudinals in a minimum of 3 bays along the tank (ii) Plating between every third pair of longitudinals in same 3 bays	(i) Single measurement (ii) Single measurement
(2) Side shell and inner side transverse frames/longitudinals on: (i) Upper strake (ii) All other strakes	(i) Each transverse frame/longitudinal in same 3 bays (ii) Every third transverse frame/longitudinal in same 3 bays	(i) 3 measurements across web and 1 measurement on flange (ii) 3 measurements across web and 1 measurement on flange
(3) Transverse frames/longitudinals – brackets	Minimum of 3 at top, middle and bottom of tank in same 3 bays	5 point pattern over area of bracket
(4) Vertical web and transverse bulkheads: (i) Strakes in way of horizontal girders (ii) Other strakes	(i) Minimum of 2 webs and both transverse bulkheads (ii) Minimum of 2 webs and both transverse bulkheads	(i) 5 point pattern over approx. 2 m ² area (ii) 2 measurements between each pair of vertical stiffeners
(5) Horizontal girders	Plating on each girder in a minimum of 3 bays	2 measurements between each pair of longitudinal girder stiffeners
(6) Panel stiffening	Where applicable	Single measurements

■ **Section 7
Special Survey – Oil tankers
(including ore/oil ships and
ore/bulk/oil ships) – Hull
requirements**

7.1 General

7.1.1 The requirements of Sections 2, 4 and 5 are to be complied with as applicable.

7.1.2 In order to maintain and/or assign the **ESP** notation, the following requirements apply to the surveys of the hull structure and piping systems in way of the cargo tanks/cargo holds, pump rooms, cofferdam, pipe tunnels, void spaces, double bottom tanks, etc., in way of the cargo tank area and all salt-water ballast tanks.

7.2 Documentation

7.2.1 The Owner is to maintain documentation on board as follows:

- (a) A survey file comprising reports of structural surveys, thickness measurement and executive hull summary in accordance with IMO Resolution A.744(18).
- (b) Supporting documentation consisting of:
 - (i) Main structural plans of cargo tanks/cargo holds and ballast tanks.
 - (ii) Previous repair history.
 - (iii) Cargo and ballast history.
 - (iv) Reports on structural defects/deterioration in general.

- (v) Reports on leakage in bulkheads and piping systems.
- (vi) Condition of corrosion prevention system, if any.
- (vii) Extent of use of inert gas plant and tank cleaning procedures when forming part of approved corrosion control system.
- (viii) Information that may help to identify critical areas.
- (ix) Survey Programme as required by 7.3.

The complete documentation in 7.2.1 is to be readily available for examination by the Surveyor and should be used as a basis for survey.

7.2.2 The documentation is to be kept on board for the lifetime of the ship.

7.3 Planning for survey

7.3.1 A Survey Programme is to be submitted by the Owner and is to include the proposals for survey, including the means of providing access for Close-up Survey, thickness measurement and tank testing and should take account of the information detailed in 7.2.1.

7.3.2 Prior to the development of the Survey Programme a Survey Planning Questionnaire is to be completed and submitted by the Owner, see 1.6.9.

7.4 Overall Survey

7.4.1 All cargo tanks/cargo holds, and salt-water ballast tanks including double bottom tanks, pump rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks/cargo holds, deck and outer hull are to be examined, and this examination is to be supplemented by Close-up Survey, thickness measurement and testing as deemed necessary, to ensure that the structural integrity remains effective.

7.4.2 The examination is to be sufficient to ascertain substantial corrosion, significant deformation, fractures, damages or other structural deterioration and, if deemed necessary by the Surveyor, suitable non-destructive examination may be required.

7.4.3 Where substantial corrosion, as defined in 1.5, is identified and is not rectified, this will be subject to re-examination at Annual and/or Intermediate Surveys. In the case of salt-water ballast tanks and combined tanks for the carriage of salt-water ballast and cargo oil, the examination will be required at Annual Survey and Intermediate Survey. In the case of cargo oil tanks the examination will be required at Intermediate Surveys.

7.4.4 All cargo piping on deck, including Crude Oil Washing (COW) piping, and cargo and ballast piping within those spaces indicated in 7.4.1 are to be examined and tested under working conditions to ensure that tightness and condition remain satisfactory. Special attention is to be given to ballast piping in cargo tanks and any cargo piping in ballast tanks and void spaces.

7.4.5 Where salt-water ballast tanks have been converted to void spaces the survey extent is to be based upon salt-water ballast tank requirements.

7.4.6 Where provided, in association with a corrosion control (c.c.) notation as defined in the *Register Book*, the condition of the protective coating or corrosion prevention system of cargo tanks is to be examined.

7.4.7 The attachment to the structure and condition of anodes in tanks are to be examined.

7.4.8 Where fitted, the strums of the cargo suction pipes are to be removed or lifted to facilitate examination of the shell plating and bulkheads in the vicinity, unless other means for visual inspection of these parts are provided.

7.5 Testing

7.5.1 The minimum tank testing requirements are given in Table 3.7.1 and, where required, the Surveyor may extend the tank testing if deemed necessary. The remaining requirements for tank testing, as applicable, are given in 5.3.5.

7.6 Close-up Survey

7.6.1 The minimum requirements for Close-up Survey are given in Table 3.7.2 (Single hull oil tankers), Table 3.7.3 (Double hull oil tankers), Table 3.7.4 (Ore/oil ships) and Table 3.7.5 (Ore/bulk/oil ships).

7.6.2 The Surveyor may extend the Close-up Survey, if deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system, and the following:

- (a) Structural arrangements or details which have suffered defects in similar spaces or on similar ships.
- (b) Spaces which have structures approved with reduced scantlings in association with an approved corrosion control system (c.c.).

7.6.3 For areas in tanks where coatings are found to be in GOOD condition, as defined in 1.5, the extent of Close-up Surveys may be specially considered.

7.7 Thickness measurement

7.7.1 The minimum requirements for thickness measurements are given in Table 3.7.6 (Single and double hull oil tankers, including ore/oil ships and ore/bulk/oil ships), see also 5.4.

7.7.2 In areas where substantial corrosion, as defined in 1.5, has been noted then additional measurements are to be carried out, as applicable, in accordance with Tables 3.7.7, 3.7.8, 3.7.9, 3.7.10, 3.7.11, 3.7.12, 3.7.13, 3.7.14 and 3.7.15 to determine the full extent of the corrosion pattern. The survey will not be considered complete until these additional thickness measurements have been carried out.

7.7.3 For **oil tankers** (including ore/oil and ore/bulk/oil ships) of 130 m in length and upwards (as defined by the International Convention on Load Lines in force), the ship's longitudinal strength is to be evaluated by using the thickness of structural members measured, renewed and reinforced as appropriate, during the Special Surveys carried out after the ship reaches 10 years of age.

Table 3.7.1 Tank testing requirements – Single hull and double hull oil tankers, ore/oil ships and ore/bulk/oil ships

Special Survey I (Ships 5 years old)	Special Survey II and subsequent (Ships 10 years old and over)
All ballast tank boundaries	All ballast tank boundaries
Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, pump rooms or cofferdams	All cargo tank bulkheads

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Table 3.7.2 Close-up Survey – Single hull oil tankers

Special Survey I (Ships 5 years old)	Special Survey II (Ships 10 years old)	Special Survey III (Ships 15 years old)	Special Survey IV (Ships 20 years old and over)
(1) One web frame ring – in a wing ballast tank, if any, or a cargo wing tank used primarily for water ballast, see Note 1 (2) One deck transverse – in a cargo tank, see Note 2 (3) One transverse bulkhead, see Note 4: (a) in a ballast tank (b) in a cargo wing tank (c) in a cargo centre tank	(1) All web frame rings – in a wing ballast tank, if any, or a cargo wing tank used primarily for water ballast, see Note 1 (2) One deck transverse, see Notes 2 and 8: (a) in each of the remaining ballast tanks, if any (b) in a cargo wing tank (c) in 2 cargo centre tanks (3) Both transverse bulkheads – in a wing ballast tank, if any, or a cargo wing tank used primarily for water ballast, see Note 3 (4) One transverse bulkhead, see Note 4: (a) in each remaining ballast tank (b) in a cargo wing tank (c) in 2 cargo centre tanks	(1) All web frame rings, see Note 1: (a) in all ballast tanks (b) in a cargo wing tank (2) A minimum of 30% of all web frame rings in each remaining cargo wing tank, see Notes 1 and 8 (3) All transverse bulkheads – in all cargo and ballast tanks, see Note 3 (4) A minimum of 30% of deck and bottom transverses in each cargo centre tank, see Notes 5 and 8. (5) As considered necessary by the Surveyor, see Note 6	(1) As Special Survey III (2) Additional transverse areas if deemed necessary by the Surveyor
<p>NOTES</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p>1. Complete transverse web frame ring including adjacent structural members.</p> <p>2. Deck transverse including adjacent deck structural members.</p> <p>3. Transverse bulkhead complete, including girder system and adjacent members, and adjacent longitudinal bulkhead structure.</p> <p>4. Transverse bulkhead lower part including girder system and adjacent structural members.</p> </div> <div style="width: 48%;"> <p>5. Deck and bottom transverse including adjacent structural members.</p> <p>6. Additional complete transverse web frame ring.</p> <p>7. Ballast tank includes peak tanks.</p> <p>8. Within the mid 0,5 length of the tank. The 30% is to be rounded up to the next whole number of structural items.</p> </div> </div>			

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Table 3.7.3 Close-up Survey – Double hull oil tankers

Special Survey I (Ships 5 years old)	Special Survey II (Ships 10 years old)	Special Survey III (Ships 15 years old)	Special Survey IV (Ships 20 years old and over)
(1) One web frame ring in a complete ballast tank, see Notes 1 and 3 (2) One deck transverse in a cargo tank, see Notes 4 and 12 (3) One transverse bulkhead in a complete ballast tank, see Notes 1 and 6 (4) One transverse bulkhead in a cargo centre tank, see Notes 2 and 7 (5) One transverse bulkhead in a cargo wing tank, see Note 7	(1) All web frame rings in a complete ballast tank, see Notes 1 and 3 (2) The knuckle area and the upper part (approx. 5 m) of one web frame ring in each remaining ballast tank, see Note 8 (3) One deck transverse in two cargo tanks, see Note 4 (4) One transverse bulkhead in each complete ballast tank, see Notes 1 and 6 (5) One transverse bulkhead in two cargo centre tanks, see Notes 2 and 7 (6) One transverse bulkhead in a cargo wing tank, see Note 7	(1) All web frame rings in all ballast tanks, see Note 3 (2) All web frame rings in a cargo tank, see Note 9 (3) One web frame ring in each remaining cargo tank, see Note 9 (4) All transverse bulkheads – in all cargo and ballast tanks, see Notes 5 and 6 (5) As considered necessary by the Surveyor, see Note 10	(1) As Special Survey III (2) Additional transverse areas if deemed necessary by the Surveyor, see Note 10
<p>NOTES</p> <p>1. Complete ballast tank means double bottom tank plus the double side tank and the double deck tank, as applicable, even if these are separate.</p> <p>2. Where there are no centre tanks, the transverse bulkheads in wing tanks are to be subject to Close-up Survey.</p> <p>3. Web frame ring in a ballast tank includes the vertical web in side tank, hopper web in hopper tank, floor in double bottom tank and deck transverse in a double deck tank and adjacent structural members. In peak tanks a web frame means a complete transverse web frame, including adjacent structural members.</p> <p>4. Deck transverse including adjacent deck structural members (or external structure on deck in way of the tank, where applicable).</p> <p>5. Transverse bulkhead complete in cargo tanks, including girder system, adjacent structural members (including longitudinal bulkheads) and internal structure of lower and upper stools, where fitted.</p> <p>6. Transverse bulkhead complete in ballast tanks, including girder system and adjacent structural members including longitudinal bulkheads, girders in double bottom tanks, inner bottom plating, hopper side, connecting brackets.</p> <p>7. Transverse bulkhead lower part in cargo tanks, including girder system, adjacent structural members (including longitudinal bulkheads) and internal structure of lower stool, where fitted.</p> <p>8. The knuckle area and the upper part (approximately 5 m), including adjacent structural members. Knuckle area is the area of the web frame around the connections of the sloping 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.</p> <p>9. Web frame ring in cargo tank includes deck transverse, longitudinal bulkhead vertical girder and cross ties, where fitted, and adjacent structural members.</p> <p>10. Additional complete transverse web frame ring.</p> <p>11. Ballast tanks include peak tanks.</p> <p>12. Within the mid 0,5 length of the tank.</p>			

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Table 3.7.4 Close-up Survey – Ore/oil ships

Special Survey I (Ships 5 years old)	Special Survey II (Ships 10 years old)	Special Survey III (Ships 15 years old)	Special Survey IV (Ships 20 years old and over)
(1) One web frame ring – in a wing ballast tank, if any, or a cargo wing tank used primarily for water ballast, see Note 1 (2) One deck transverse – in a cargo tank, see Note 2 (3) One transverse bulkhead, see Note 4: (a) in a ballast tank (b) in a cargo wing tank (c) in a cargo centre tank	(1) All web frame rings – in a wing ballast tank, if any, or a cargo wing tank used primarily for water ballast, see Note 1 (2) One deck transverse, see Notes 2 and 6: (a) in each of the remaining ballast tanks, if any (b) in a cargo wing tank (c) in 2 cargo centre tanks (3) Both transverse bulkheads – in a wing ballast tank, if any, or a cargo wing tank used primarily for water ballast, see Note 3 (4) One transverse bulkhead, see Note 4: (a) in each remaining ballast tank (b) in a cargo wing tank (c) in 2 cargo centre tanks (5) Selected cargo hold hatch covers and coamings (plating and stiffeners) (6) Selected areas of deck plating inside line of hatch openings between cargo hold hatches	(1) All web frame rings, see Note 1: (a) in all ballast tanks (b) in a cargo wing tank (2) One web frame ring – in each remaining cargo wing tank, see Notes 1 and 6 (3) One deck transverse – in each cargo centre tank, see Notes 2 and 6 (4) All transverse bulkheads – in all cargo and ballast tanks, see Note 3 (5) All cargo hold hatch covers and coamings (plating and stiffeners) (6) All deck plating inside line of hatch coamings between cargo hold hatches (7) As considered necessary by the Surveyor, see Note 5	(1) As Special Survey III (2) Additional transverse areas if deemed necessary by the Surveyor
<p>NOTES</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>1. Complete transverse web frame ring including adjacent structural members.</p> <p>2. Deck transverse including adjacent deck structural members.</p> <p>3. Transverse bulkhead complete, including girder system and adjacent members, and adjacent longitudinal bulkhead structure.</p> </div> <div style="width: 45%;"> <p>4. Transverse bulkhead lower part including girder system and adjacent structural members.</p> <p>5. Additional complete transverse web frame ring.</p> <p>6. Within the mid 0,5 length of the tank.</p> </div> </div>			

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Table 3.7.5 Close-up Survey – Ore/bulk/oil ships

Special Survey I (Ships 5 years old)	Special Survey II (Ships 10 years old)	Special Survey III (Ships 15 years old)	Special Survey IV (Ships 20 years old and over)
(1) 25% of shell frames and their end attachments in the forward cargo hold at representative positions (2) Selected frames and their end attachments in remaining cargo holds (3) 1 transverse web with associated plating and longitudinals in 2 representative water ballast tanks of each (i.e. topside, hopper side or side tank) (4) 2 selected cargo hold transverse bulkheads including internal structure of upper and lower stools where fitted. This is to include the aft bulkhead in the forward cargo hold	(1) 25% of shell frames including their end attachments and adjacent shell plating in all cargo holds (2) 1 transverse web with associated plating and longitudinals in each water ballast tank (i.e. topside, hopper side or side tank) (3) Forward and aft transverse bulkhead in 1 side ballast tank, including stiffening system (4) 1 transverse bulkhead in each cargo hold including internal structure of upper and lower stools where fitted. This is to include the aft bulkhead in the forward cargo hold (5) Selected cargo hold hatch covers and coamings (plating and stiffeners) (6) Selected areas of deck plating inside line of hatch openings between cargo hold hatches	(1) All shell frames in the forward cargo hold and 25% of frames in remaining cargo holds, including their end attachments and adjacent shell plating (2) All transverse webs with associated plating and longitudinals in each water ballast tank (i.e. topside, hopper side or side tank) (3) All transverse bulkheads in ballast tanks, including stiffening system (4) All cargo hold transverse bulkheads including internal structure of upper and lower stools, where fitted (5) All cargo hold hatch covers and coamings (plating and stiffeners) (6) All deck plating inside line of hatch openings between cargo hold hatches	(1) All shell frames including their end attachments and adjacent shell plating in all cargo holds (2) All transverse webs with associated plating and longitudinals in each water ballast tank (i.e. topside, hopper side or side tank) (3) All transverse bulkheads in ballast tanks, including stiffening system (4) All cargo hold transverse bulkheads including internal structure of upper and lower stools, where fitted (5) All cargo hold hatch covers and coamings (plating and stiffeners) (6) All deck plating inside line of hatch openings between cargo hold hatches

NOTES

1. Ballast tank includes peak tanks.
2. Close-up Survey of transverse bulkheads to be carried out at four levels:
 - Level (a) Immediately above the inner bottom and immediately above the line of gussets (if fitted) and shedders for ships without lower stool.
 - Level (b) Immediately above and below the lower stool shelf plate (for those ships fitted with lower stools), and immediately above the line of the shedder plates.
 - Level (c) About mid-height of the bulkhead.
 - Level (d) Immediately below the upper deck plating and immediately adjacent to the upper wing tank and immediately below the upper stool shelf plate for those ships fitted with upper stools, or immediately below the topside tanks.

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Table 3.7.6 Thickness measurement – Single hull and double hull oil tankers, ore/oil ships and ore/bulk/oil ships

Special Survey I (Ships 5 years old)	Special Survey III (Ships 15 years old)	Special Survey IV (Ships 20 years old and over)
(1) 1 section of deck plating for the full beam of the ship within 0,5L amidships in way of a ballast tank, if any, or a cargo tank used primarily for water ballast. (2) Measurements for general assessment and recording of corrosion pattern of the structural members subject to Close-up Survey in accordance with Table 3.7.2, Table 3.7.3, Table 3.7.4 or Table 3.7.5. (3) Critical areas, as required by the Surveyor.	(1) Within the cargo area: (a) Each deck plate. (b) 2 transverse sections, see Note 6. (2) Measurements for general assessment and recording of corrosion pattern of the structural members subject to Close-up Survey in accordance with Table 3.7.2, Table 3.7.3, Table 3.7.4 or Table 3.7.5. (3) Selected wind and water strakes outside the cargo area. (4) All wind and water strakes within the cargo area. (5) All cargo hold hatch covers and coamings (plating and stiffeners), see Note 5. (6) All transverse webs with associated plating and longitudinals, and the transverse bulkhead complete in the fore peak tank, see Notes 1 and 4. (7) Critical areas, as required by the Surveyor.	(1) Within the cargo area: (a) Each deck plate. (b) 3 transverse sections, see Note 6. (c) Each bottom plate. (2) Measurements for general assessment and recording of corrosion pattern of the structural members subject to Close-up Survey in accordance with Table 3.7.2, Table 3.7.3, Table 3.7.4 or Table 3.7.5. (3) All wind and water strakes over the full length of the ship, port and starboard . (4) All cargo hold hatch covers and coamings (plating and stiffeners), see Note 5. (5) Remaining exposed main deck plating not considered in item (1) and representative exposed superstructure deck plating (i.e. poop, bridge and forecastle deck). (6) All transverse webs with associated plating and longitudinals, and the transverse bulkhead complete in the fore peak tank and aft peak tank, see Notes 1 and 4. (7) All keel plates outside the cargo tank length. Also additional bottom plates in way of cofferdams, machinery space and aft end of tanks. (8) Plating of seachests. Also side shell plating in way of overboard discharges, as considered necessary by the Surveyor. (9) Critical areas, as required by the Surveyor.
Special Survey II (Ships 10 years old)		
(1) Within the cargo area: (a) Each deck plate. (b) 1 transverse section, see Note 6. (2) Measurements for general assessment and recording of corrosion pattern of the structural members subject to Close-up Survey in accordance with Table 3.7.2, Table 3.7.3, Table 3.7.4 or Table 3.7.5. (3) Selected wind and water strakes outside the cargo area. (4) Critical areas, as required by the Surveyor.		
NOTES 1. For areas in tanks where coatings are found to be in GOOD condition, as defined in 1.5, the extent of thickness measurements may be specially considered. 2. Transverse sections should be chosen where the largest reductions are likely to occur, or as revealed by deck plating measurements. 3. Where two or three transverse sections are required to be measured, at least one is to include a ballast tank within 0,5L amidships. 4. Transverse bulkhead complete including stiffening system. 5. All cargo hold hatch covers and coamings, where fitted, are to be measured on ore/oil and ore/bulk/oil ships. 6. For oil tankers (including ore/oil and ore/bulk/oil ships), with length ≥ 130 m and over 10 years of age, the longitudinal strength is to be evaluated. In such cases, a minimum of three transverse sections are to be measured within 0,5L amidships.		

Table 3.7.7 Thickness measurement – Single hull oil tankers, ore/oil ships and ore/bulk/oil ships – Bottom structure with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Bottom plating	Minimum of 3 bays across tank, including aft bay Measurement around and under all suction strums	5 point pattern for each panel between longitudinals and webs
(2) Bottom longitudinals	Minimum of 3 longitudinals in each bay where bottom plating measured	3 measurements in line across flange and 3 measurements on vertical web
(3) Bottom girders and brackets	At fore and aft transverse bulkhead, bracket toes and in centre of tanks	Vertical line of single measurements on web plating with 1 measurement between each panel stiffener, or a minimum of 3 measurements. 2 measurements across face flat. 5 point pattern on girder/bulkhead brackets
(4) Bottom transverse webs	3 webs in bays where bottom plating measured, with measurements at middle and both ends	5 point pattern over 2 m ² area. Single measurements on face flat
(5) Panel stiffening	Where applicable	Single measurements

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Table 3.7.8 Thickness measurement – Single hull oil tankers, ore/oil ships and ore/bulk/oil ships – Deck structure with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Deck plating	2 bands across tank	Minimum of 3 measurements per plate per band
(2) Deck longitudinals	Minimum of 3 longitudinals in each of 2 bays	3 measurements in line vertically on webs and 2 measurements on flange (if fitted)
(3) Deck girders and brackets	At fore and aft transverse bulkhead, bracket toes and in centre of tanks	Vertical line of single measurements on web plating with 1 measurement between each panel stiffener, or a minimum of 3 measurements. 2 measurements across face flat. 5 point pattern on girder/bulkhead brackets
(4) Deck transverse webs	Minimum of 2 webs with measurement at both ends and middle of span	5 point pattern over 2 m ² area. Single measurements on face flat
(5) Panel stiffening	Where applicable	Single measurements

Table 3.7.9 Thickness measurement – Single hull oil tankers, ore/oil ships and ore/bulk/oil ships – Shell and longitudinal bulkheads with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Deckhead and bottom strakes and strakes in way of stringer platforms	Plating between each pair of longitudinals in a minimum of 3 bays	Single measurement
(2) All other strakes	Plating between every 3rd pair of longitudinals in same 3 bays	Single measurement
(3) Longitudinals – deckhead and bottom strakes	Each longitudinal in same 3 bays	3 measurements across web and 1 measurement on flange
(4) Longitudinals – all others	Every third longitudinal in same 3 bays	3 measurements across web and 1 measurement on flange
(5) Longitudinals – bracket	Minimum of 3 at top, middle and bottom of tank in same 3 bays	5 point pattern over area of bracket
(6) Web frames and cross ties	3 webs with minimum of 3 locations on each web, including in way of cross tie connections	5 point pattern over 2 m ² area, plus single measurements on web frame and cross tie face flats

Table 3.7.10 Thickness measurement – Single hull oil tankers, ore/oil ships and ore/bulk/oil ships – Transverse bulkheads and swash bulkheads with substantial corrosion

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

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Table 3.7.11 Thickness measurement – Double hull oil tankers – Bottom, inner bottom and hopper structure with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Bottom, inner bottom and hopper plating	Minimum of 3 bays across double bottom tank, including aft bay. Measurement around and under all suction strums	5 point pattern for each panel between longitudinals and floors
(2) Bottom, inner bottom and hopper longitudinals	Minimum of 3 longitudinals in each bay where bottom plating measured	3 measurements in line across flange and 3 measurements on vertical web
(3) Bottom girders, including watertight girders	At the fore and aft watertight floors and in centre of tanks	Vertical line of single measurements on girder plating with 1 measurement between each panel stiffener, or a minimum of 3 measurements
(4) Bottom floors, including watertight floors	3 floors in bays where bottom plating measured, with measurements at both ends and middle	5 point pattern over 2 m ² area
(5) Hopper web frame ring	3 floors in bays where bottom plating measured	5 point pattern over 1 m ² of plating. Single measurements on flange
(6) Hopper transverse watertight bulkhead or swash bulkhead	(i) Lower 1/3 of bulkhead (ii) Upper 2/3 of bulkhead (iii) Stiffeners (minimum of 3)	(i) 5 point pattern over 1 m ² of plating. (ii) 5 point pattern over 2 m ² of plating. (iii) For web, 5 point pattern over span (2 measurements across web at each end and 1 at centre of span). For flange, single measurement at each end and centre of span.
(7) Panel stiffening	Where applicable	Single measurements

Table 3.7.12 Thickness measurement – Double hull oil tankers – Deck structure with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Deck plating	2 transverse bands across tank	Minimum of 3 measurements per plate per band
(2) Deck longitudinals	Every 3rd longitudinal in each of 2 bands with a minimum of 1 longitudinal	3 measurements in line vertically on webs and 2 measurements on flange (if fitted)
(3) Deck girders and brackets (usually in cargo tanks only)	At the fore and aft transverse bulkhead, bracket toes and in centre of tanks	Vertical line of single measurements on web plating with 1 measurement between each panel stiffener, or a minimum of 3 measurements. 2 measurements across flange. 5 point pattern on girder / bulkhead brackets
(4) Deck transverse webs	Minimum of 2 webs, with measurements at both ends and middle of span	5 point pattern over 1 m ² area. Single measurements on the flange
(5) Vertical web and transverse bulkhead in wing ballast tank (two metres from deck)	Minimum of 2 webs, and both transverse bulkheads	5 point pattern over 1 m ² area
(6) Panel stiffening	Where applicable	Single measurements

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Table 3.7.13 Thickness measurement – Double hull oil tankers – Wing ballast tank structure with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Side shell and longitudinal bulkhead plating: (i) Upper strake and strakes in way of horizontal girders (ii) All other strakes	(i) Plating between each pair of longitudinals in a minimum of 3 bays (along the tank) (ii) Plating between every 3rd pair of longitudinals on same 3 bays	(i) Single measurements (ii) Single measurements
(2) Side shell and longitudinal bulkhead longitudinals on: (i) Upper strake (ii) All other strakes	(i) Each longitudinal in same 3 bays (ii) Every 3rd longitudinal in same 3 bays	(i) 3 measurements across web and 1 measurement on flange (ii) 3 measurements across web and 1 measurement on flange
(3) Longitudinals – brackets	Minimum of 3 at top, middle and bottom of tank in same 3 bays	5 point pattern over area of bracket
(4) Vertical web and transverse bulkheads (excluding deckhead area): (i) Strakes in way of horizontal girders (ii) Other strakes	(i) Minimum of 2 webs and both transverse bulkheads (ii) Minimum of 2 webs and both transverse bulkheads	(i) 5 point pattern over approximately 2 m ² area (ii) 2 measurements between each pair of vertical stiffeners
(5) Horizontal girders	Plating on each girder in a minimum of 3 bays	2 measurements between each pair of longitudinal girder stiffeners
(6) Panel stiffening	Where applicable	Single measurements

Table 3.7.14 Thickness measurement – Double hull oil tankers – Longitudinal bulkhead structure in cargo tanks with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Deckhead and bottom strakes, and strakes in way of horizontal stringers on transverse bulkheads	Plating between each pair of longitudinals in a minimum of 3 bays	Single measurement
(2) All other strakes	Plating between every 3rd pair of longitudinals in same 3 bays	Single measurement
(3) Longitudinals on deckhead and bottom strakes	Each longitudinal in same 3 bays	3 measurements across web and 1 measurement on flange
(4) All other longitudinals	Every 3rd longitudinal in same 3 bays	3 measurements across web and 1 measurement on flange
(5) Longitudinals – brackets	Minimum of 3 at top, middle and bottom of tank in same 3 bays	5 point pattern over area of bracket
(6) Web frames and cross ties	3 webs with minimum of 3 locations on each web, including in way of cross tie connections	5 point pattern over approximately 2 m ² area of webs, plus single measurements on flanges of web frames and cross ties
(7) Lower end brackets (opposite side of web frame)	Minimum of 3 brackets	5 point pattern over approximately 2 m ² area of brackets, plus single measurements on bracket flanges

Table 3.7.15 Thickness measurement – Double hull oil tankers – Transverse watertight and swash bulkhead structure in cargo tanks with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) 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	5 point pattern between stiffeners over 1 m length
(2) Deckhead and bottom strakes, and strakes in way of horizontal stringers	Plating between pair of stiffeners at 3 locations; approximately 1/4, 1/2 and 3/4 width of tank	5 point pattern between stiffeners over 1 m length
(3) All other strakes	Plating between pair of stiffeners at middle location	Single measurement
(4) Strakes in corrugated bulkheads	Plating for each change of scantling at centre of panel and at flange of fabricated connection	5 point pattern over approximately 1 m ² of plating
(5) Stiffeners	Minimum of 3 typical stiffeners	For web, 5 point pattern over span between bracket connections (2 measurements across web at each bracket connection and 1 at centre of span). For flange, single measurement at bracket toe and at centre of span
(6) Brackets	Minimum of 3 at top, middle and bottom of tank	5 point pattern over area of bracket
(7) Horizontal stringers	All stringers with measurements at both ends and middle	5 point pattern over 1 m ² area, plus single measurements near bracket toes and on flanges

■ **Section 8**
Special Survey – Chemical tankers – Hull requirements

8.1 General

8.1.1 The requirements of Sections 2, 4 and 5 are to be complied with as applicable.

8.1.2 In order to maintain and/or assign the **ESP** notation, the following requirements apply to the surveys of the hull structure and piping systems in way of the cargo tanks, pump rooms, cofferdam, pipe tunnels, void spaces, double bottom tanks, etc., in way of the cargo tank area and all salt-water ballast tanks.

8.2 Documentation

8.2.1 The Owner is to maintain documentation on board as follows:

- (a) A survey file comprising reports of structural surveys, thickness measurement and executive hull summary in accordance with IMO Resolution A.744(18).
- (b) Supporting documentation consisting of:
 - (i) Main structural plans of cargo tanks and ballast tanks.
 - (ii) Previous repair history.
 - (iii) Cargo and ballast history.
 - (iv) Reports on structural defects/deterioration in general.

- (v) Reports on leakage in bulkheads and piping systems.
- (vi) Condition of corrosion prevention system, if any.
- (vii) Extent of use of inert gas plant and tank cleaning procedures when forming part of approved corrosion control system.
- (viii) Information that may help to identify critical areas.
- (ix) Survey Programme as required by 8.3.

The complete documentation in 8.2.1 is to be readily available for examination by the Surveyor and should be used as a basis for survey.

8.2.2 The documentation is to be kept on board for the lifetime of the ship.

8.3 Planning for survey

8.3.1 A Survey Programme is to be submitted by the Owner and is to include the proposals for survey, including the means of providing access for Close-up Survey, thickness measurement and tank testing and should take account of the information detailed in 8.2.1.

8.3.2 Prior to the development of the Survey Programme a Survey Planning Questionnaire is to be completed and submitted by the Owner, see 1.6.9.

8.4 Overall Survey

8.4.1 All cargo tanks and salt-water ballast tanks including double bottom tanks, pump rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, deck and outer hull are to be examined, and this examination is to be supplemented by Close-up Survey, thickness measurement and testing as deemed necessary, to ensure that the structural integrity remains effective.

8.4.2 The examination is to be sufficient to ascertain substantial corrosion, significant deformation, fractures, damages or other structural deterioration and, if deemed necessary by the Surveyor, suitable non-destructive examination may be required.

8.4.3 Where substantial corrosion, as defined in 1.5, is identified and is not rectified, this will be subject to re-examination at Annual and/or Intermediate Surveys. In the case of salt-water ballast tanks the examination will be required at Annual Survey and Intermediate Survey. In the case of cargo tanks the examination will be required at Intermediate Surveys.

8.4.4 All cargo piping on deck, and cargo and ballast piping, within those spaces indicated in 8.4.1 are to be examined and tested under working conditions to ensure that tightness and condition remain satisfactory. Special attention is to be given to ballast piping in cargo tanks and any cargo piping in ballast tanks and void spaces.

8.4.5 The survey of stainless steel tanks may be carried out as an Overall Survey supplemented by Close-up Survey as deemed necessary by the Surveyor.

8.4.6 Where salt-water ballast tanks have been converted to void spaces the survey extent is to be based upon salt-water ballast tank requirements.

8.4.7 Where provided, in association with a corrosion control (c.c.) notation as defined in the *Register Book*, the condition of the protective coating or corrosion prevention system of cargo tanks is to be examined.

8.4.8 The attachment to the structure and condition of anodes in tanks are to be examined.

8.4.9 Where fitted, the strums of the cargo suction pipes are to be removed or lifted to facilitate examination of the shell plating and bulkheads in the vicinity, unless other means for visual inspection of these parts are provided.

8.5 Testing

8.5.1 The minimum tank testing requirements are given in Table 3.8.1 and, where required, the Surveyor may extend the tank testing if deemed necessary. Other arrangements for cargo tank testing will be considered on application. The remaining requirements for tank testing, as applicable, are given in 5.3.5.

8.6 Close-up Survey

8.6.1 The minimum requirements for Close-up Survey are given in Table 3.8.2.

8.6.2 The Surveyor may extend the Close-up Survey, if deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system, and the following:

- (a) Structural arrangements or details which have suffered defects in similar spaces or on similar ships.
- (b) Spaces which have structures approved with reduced scantlings in association with an approved corrosion control system (c.c.).

8.6.3 For areas in tanks where coatings are found to be in GOOD condition, as defined in 1.5, the extent of Close-up Surveys may be specially considered.

8.7 Thickness measurement

8.7.1 The minimum requirements for thickness measurements are given in Table 3.8.3.

8.7.2 In areas where substantial corrosion, as defined in 1.5, has been noted, then additional measurements are to be carried out, as applicable, in accordance with Tables 3.8.4, 3.8.5, 3.8.6 and 3.8.7 to determine the full extent of the corrosion pattern. The survey will not be considered complete until these additional thickness measurements have been carried out.

Table 3.8.1 Tank testing requirements – Chemical ships

Special Survey I (Ships 5 years old)	Special Survey II and subsequent (Ships 10 years old and over)
All ballast tank boundaries	All ballast tank boundaries
Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, pump rooms or cofferdams	All cargo tank bulkheads

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Table 3.8.2 Close-up Survey – Chemical tankers

Special Survey I (Ships 5 years old)	Special Survey II (Ships 10 years old)	Special Survey III (Ships 15 years old)	Special Survey IV (Ships 20 years old and over)
(1) One web frame ring – in a wing ballast tank, if any, or a ballast double hull side tank, see Notes 1 and 8 (2) One deck transverse – in a cargo tank or on deck, see Note 2 (3) One transverse bulkhead, see Note 4: (a) in a ballast tank (b) in a cargo wing tank (c) in a cargo centre tank	(1) All plating and internal structure in a wing ballast tank, if any, or a ballast double hull side tank, see Notes 7 and 8 (2) One deck transverse, see Note 2: (a) in each of the remaining ballast tanks, or on deck (b) in a cargo wing tank or on deck (c) in 2 cargo centre tanks or on deck (3) Both transverse bulkheads – in a wing ballast tank, if any, or a double hull side tank, see Note 3 (4) One transverse bulkhead, see Note 4: (a) in each remaining ballast tank (b) in a cargo wing tank (c) in 2 cargo centre tanks	(1) All plating and internal structure, see Note 7: (a) in all ballast tanks (b) in a cargo wing tank (2) One web frame ring – in each remaining cargo tank, see Note 1 (3) All transverse bulkheads – in all cargo tanks, see Note 3 (4) As considered necessary by the Surveyor, see Note 5	(1) As Special Survey III (2) Additional transverse areas if deemed necessary by the Surveyor
<p>NOTES</p> <ol style="list-style-type: none"> Complete transverse web frame ring including adjacent structural members. Deck transverse including adjacent deck structural members. Transverse bulkhead complete, including girder system and adjacent members, and adjacent longitudinal bulkhead structure. Transverse bulkhead lower part including girder system and adjacent structural members. Additional complete transverse web frame ring. Ballast tank includes peak tanks. Complete tank – including all tank boundaries and internal structure, and external structure on deck in way of the tank where applicable. Double hull side tank includes double bottom and side tank even though these tanks may be separated. 			

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Table 3.8.3 Thickness measurement – Chemical tankers

Special Survey I (Ships 5 years old)	Special Survey III (Ships 15 years old)	Special Survey IV (Ships 20 years old and over)
(1) 1 section of deck plating for the full beam of the ship within 0,5L amidships (in way of a ballast tank, if any) (2) Measurements for general assessment and recording of corrosion pattern of the structural members subject to Close-up Survey in accordance with Table 3.8.2 (3) Critical areas, as required by the Surveyor	(1) Within the cargo area: (a) Each deck plate (b) 2 transverse sections (2) Measurements for general assessment and recording of corrosion pattern of the structural members subject to Close-up Survey in accordance with Table 3.8.2 (3) Selected wind and water strakes outside the cargo area (4) All wind and water strakes within the cargo area (5) All transverse webs with associated plating and longitudinals, and the transverse bulkhead complete in the fore peak tank, see Notes 1 and 4 (6) Critical areas, as required by the Surveyor	(1) Within the cargo area: (a) Each deck plate (b) 3 transverse sections (c) Each bottom plate (2) Measurements for general assessment and recording of corrosion pattern of the structural members subject to Close-up Survey in accordance with Table 3.8.2 (3) All wind and water strakes over the full length of the ship, port and starboard (4) Remaining exposed main deck plating not considered in item (1) and representative exposed superstructure deck plating (i.e. poop, bridge and fore-castle deck) (5) All transverse webs with associated plating and longitudinals, and the transverse bulkhead complete in the fore peak tank and aft peak tank, see Notes 1 and 4 (6) All keel plates outside the cargo tank length. Also additional bottom plates in way of cofferdams, machinery space and aft end of tanks (7) Plating of seachests. Also side shell plating in way of overboard discharges, as considered necessary by the Surveyor (8) Critical areas, as required by the Surveyor
Special Survey II (Ships 10 years old)		
(1) Within the cargo area: (a) Each deck plate (b) 1 transverse section (2) Measurements for general assessment and recording of corrosion pattern of the structural members subject to Close-up Survey in accordance with Table 3.8.2 (3) Selected wind and water strakes outside the cargo area (4) Critical areas, as required by the Surveyor		
NOTES 1. For areas in tanks where coatings are found to be in GOOD condition, as defined in 1.5, the extent of thickness measurements may be specially considered. 2. Transverse sections should be chosen where the largest reductions are likely to occur, or as revealed by deck plating measurements. 3. Where two or three transverse sections are required to be measured, at least one is to include a ballast tank within 0,5L amidships. 4. Transverse bulkhead complete including stiffening system.		

Table 3.8.4 Thickness measurement – Chemical tankers – Bottom structure with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Bottom plating and inner bottom plating	Minimum of 3 bays across tank, including aft bay Measurement around and under all suction strums	5 point pattern for each panel between longitudinals over 1 m length
(2) Bottom longitudinals and inner bottom longitudinals	Minimum of 3 longitudinals in each bay where plating measured	3 measurements in line across flange and 3 measurements on vertical web
(3) Bottom longitudinal girder, transverse floors and web frames	Suspect plates	5 point pattern over about 1 m ² area
(4) Watertight floors	(a) Lower 1/3 of tank (b) Upper 2/3 of tank	5 point pattern over about 1 m ² area
(5) Panel stiffening	Where applicable	Single measurements

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Table 3.8.5 Thickness measurement – Chemical tankers – Deck structure with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Deck plating	2 bands across tank	Minimum of 3 measurements per plate per band
(2) Deck longitudinals	Minimum of 3 longitudinals in each 2 bays	3 measurements in line vertically on webs and 2 measurements on flange (if fitted)
(3) Deck girders and brackets	At fore and aft transverse bulkhead, bracket toes and in centre of tanks	Vertical line of single measurements on web plating with 1 measurement between each panel stiffener, or a minimum of 3 measurements. 2 measurements across face flat. 5 point pattern on girder/bulkhead brackets
(4) Deck transverse webs	Minimum of 2 webs with measurement at both ends and middle of span	5 point pattern over 2 m ² area. Single measurements on face flat
(5) Panel stiffening	Where applicable	Single measurements

Table 3.8.6 Thickness measurement – Chemical tankers – Shell and longitudinal bulkheads with substantial corrosion

Structural member	Extent of measurement	Pattern of measurement
(1) Deckhead and bottom strakes and strakes in way of stringer platforms	Plating between each pair of longitudinals in a minimum of 3 bays	Single measurement
(2) All other strakes	Plating between every 3rd pair of longitudinals in same 3 bays	Single measurement
(3) Longitudinals – deckhead and bottom strakes	Each longitudinal in same 3 bays	3 measurements across web and 1 measurement on flange
(4) Longitudinals – all others	Every third longitudinal in same 3 bays	3 measurements across web and 1 measurement on flange
(5) Longitudinals – bracket	Minimum of 3 at top, middle and bottom of tank in same 3 bays	5 point pattern over area of bracket
(6) Web frames and cross ties	3 webs with minimum of 3 locations on each web, including in way of cross tie connections	5 point pattern over 2 m ² area, plus single measurements on web frame and cross tie face flats

Table 3.8.7 Thickness measurement – Chemical tankers – Transverse bulkheads and swash bulkheads with substantial corrosion

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

■ **Section 9**
Ships for liquefied gases

9.1 General

9.1.1 The requirements of Sections 2 to 7 are to be complied with, as applicable.

9.1.2 Prior to the inspection of cargo tanks, surrounding spaces, associated piping, fittings and equipment, etc., the respective items are to be cleaned and thoroughly cleared of gas. Every precaution is to be taken to ensure safety during inspection.

9.1.3 The following documentation, as applicable, is to be available on board the ship:

- (a) Relevant instruction and information material such as cargo handling plans, filling limit information, cooling down procedures, etc.
- (b) A copy of the IGC Code.
- (c) Test records of secondary barrier.
- (d) Loading and stability information, including damage stability.

9.1.4 For requirements of Special Survey for electrical equipment, see Section 14.

9.2 Annual Surveys – Basic requirements

9.2.1 The Annual Survey is preferably to be carried out during a loading or discharging operation. Access to cargo tanks or inerted hold spaces, necessitating gas freeing/aerating will normally not be necessary unless required by the Regulations.

9.2.2 The ship's log and operational records for the cargo containment system covering the period from the previous survey are to be examined. Any malfunction of the system entered in the log is to be investigated, the cause ascertained, and that part of the system at fault is to be found or placed in good order.

9.2.3 Instrumentation and safety systems are to be surveyed as follows:

- (a) The instrumentation of the cargo installations with regard to pressure, temperature and liquid level is to be verified in good working order by one or more of the following methods:
 - (i) Visual external examination.
 - (ii) Comparing of read outs from different indicators.
 - (iii) Consideration of read outs with regard to the actual cargo and/or actual conditions.
 - (iv) Examination of maintenance records with reference to cargo plant instrumentation maintenance manual.
 - (v) Verification of calibration status of the measuring instruments.
- (b) The low level, high level, and overfill alarms are to be examined and tested to ascertain that they are in working order.

- (c) The alarms associated with the following are to be tested as applicable:
- (i) Cargo tank high and low pressure.
 - (ii) Cargo tank temperature.
 - (iii) Cargo hold pressure.
 - (iv) Interbarrier space pressure.
 - (v) Inner hull temperature.
 - (vi) Secondary barrier temperature.
 - (vii) Cargo Hold or Interbarrier bilge level detection.
- (d) Control devices for the cargo containment systems and cargo handling equipment, together with any associated shutdown and/or interlock, are to be checked under simulated working conditions and, if necessary, recalibrated. Such safety systems include but are not limited to:
- (i) Cargo tank overflow protection including cargo pump, compressor and other cargo machinery automatic shutdown.
 - (ii) Cargo pump, compressor and other cargo machinery shutdown on low cargo tank pressure or cargo tank and interbarrier/hold space differential pressure.
 - (iii) Cargo pump automatic shutdown on low level or current;
- (e) The emergency shutdown system is to be tested, without flow in the pipe lines, to verify that the system will cause the cargo pumps, compressors and other cargo machinery, as applicable, to stop.
- (f) Consideration will be given to the acceptance of simulated tests, provided that they are carried out at the cargo temperature, or comprehensive maintenance records, including details of tests held, in accordance with the cargo plant instrumentation maintenance manual.

9.2.4 Cargo gas leakage detection systems are to be examined and tested to ascertain that they are in working order and calibrated using sample gas.

9.2.5 Inert gas/dry air installations including the means for prevention of backflow of cargo vapour to gas-safe spaces are to be verified as being in satisfactory operating condition.

9.2.6 Ventilation systems and air locks in working spaces are to be checked for satisfactory operation.

9.2.7 Cargo pipeline, valves and fittings are to be generally examined, with special reference to expansion bellows, supports and vapour seals on insulated pipes. It is to be verified that all accessible cargo piping systems are electrically bonded to the hull.

9.2.8 Portable and/or fixed drip trays, or insulation for deck protection in the event of cargo leakage, are to be examined for condition.

9.2.9 The means for accomplishing gas tightness of the wheelhouse doors and windows is to be examined. All windows and side-scuttles within the area required to be of the fixed type (non-opening) are to be examined for gas tightness. The closing devices for all air intakes and openings into accommodation spaces, service spaces, machinery spaces, control stations and approved openings in superstructures and deckhouses facing the cargo area or bow and stern loading/unloading arrangements are to be examined. For ships carrying toxic gases such devices should be capable of being operated from inside the space.

9.2.10 Venting systems, including protection screens if provided, for the cargo tanks, inter-barrier spaces and hold spaces are to be visually examined externally. It is to be verified that the cargo tank relief valves are sealed and that the certificate for the relief valves opening/closing pressures is on board the ship.

9.2.11 Mechanical ventilation fans in gas dangerous spaces and zones are to be visually examined. Adequate spare parts should be carried for each type of fan installed.

9.2.12 Electrical equipment, cables and supports in gas dangerous zones shall be examined as far as practicable. Alarms and safety systems associated with pressurised lighting systems and any safety device associated with non-safe type electrical equipment that is protected by air-locks are to be verified.

9.2.13 Heating arrangements, if fitted, for cofferdams and other spaces shall be verified in good working order.

9.2.14 All accessible gas-tight bulkhead penetrations including gas-tight shaft sealings are to be visually examined.

9.2.15 The sealing arrangements for tanks or tank domes penetrating decks or tank covers are to be externally examined.

9.3 Annual Surveys – Reliquefaction/refrigeration equipment

9.3.1 Where reliquefaction or refrigeration equipment for cargo temperature and pressure control is fitted, the following are to be examined, so far as practicable:

- (a) The machinery under working conditions.
- (b) The shells of all pressure vessels in the system, externally. Insulation need not be removed for this examination, but any deterioration of insulation or evidence of dampness which could lead to external corrosion of the vessels or their connections, is to be investigated.
- (c) Primary refrigerant gas and liquid pipes, cargo vapour and liquid condensate pipes and condenser cooling water pipes. Insulation need not be removed, but any deterioration or evidence of dampness is to be investigated.
- (d) The reliquefaction/refrigeration plant spare gear.

9.3.2 Reference should be made to the Special Survey requirements for guidance on Continuous Survey arrangements.

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9.4 Annual Surveys – Methane burning equipment and other equipment components

9.4.1 The following components are to be generally examined externally. If insulation is fitted, this need not be removed, but any deterioration of insulation, or evidence of dampness which could lead to external corrosion of the vessels or their connections, is to be investigated:

- (a) Heat exchangers and pressure vessels for use with methane burning in boilers or machinery.
- (b) Cargo heaters, vaporizers, masthead heaters and other miscellaneous pressure vessels.

9.4.2 Controls and interlocks are to be checked.

9.4.3 Alarm systems are to be checked to ascertain that they are in working order.

9.4.4 Exhaust fans and/or pressurizing system for gas trunking are to be tested.

9.5 Annual Surveys – Cargo containment systems

9.5.1 Where the insulation arrangement is such that the insulation cannot be examined, the surrounding structures of wing tanks, double bottom tanks and cofferdams are to be examined for cold spots, prior to the survey. This examination is to be held at a convenient cargo discharge operation with the cargo tanks loaded at approximately the minimum notation temperature.

9.5.2 On application by the Owner, consideration will be given to the cold spot examination, where applicable, being carried out by the ship's staff.

9.5.3 When tests are required after repairs, independent cargo tanks, other than independent tanks Type C, are to be tested by hydraulic or hydropneumatic means as appropriate. Test heads and pressures should be as defined in Ch 4, 10 of the Rules for Liquefied Gases. Cargo tanks of the membrane or semi-membrane type are to be tested by means of a detectable gas in the inter-barrier spaces and discolouring paint on the weld seams of the cargo tanks wall, or other suitable means. Independent cargo tanks of Type C are to be tested hydraulically at 1,25 times the approved maximum vapour pressure.

9.6 Intermediate Surveys

9.6.1 The Intermediate Survey intends to supplement the Annual Survey by testing cargo handling installations with related automatic control, alarm and safety systems for correct functioning. The Intermediate Survey is preferably to be carried out with the ship in a gas-free condition. The extent of the testing required for the Intermediate Survey will normally be such that the survey cannot be carried out during a loading or discharging operation.

9.6.2 In addition to the requirements for Annual Survey and the requirements of 3.2.1 to 3.2.8, the following are to be dealt with as applicable:

- (a) Examination of means for draining the vent piping system.
- (b) Verification that pipelines and cargo tanks are electrically bonded to the hull.
- (c) Verification that the heating arrangements, if any, for steel structures are satisfactory.
- (d) Where required by the manufacturer's maintenance instructions, cargo tank and inter-barrier space pressure and vacuum relief valve settings are to be checked and adjusted as required. Cargo tank pressure relief valve harbour settings are also to be checked, if applicable. Cargo tank pressure relief valves are to lift at a pressure not more than the percentage given below, above the maximum vapour pressure for which the tanks have been approved.
 - For 0 to 1,5 bar (0 to 1,5 kgf/cm²), 10 per cent.
 - For 1,5 to 3,0 bar (1,5 to 3,0 kgf/cm²), 6 per cent.
 - For pressures exceeding 3,0 bar (3,0 kgf/cm²), 3 per cent.
 - Valves may be removed from the tanks for the purpose of checking.
- (e) A General Examination within the areas deemed as dangerous such as cargo compressor rooms and spaces adjacent to and zones above cargo areas, for defective and non-certified safe-type electrical equipment, improperly installed, defective and dead wiring. An electrical insulation resistance test of the circuits terminating in, or passing through the dangerous areas, is to be carried out. If the ship is not in a gas free condition the results of previously recorded test readings may be accepted.

9.6.3 At the first Intermediate Survey after initial commissioning of the ship, the following examinations are to be carried out:

- (a) Cargo tanks, other than independent tanks Types A and C, are to be examined internally. Insulation, where fitted externally, is to be generally examined.
- (b) Particular attention is to be given to tower structures and other attachments within the tanks, tank supports and securing arrangements.

9.7 Special Survey I (ships five years old) – General requirements

9.7.1 The requirements of 9.1 to 9.6 are to be complied with.

9.7.2 The requirements for Close-up Survey and thickness measurement are given in 9.12 and 9.13.

9.7.3 All cargo tanks are to be examined internally, also externally so far as practicable, particular attention being paid to the plating in way of supports of securing arrangements, tower structures, seatings and pipe connections, also to sealing arrangements in way of the deck penetrations. Provided that the structural examination is satisfactory, that the gas leakage monitoring systems have been found to be operating satisfactorily and that the voyage records have not shown any abnormal operation, cargo tanks do not require to be hydraulically tested. The primary membranes of 'Gas Transport' design should be examined with the primary insulation space under a vacuum of at least -500 mbar gauge. For 'Moss Type' LNG cargo tanks, the Structural Transition Joints (STJ) are to be examined at the port, starboard, forward and aft locations. Insulation is to be removed as required. Non-destructive testing may be required where considered necessary.

9.7.4 The non-destructive testing of cargo tanks is to be carried out as follows:

- (a) Non-destructive testing is to supplement cargo tank inspection with special attention to be given to the integrity of the main structural members, tank shell and highly stressed parts, including welded connections as deemed necessary by the Surveyor. The following items are, inter alia, considered as highly stressed parts:
 - (i) Cargo tanks supports and anti-rolling/anti-pitching devices;
 - (ii) Web frames or stiffening rings;
 - (iii) Swash bulkhead boundaries;
 - (iv) Dome and stump connections to tank shell;
 - (v) Foundations for pumps, towers, ladders, etc.;
 - (vi) Pipe connections.
- (b) For independent tanks of Type B, the extent of non-destructive testing shall be as given in the programme specially prepared for the cargo tank design.
- (c) Independent cargo tanks of Type C are to be subjected to non-destructive testing of the plating in way of supports and also at selected lengths of welds. Where such testing raises doubt as to the structural integrity, a hydraulic test should be carried out at 1,25 times the approved maximum vapour pressure. Alternatively, consideration will be given to pneumatic testing under special circumstances, provided full details are submitted for approval.
- (d) At each alternate Special Survey (i.e. SSII, SSIV and so on), all independent cargo tanks of Type C are to be either:
 - (i) Hydraulically or hydro-pneumatically tested to 1.25 times MARVS, followed by non-destructive testing in accordance with paragraph (a) above, or,
 - (ii) Subjected to a thorough, planned, non-destructive testing. This testing is to be carried out in accordance with a programme specially prepared for the tank design. If a special programme does not exist, the following applies:
 - cargo tank supports and anti-rolling/anti-pitching devices;
 - stiffening rings;

- Y-connections between tank shell and a longitudinal bulkhead of bi-lobe tanks;
- swash bulkhead boundaries;
- dome and sump connections to the tank shell;
- foundations for pumps, towers, ladders etc.;
- pipe connections.

At least 10 per cent of the length of the welded connections in each of the above mentioned areas is to be tested. This testing is to be carried out internally and externally as applicable. Insulation is to be removed as necessary for the required non-destructive testing.

9.7.5 Deck mounted cargo storage tanks are to be examined in the same manner as main cargo tanks.

9.7.6 Secondary barriers are to be examined for their effectiveness, visually whenever possible, or by means of pressure/vacuum tests on the inter-barrier spaces. Testing is to be carried out in accordance with the system designer's requirements as approved by LR. Alternative means of checking the secondary barriers will be considered.

9.7.7 Where cargo containment systems have secondary barriers which cannot be examined or tested and have been approved on the basis of extensive prototype testing, the barriers will be considered to remain efficient provided a cold spot examination of the adjacent steelwork is satisfactory and records of the steelwork temperature readings are verified as acceptable.

9.7.8 Where a cargo tank or the hull structure is insulated and the insulation is accessible, the insulation should be examined externally, together with any vapour or protective barrier, and sections removed for examination, if considered necessary by the Surveyor. Special attention should be given to insulation in way of chocks, supports and keys. Portions of the insulation are also to be removed, if required by the Surveyor, to enable the condition of the plating to be ascertained. Where the insulation is not accessible, see 9.5.1.

9.7.9 Cargo tank internal pipes and fittings are to be examined, and all valves and cocks in direct communication with the interiors of the tanks are to be opened out for inspection and the connection pipes are to be examined internally, so far as practicable.

9.7.10 Relief valves are to be surveyed as follows:

- (a) The pressure relief valves for the cargo tanks are to be opened for examination, adjusted, function tested, and sealed. If the cargo tanks are equipped with relief valves with non-metallic membranes in the main or pilot valves, such non-metallic membranes are to be replaced.
- (b) Pressure relief valves are subsequently to be adjusted to lift at a pressure in accordance with 9.6.1(d). Relief valve harbour settings are to be checked, if applicable. Valves may be removed from the shell for the purpose of making this adjustment under pressure of air or other suitable gas.

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- (c) Where a proper record of continuous overhaul and retesting of individually identifiable relief valves is maintained, consideration will be given to acceptance on the basis of opening, internal examination, and testing of a representative sampling of valves, including each size and type of liquefied gas or vapour relief valve in use, provided there is logbook evidence that the remaining valves have been overhauled and tested since crediting of the previous Special Survey.
- (d) Relief valves on cargo gas and liquid pipelines are to have their pressure settings checked. The valves may be removed from the pipelines for this purpose. At the Surveyor's discretion a sample of each size and type of valve may be opened for examination and testing.

9.7.11 All cargo pumps, cargo booster pumps and cargo vapour pumps are to be opened out for examination. If requested by the Owner, these items may be examined on a Continuous Survey basis, provided the interval between examination of each item does not exceed five years. Pumping systems for inter-barrier spaces are to be checked and verified to be in good working order.

9.7.12 Where considered necessary, insulated cargo gas and liquid pipelines are to have sections of insulation removed to ascertain the condition of the pipes. Care is to be taken that in the replacement of insulation, the outer vapour seal is made good.

9.7.13 Equipment for the production of inert gas is to be examined and shown to be operating satisfactorily within the gas specification limits. Pipelines, valves, etc., for the distribution of the inert gas are to be generally examined. Pressure vessels for the storage of inert gas are to be examined internally and externally and the securing arrangements are to be specially examined. Pressure relief valves are to be demonstrated to be in good working order. Liquid nitrogen storage vessels are to be examined, so far as practicable, and all control equipment, alarms and safety devices are to be verified as operational.

9.7.14 Gastight bulkhead shaft seals are to be opened out so that the sealing arrangements may be checked.

9.7.15 Sea connections associated with the cargo handling equipment are to be opened out when the ship is in dry-dock.

9.7.16 The arrangements for discharging the cargo overboard in an emergency are to be checked.

9.8 Special Survey I (ships five years old) – Reliquefaction/refrigeration equipment

9.8.1 Each reciprocating compressor is to be opened out. Cylinder bores, pistons, piston rods, connecting rods, valves and seats, glands, relief devices, suction filters and lubricating arrangements are to be examined. Crankshafts are to be examined, but crankcase glands and the lower half of main bearings need not be exposed if the Surveyor is satisfied with the alignment and wear.

9.8.2 Where other than reciprocating-type compressors are fitted, or where there is a program of replacement instead of surveys on board, alternative survey arrangements will be considered. Each case will be given individual consideration.

9.8.3 The water end covers of condensers are to be removed for examination of the tubes, tubeplates and covers.

9.8.4 Refrigerant condenser cooling water pumps, including standby pump(s) which may be used on other services, are to be opened out for examination.

9.8.5 Where a pressure vessel is insulated, sufficient insulation is to be removed, especially in way of connections and supports, to enable the vessel's condition to be ascertained.

9.8.6 Insulated pipes are to have sufficient insulation removed to enable their condition to be ascertained. Vapour seals are to be specially examined for their condition.

9.8.7 The Surveyor is to satisfy himself that all pressure relief valves and/or safety discs throughout the system are in good order. No attempt, however, is to be made to test primary refrigerant pressure relief valves on board ship.

9.8.8 The items covered by 9.8.1 to 9.8.4 may, at the request of the Owner, be examined on a Continuous Survey basis provided the interval between examination of each item does not exceed five years.

9.9 Special Survey I (ships five years old) – Methane burning equipment

9.9.1 Where methane is used as fuel for main propulsion purposes, the associated compressors and heat exchangers are to be opened out and examined as for reliquefaction/refrigeration equipment. The steam side of steam heaters is to be hydraulically tested to 1,5 times the design pressure.

9.9.2 Methane gas pipe trunks or casings are to be generally examined and the exhaust or inerting arrangements for these trunks are to be verified.

9.9.3 All alarms associated with the methane burning systems are to be verified.

9.10 Special Survey II and Special Surveys thereafter (ships 10 years old and over)

9.10.1 The requirements of 9.1 to 9.9 are to be complied with.

9.10.2 Water cooled condensers in which the primary refrigerant is in contact with the shell are to have the end covers removed and the shell pneumatically tested to a pressure equal to the designed working pressure.

9.10.3 All other pressure vessels in the reliquefaction/refrigeration system, methane burning system and other handling systems are to be pneumatically tested to a pressure equal to the designed working pressure.

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9.10.4 Liquid cargo pipes are to be tested, by approved means, to a pressure equal to 1,25 times the working pressure. Alternatively, selected representative lengths may be removed for internal examination and hydraulic testing.

9.10.5 The requirements for Close-up Survey and thickness measurement are given in 9.12 and 9.13.

9.13.2 In areas where substantial corrosion, as defined in 1.5, has been noted, then additional measurements are to be carried out, as applicable, in accordance with the appropriate Tables in Section 6 or 7 (depending on the structural configuration of the ship) to determine the full extent of the corrosion pattern. The survey will not be considered complete until these additional thickness measurements have been carried out.

9.11 Special Survey III and Special Surveys thereafter (ships 15 years old and over)

9.11.1 The requirements of 9.1 to 9.10 are to be complied with.

9.11.2 For independent tanks of Type B, the Owner is to submit proposals for the extent of non-destructive testing of the cargo tanks well in advance of the Special Survey.

9.12 Close-up Survey

9.12.1 The minimum requirements for Close-up Survey are given in Table 3.9.1.

9.12.2 The Surveyor may extend the Close-up Survey, if deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and the structural arrangements or details which have suffered defects in similar spaces or on similar ships.

9.12.3 For areas in tanks where coatings are found to be in GOOD condition, as defined in 1.5, the extent of Close-up Survey may be specially considered.

9.13 Thickness measurement

9.13.1 The minimum requirements for thickness measurement are given in Table 3.9.2.

Table 3.9.1 Close-up Survey – Ships for liquefied gases

Special Survey I (Ships 5 years old)	Special Survey II (Ships 10 years old)	Special Survey III (Ships 15 years old)	Special Survey IV (Ships 20 years old and over)
(1) One transverse web frame in 2 representative water ballast tanks of each type, see Notes 1 and 2 (2) One transverse bulkhead in a ballast tank, see Note 4	(1) One transverse web frame in each water ballast tank, see Notes 1 and 2 (2) Forward and aft transverse bulkhead in one side ballast tank, see Note 3	(1) All web frame rings in all ballast tanks, see Notes 1 and 2 (2) All transverse bulkheads – in all ballast tanks, see Note 3 (3) As considered necessary by the Surveyor, see Note 5	(1) All web frame rings in all ballast tanks, see Notes 1 and 2 (2) All transverse bulkheads – in all ballast tanks, see Note 3 (3) As considered necessary by the Surveyor, see Note 5
<p>NOTES</p> <p>1. Ballast tanks includes topside, double hull side, double bottom, hopper side, or any combined arrangement of the aforementioned, and peak tanks where fitted.</p> <p>2. Complete transverse web frame ring including adjacent structural members.</p> <p>3. Transverse bulkhead complete, including girder system and adjacent members, and adjacent longitudinal bulkhead structure.</p> <p>4. Transverse bulkhead lower part including girder system and adjacent structural members.</p> <p>5. Additional complete transverse web frame ring.</p>			

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Table 3.9.2 Thickness measurement – Ships for liquefied gases

Special Survey I (Ships 5 years old)	Special Survey III (Ships 15 years old)	Special Survey IV and subsequent (Ships 20 years old and over)
(1) 1 section of deck plating for the full beam of the ship within 0,5L amidships in way of a ballast tank, if any (2) Measurements for general assessment and recording of corrosion pattern of the structural members subject to close-up survey in accordance with Table 3.9.1 (3) Critical areas, as required by the Surveyor	(1) Within the cargo area: (a) Each deck plate (b) 2 transverse sections (2) Measurements for general assessment and recording of corrosion pattern of the structural members subject to Close-up Survey in accordance with Table 3.9.1 (3) Selected wind and water strakes outside the cargo area (4) All wind and water strakes within the cargo area (5) All transverse webs with associated plating and longitudinals, and the transverse bulkhead complete in the fore peak tank, see Notes 1 and 4 (6) Critical areas, as required by the Surveyor	(1) Within the cargo area: (a) Each deck plate (b) 3 transverse sections (c) Each bottom plate (2) Measurements for general assessment and recording of corrosion pattern of the structural members subject to Close-up Survey in accordance with Table 3.9.1 (3) All wind and water strakes over the full length of the ship, port and starboard (4) Remaining exposed main deck plating not considered in item (1) and representative exposed superstructure deck plating (i.e. poop, bridge and fore-castle deck) (5) All transverse webs with associated plating and longitudinals, and the transverse bulkhead complete in the fore peak tank and aft peak tank, see Notes 1 and 4 (6) All keel plates outside the cargo tank length. Also additional bottom plates in way of cofferdams, machinery space and aft end of tanks (7) Plating of seachests. Also side shell plating in way of overboard discharges, as considered necessary by the Surveyor (8) Critical areas, as required by the Surveyor
Special Survey II (Ships 10 years old)		
(1) Within the cargo area: (a) Each deck plate (b) 1 transverse section (2) Measurements for general assessment and recording of corrosion pattern of the structural members subject to Close-up Survey in accordance with Table 3.9.1 (3) Selected wind and water strakes outside the cargo area (4) Critical areas, as required by the Surveyor		
NOTES 1. For areas in tanks where coatings are found to be in GOOD condition, as defined in 1.5, the extent of thickness measurements may be specially considered. 2. Transverse sections should be chosen where the largest reductions are likely to occur, or as revealed by deck plating measurements. 3. Where two or three transverse sections are required to be measured, at least one is to include a ballast tank within 0,5L amidships. 4. Transverse bulkhead complete including stiffening system. 5. Where considered necessary by the Surveyor, the inner bottom plating and adjacent tank supports are to be subject to thickness measurement for general assessment and recording of the corrosion pattern. 6. For those ships designated to carry light oils in the independent cargo tanks, thickness measurement of the independent cargo tank structure is to be carried out as considered necessary by the Surveyor.		

■ **Section 10**
Dredgers, hopper dredgers, sand carriers, hopper barges and reclamation craft

10.1 General

10.1.1 The requirements of this Section are to be complied with, as applicable, in addition to the survey requirements of Sections 2, 3, 4 and 5. Where surveys are required on dredging or hopper equipment such as gantries, bottom doors and their operating gear, positioning spuds and suction pipe attachments or split hull devices such as actuating and locking devices, these will be limited to the extent considered necessary by the Surveyor to satisfy himself that their condition or malfunction will not adversely affect the ship's structure.

10.1.2 Where applicable, the Docking Survey is to include the examination of hopper doors and their fittings, and of hopper valves.

10.2 Special Surveys

10.2.1 On ships up to 10 years old (Special Survey I and II):

- Hoppers are to be cleared and cleaned as necessary and examined.
- Where applicable, hopper doors or valves are to be opened and closed, so far as practicable, but keel blocks need not normally be moved specially to permit this to be done.
- The integrity of hopper overflows and diluting water inlet and distribution structures is to be confirmed. Weir valves and sluices are to be tested to ensure proper operation, particular attention being paid to the lower weir when weirs are fitted at more than one level.
- Attention is to be given to shell plating in way of hopper overflows.

(e) The attachment to the ship's structure of all main items of dredging equipment, including gantries, 'A' frames, spud control gear supports and items provided to facilitate separation of split hulls including hinge pin gudgeons, anchorages for rams and locking devices, is to be carefully examined to ensure that no fracture is present.

10.2.2 On ships 15 years old and over (Special Survey III and subsequent Special Surveys):

- (a) Attention is to be given by the Surveyor to the structure in way of dredging pumps.
- (b) Hopper doors, valves and items provided to facilitate separation of split hulls are to be checked for proper operation, and their hinges, control gear and other fittings are to be examined for wear or distortion. All seals and wear-down strips are to be replaced if necessary, but a watertight seal is not normally required. Attention is to be paid to areas likely to be suffering from excessive erosion.
- (c) Those items of dredging gear and equipment whose efficiency is not part of classification but whose failure or malfunctioning is, nevertheless, likely to adversely affect the ship's structure, are to be examined to ensure that the structural integrity of the ship is maintained.

■ **Section 11**
Machinery surveys – General requirements

11.1 Annual, Intermediate and Docking Surveys

11.1.1 For Annual, Intermediate and Docking Surveys, see Sections 2, 3 and 4.

11.2 Complete Surveys

11.2.1 While the ship is in dry-dock, all openings to the sea in the machinery spaces and pump-rooms, together with the valves, cocks and the fastenings with which these are connected to the hull, are to be examined.

11.2.2 All shafts (except screwshafts and tube shafts, for which special arrangements are detailed in Section 17), thrust block and all bearings are to be examined. The lower halves of bearings need not be exposed if alignment and wear are found to be acceptable.

11.2.3 An examination is to be made of all reduction gears complete with all wheels, pinions, shafts, bearings and gear teeth, thrust bearings and incorporated clutch arrangements.

11.2.4 The following auxiliaries and components are also to be examined:

- (a) Auxiliary engines, auxiliary air compressors with their intercoolers, filters and/or oil separators and safety devices, and all pumps and components used for essential services.
- (b) Steering machinery.

- (c) Windlass and associated driving equipment, where fitted.
- (d) Evaporators (other than those of vacuum type) and their safety valves, which should be seen in operation under steam.
- (e) The holding down bolts and chocks of main and auxiliary engines, gearcases, thrust blocks and intermediate shaft bearings.

11.2.5 All air receivers for essential services, together with their mountings, valves and safety devices, are to be cleaned internally and examined internally and externally. If internal examination of the air receivers is not practicable, they are to be tested hydraulically to 1,3 times the working pressure.

11.2.6 The valves, cocks and strainers of the bilge system, including bilge injection, are to be opened up as considered necessary by the Surveyor and, together with pipes, are to be examined and tested under working conditions. The oil fuel, feed, lubricating oil and cooling water systems, as well as the ballast connections and blanking arrangements to deep tanks which may carry liquid or dry cargoes, together with all pressure filters, heaters and coolers used for essential services, are to be opened up and examined or tested, as considered necessary by the Surveyor. All safety devices for the foregoing items are to be examined.

11.2.7 Fuel tanks which do not form part of the ship's structure are to be examined and, if considered necessary by the Surveyor, they are to be tested to the pressure specified for new tanks. The tanks need not be examined internally at the first survey if they are found satisfactory on external inspection. The mountings, fittings and remote controls of all oil fuel tanks are to be examined, so far as practicable.

11.2.8 Where remote and/or automatic controls are fitted for essential machinery, they are to be tested to demonstrate that they are in good working order.

11.2.9 On vessels fitted with a classed dynamic positioning system, the control system and associated machinery items are to be examined and tested to demonstrate that they are in good working order.

11.2.10 In addition to the above, detailed requirements for steam and gas turbines and steam engines, oil engines, electrical installations and boilers are given in Sections 12, 13, 14 and 15 respectively. In certain instances, upon application by the Owner or where indicated by the maker's servicing recommendations, the Committee will give consideration to the circumstances where deviation from these detailed requirements is warranted, taking account of design, appropriate indicating equipment (e.g. vibration indicators) and operational records.

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■ Section 12 Turbines and steam engines – Detailed requirements

12.1 Complete Surveys

12.1.1 The requirements of Section 11 are to be complied with.

12.1.2 The working parts of the main engine and attached pumps, and of auxiliary machinery used for essential services, are to be opened out and examined, including:

- (a) For reciprocating engines:
- Bulkhead stop valves and manoeuvring valves.
 - Cylinders.
 - Pistons, piston rods, connecting rods, crossheads and guides.
 - Valves and valve gear.
 - Crankshaft.
- (b) For turbine machinery:
- Blading and rotors.
 - Flexible couplings.
 - Casings.

12.1.3 In gas turbines and free piston gas generators, the following parts are also to be opened out and examined:

- Impellers or blading.
- Rotors and casings of the air compressors.
- Combustion chambers and burners.
- Intercoolers and heat exchangers.
- Gas and air piping, and fittings.
- Starting and reversing arrangements.

12.1.4 Where gas turbines operate in conjunction with free piston gas generators, the following parts of the latter are to be opened out and examined:

- Gas and air compressor cylinders and pistons.
- Compressor end covers.
- Valves and valve gear.
- Fuel pumps and fittings.
- Synchronizing and control gear.
- Cooling system.
- Explosion relief devices.
- Gas and air piping.
- Receivers and valves, including by-pass arrangements.

12.1.5 Condensers, steam reheaters, desuperheaters which are not incorporated in the boilers, and any other appliances used for essential services, are to be examined to the satisfaction of the Surveyor and, if it is considered necessary, they are to be tested.

12.1.6 The manoeuvring of the engines is to be tested under working conditions.

12.1.7 Exhaust steam turbines supplying power for main propulsion purposes in conjunction with reciprocating engines together with their gearing and appliances, steam compressors or electrical machinery, are to be examined, so far as practicable. Where cone connections to internal gear shafts are fitted, the coned ends are to be examined, so far as practicable.

12.1.8 In ships having essential auxiliary machinery driven by oil engines, the prime movers of these auxiliaries are to be examined as detailed in Section 13.

■ Section 13 Oil engines – Detailed requirements

13.1 Complete Surveys

13.1.1 The requirements of Section 11 are to be complied with.

13.1.2 The following parts are to be opened out and examined:

- Cylinders and covers.
- Pistons, piston rods, connecting rods, crossheads and guides.
- Valves and valve gear.
- Crankshafts and all bearings.
- Crankcases, bedplates and entablatures.
- Crankcase door fastenings, explosion relief devices and scavenge relief devices.
- Scavenge pumps, scavenge blowers, superchargers and their associated coolers.
- Air compressors and their intercoolers.
- Filters and/or separators and safety devices.
- Fuel pumps and fittings.
- Camshaft drives and balancer units.
- Vibration dampers or detuners.
- Flexible couplings and clutches.
- Reverse gears.
- Attached pumps and cooling arrangements.

13.1.3 Selected pipes in the starting air system are to be removed for internal examination and are to be hammer tested. If any appreciable amount of lubricating oil is found in the pipes, the starting air system is to be thoroughly cleaned internally by steaming out, or other suitable means. Some of the pipes selected are to be those adjacent to the starting air valves at the cylinders and to the discharges from the air compressors.

13.1.4 The electric ignition system, if fitted, is to be examined and tested.

13.1.5 The manoeuvring of engines is to be tested under working conditions. Initial starting arrangements are to be tested.

13.1.6 Where steam is used for essential purposes, the condensing plant, feed pumps and oil fuel burning plant are to be examined and the steam pipes examined and tested as detailed in Section 16.

■ Section 14

Electrical equipment

14.1 Annual and Intermediate Surveys

14.1.1 The requirements of 2.2 and 3.2 are to be complied with as far as applicable.

14.2 Complete Surveys

14.2.1 An electrical insulation resistance test is to be made on the electrical equipment and cables. The installation may be sub-divided, or equipment which may be damaged disconnected, for the purpose of this test.

14.2.2 The fittings on the main and emergency switch-board, section boards and distribution boards are to be examined and over-current protective devices and fuses inspected to verify that they provide suitable protection for their respective circuits.

14.2.3 Generator circuit-breakers are to be tested, so far as practicable, to verify that protective devices including preference tripping relays, if fitted, operate satisfactorily.

14.2.4 The electric cables are to be examined, so far as practicable, without undue disturbance of fixtures or casings, unless opening up is considered necessary as a result of observation or of the tests required by 14.2.1.

14.2.5 The generator prime movers are to be surveyed as required by Sections 12 and 13 and the governing of the engines tested. The motors concerned with essential services together with associated control and switch gear are to be examined and, if considered necessary, are to be operated, so far as practicable, under working conditions. All generators and steering gear motors are to be examined and are to be operated under working conditions, though not necessarily under full load or simultaneously.

14.2.6 Where transformers associated with supplies to essential services are liquid-immersed, the Owner is to arrange for samples of the liquid to be taken and tested for breakdown voltage, acidity and moisture by a competent testing authority, and a certificate giving the test results is to be furnished to the Surveyor.

14.2.7 Navigation light indicators are to be tried under working conditions, and correct operation on the failure of supply or failure of navigation lights is to be verified.

14.2.8 The emergency sources of electrical power, their automatic arrangements and associated circuits are to be tested.

14.2.9 Emergency lighting, transitional emergency lighting, supplementary emergency lighting, general emergency alarm and public address systems are to be tested as far as practicable.

14.2.10 Where the ship is electrically propelled, the propulsion motors, generators, cables and all ancillary electrical gear, exciters and ventilating plant (including coolers) associated therewith are to be examined, and the insulation resistance to earth is to be tested. Special attention is to be given to windings, commutators and slip-rings. The operation of protective gear and alarm devices is to be checked, so far as practicable. Insulating oil, if used, is to be tested in accordance with 14.2.6. Interlocks intended to prevent unsafe operations or unauthorized access are to be checked to verify that they are functioning correctly. Emergency overspeed governors are to be tested.

14.2.11 A General Examination of the electrical equipment in areas which may contain flammable gas or vapour and/or combustible dust is to be made to ensure that the integrity of the safe-type electrical equipment has not been impaired owing to corrosion, missing bolts, etc., and that there is not an excessive build-up of dust on or in dust protected electrical equipment. Cable runs are to be examined for sheath and armouring defects, where practicable, and to ensure that the means of supporting the cables are in good order. Tests are to be carried out to demonstrate the effectiveness of bonding straps for the control of static electricity. Alarms and interlocks associated with pressurized equipment or spaces are to be tested for correct operation.

14.3 Docking Surveys

14.3.1 For tankers five years old and over, 14.2.11 is to be complied with. In addition, an electrical insulation resistance test of the circuits terminating in, or passing through, the dangerous areas is to be carried out.

■ Section 15

Boilers

15.1 Frequency of surveys

15.1.1 All boilers, economizers, steam receivers, steam heated steam generators, thermal oil and hot water units intended for essential services, together with boilers used exclusively for non-essential services having a working pressure exceeding 3,5 bar and a heating surface exceeding 4,5 m² are to be surveyed internally. There is to be a minimum of two internal examinations during each five-year Special Survey cycle. The interval between any two such examinations is not to exceed 36 months. A general external examination is to be carried out at the time of the Annual Survey.

15.1.2 Consideration may be given in exceptional circumstances to an extension of the internal examination of the boiler not exceeding three months beyond the due date. The extension may be granted after the following is satisfactorily carried out:

- (a) External examination of the boiler
- (b) Examination and operational test of the boiler safety valve relieving gear (easing gear)

- (c) Operational tests of the boiler protective devices
- (d) Review of the following records since the previous Boiler Survey:
 - Operation
 - Maintenance
 - Repair history
 - Feedwater chemistry

In this context 'exceptional circumstances' means unavailability of repair facilities, essential materials, equipment or spare parts, or delays incurred by action taken to avoid severe weather conditions.

15.1.3 An external survey of boilers including tests of safety and protective devices, and tests of safety valves using their relieving gear, is to be carried out annually within the range dates of the Annual Survey of the ship. For exhaust gas heated economizers, the safety valves are to be tested by the Chief Engineer at sea within the range dates of the Annual Survey. This test is to be recorded in the log book and reviewed by the attending Surveyor prior to crediting the Annual Survey.

15.2 Scope of surveys

15.2.1 At the surveys described in 15.1, the boilers, superheaters, economizers and air heaters are to be examined internally on the water-steam side and the fire side. Where considered necessary, the pressure parts are to be tested by hydraulic pressure and the thicknesses of plates and tubes and sizes of stays are to be ascertained to determine a safe working pressure. The safety valves and principal mountings on boilers, superheaters and economizers are to be examined and opened up as necessary by the Surveyor. The adjustment of safety valves is to be verified during each boiler internal survey. Boiler safety valves and their relieving gear are to be examined and tested to verify their satisfactory operation. Safety valves are to be set under steam to a pressure not greater than the approved design pressures of the respective parts. As a working tolerance, the setting is acceptable, provided that the valves lift at not more than 103 per cent of the approved design pressure. However, for exhaust gas heated economizers, if steam cannot be raised in port, the safety valves may be set by the Chief Engineer at sea, and the results recorded in the log book and reviewed by the attending Surveyor. The following records since the previous Boiler Survey are to be reviewed as part of the survey:

- Operation
- Maintenance
- Repair history
- Feedwater chemistry.

The remaining mountings are to be examined externally and, if considered necessary by the Surveyor, are to be opened up for internal examination. Collision chocks, rolling stays and boiler stools are to be examined and maintained in an efficient condition.

15.2.2 In addition to the foregoing, in exhaust gas heated economizers of the shell type, all accessible welded joints are to be subjected to a visual examination in order to identify any evidence of cracking. Non-destructive testing may be required for this purpose and may be requested by the Surveyor.

15.2.3 In fired boilers employing forced circulation, the pumps used for this service are to be opened and examined at each Boiler Survey.

15.2.4 The oil fuel burning system is to be examined under working conditions and a General Examination made of fuel tank valves, pipes, deck control gear and oil discharge pipes between pumps and burners.

15.2.5 At each survey of a cylindrical boiler which is fitted with smoke tube superheaters, the saturated steam pipes are to be examined as detailed in Section 16.

15.2.6 At the annual General Examination referred to in 15.1.1 the requirements of 2.2.11 are to be complied with.

■ **Section 16
Steam pipes**

16.1 Frequency of surveys

16.1.1 Saturated steam pipes, as well as superheated steam pipes where the temperature of the steam at the superheater outlet is not over 450°C, are to be surveyed 10 years from the date of build (or installation) and thereafter at five-yearly intervals.

16.1.2 Superheated steam pipes where the temperature of the steam at the superheater outlet is over 450°C are to be surveyed five years from the date of build (or installation) and thereafter at five-yearly intervals.

16.1.3 At 10 years from the date of build (or installation) and thereafter at five-yearly intervals, all copper or copper alloy steam pipes over 76 mm external diameter supplying steam for essential services at sea, are to be hydraulically tested to twice the working pressure.

16.2 Scope of surveys

16.2.1 At each survey, a selected number of main steam pipes, also of auxiliary steam pipes, which:

- (a) are over 76 mm external diameter,
- (b) supply steam for essential services at sea, and
- (c) have bolted joints,

are to be removed for internal examination and are to be hydraulically tested to 1,5 times the working pressure. If these selected pipes are found satisfactory in all respects, the remainder need not be tested. So far as practicable, the pipes are to be selected for examination and hydraulic test in rotation, so that in the course of surveys all sections of the pipeline will be tested.

Periodical Survey Regulations

Part 1, Chapter 3

Sections 16 & 17

16.2.2 Where main and/or auxiliary steam pipes of the category described in 16.2.1(a) and (b) have welded joints between the lengths of pipe and/or between pipes and valves, the lagging in way of the welds is to be removed, and the welds examined and, if considered necessary by the Surveyor, crack detected. Pipe ranges having welded joints are to be hydraulically tested to 1,5 times the working pressure. Where lengths having ordinary bolted joints are fitted in such pipe ranges and can be readily disconnected, they are to be removed for internal examination and hydraulically tested to 1,5 times the working pressure.

16.2.3 Where, on cylindrical boilers having smoke tube superheaters, the saturated steam pipes adjoining the saturated steam headers are situated partly in the boiler smoke boxes, all such pipes adjoining and cross-connecting these headers in the smoke boxes are, at the surveys required by 16.1, to be included in the pipes selected for examination and testing, as defined in 16.2.1. Where the saturated steam pipes inside the smoke boxes consist of steel castings of substantial construction, these requirements need only be applied to a sample casting. Where steel castings are not fitted, the Surveyor is to satisfy himself of the condition of the ends of the saturated steam pipes in the smoke boxes at each Boiler Survey and, if he considers it necessary, a sample pipe is to be removed for examination.

16.2.4 At the surveys specified in 16.1.3, any of the copper or copper alloy pipes, such as those having expansion or other bends, which may be subject to bending and/or vibration, as well as closing lengths adjacent to steam-driven machinery, are to be annealed before being tested.

16.2.5 Where it is inconvenient for the Owner to fulfil all the requirements of a Steam Pipe Survey at its due date, the Committee will be prepared to consider postponement of the survey, either wholly or in part.

■ Section 17 Screwshafts, tube shafts and propellers

17.1 Frequency of surveys

17.1.1 Shafts with keyed propeller attachments and fitted with continuous liners or approved oil glands, or made of approved corrosion resistant materials, are to be surveyed at intervals of five years when the keyway complies fully with the present Rules.

17.1.2 Shafts having keyless-type propeller attachments are to be surveyed at intervals of five years, provided that they are fitted with approved oil glands or are made of approved corrosion resistant materials.

17.1.3 Shafts having solid coupling flanges at the after end are to be surveyed at intervals of five years, provided that they are fitted with approved oil glands or are made of approved corrosion resistant materials.

17.1.4 All other shafts not covered by 17.1.1 to 17.1.3 are to be surveyed at intervals of 2¹/₂ years.

17.1.5 Controllable pitch propellers for main propulsion purposes are to be surveyed at the same intervals as the screwshaft.

17.1.6 Directional propeller and podded propulsion units for main propulsion purposes are to be surveyed at intervals not exceeding five years.

17.1.7 Water jet units for main propulsion purposes are to be surveyed at intervals not exceeding five years, provided that the impeller shafts are made of approved corrosion resistant material or have approved equivalent arrangements.

17.1.8 Dynamic positioning and/or thruster-assisted mooring and athwartship thrust propellers and shaftings are to be surveyed at intervals not exceeding five years.

17.2 Normal surveys

17.2.1 All screwshafts are to be withdrawn for examination by LR's Surveyors at the intervals prescribed in 17.1.1 to 17.1.4. The after end of the cylindrical part of the shaft and forward one-third of the shaft cone, or fillet of the flange, are to be examined by a magnetic particle crack detection method. In the case of a keyed propeller attachment, at least the forward one-third of the shaft cone is to be examined with the key removed. Wear-down is to be measured and the stern-tube bearings, oil glands, propellers and fastenings are to be examined. Controllable pitch propellers, where fitted, are to be opened up and the working parts examined, together with the control gear.

17.2.2 Directional propeller and podded propulsion units are to be dismantled for examination of the propellers, shafts, gearing, control and electrical gear.

17.2.3 Water jet units are to be dismantled for examination of the impeller, casing, shaft, shaft seal, shaft bearing, inlet and outlet channels, steering nozzle, reversing arrangements, and control gear.

17.2.4 Dynamic positioning and/or thruster-assisted mooring and athwartship thrust propellers are to be generally examined so far as possible in dry-dock and tested under working conditions afloat for satisfactory operation.

17.2.5 Podded propulsion unit screwshaft roller bearings are to be renewed when the calculated life at the maximum continuous rating no longer exceeds the survey interval. See Pt 5, Ch 23,6.3.7.

Periodical Survey Regulations

Part 1, Chapter 3

Sections 17 & 18

17.3 Screwshaft Condition Monitoring (SCM)

17.3.1 Where oil lubricated shafts with approved oil glands are fitted, and the Owner has complied with the following requirements, the ShipRight descriptive note **SCM** (Screwshaft Condition Monitoring) may be entered in column 6 of the *Register Book*:

- (a) Lubricating oil analysis to be carried out regularly at intervals not exceeding six months. The lubricating oil analysis documentation is to be available on board. Each analysis is to include the following minimum parameters:
 - water content
 - chloride content
 - bearing material and metal particles content
 - oil ageing (resistance to oxidation).
- (b) Oil samples are to be taken under service conditions and are to be representative of the oil within the sterntube.
- (c) Oil consumption is to be recorded.
- (d) Bearing temperatures are to be recorded, (two temperature sensors or other approved arrangements are to be provided).
- (e) Facilities are to be provided for measurement of bearing wear down.
- (f) Oil glands are to be capable of being replaced without withdrawal of the screwshaft.

17.3.2 For maintenance of the descriptive note **SCM**, the records of analyses, consumption and temperatures, together with wear-down readings, are to be retained on board and audited annually.

17.3.3 Where the requirements for the descriptive note **SCM** have been complied with, the screwshaft need not be withdrawn at surveys as required by 17.2.1, provided all condition monitoring data are found to be within permissible limits and all exposed areas of the shaft are examined by a magnetic particle crack detection method. The remaining requirements of 17.2.1 are to be complied with. Where the Surveyor considers that the data presented are not entirely to his satisfaction, the shaft will be required to be withdrawn in accordance with 17.2.1.

17.4 Modified Survey

17.4.1 A Modified Survey may be accepted at alternate five-yearly surveys for shafts described in 17.1.1, provided that they are fitted with oil lubricated bearings and approved oil glands, and also for those in 17.1.2 and 17.1.3.

17.4.2 The Modified Survey is to consist of the partial withdrawal of the shaft, sufficient to ascertain the condition of the stern bearing and shaft in way. For keyless propellers or shafts with a solid flange connection to the propeller, a visual examination to confirm the good condition of the sealing arrangements is to be made. The oil glands are to be capable of being replaced without removal of the propeller. The forward bearing and all accessible parts, including the propeller connection to the shaft, are to be examined as far as possible. Wear down is to be measured and found satisfactory. Where a controllable pitch propeller is fitted, at least one of the blades is to be dismantled complete for examination of the working parts and the control gear.

17.4.3 For keyed propellers, the after end of the cylindrical part of the shaft and forward one-third of the shaft cone is to be examined by a magnetic particle crack detection method, for which dismantling of the propeller and removal of the key will be required.

17.4.4 Where the requirements for the descriptive note **SCM** have been complied with as described in 17.3.1 and all data are found to be within permissible limits, partial withdrawal of the shaft will not be required. Where doubt exists regarding any of the above findings, the shaft is to be withdrawn to permit an entire examination.

17.5 Partial Survey

17.5.1 For shafts where the Modified Survey is applicable, upon application by the Owner, the Committee will be prepared to give consideration to postponement of the survey for a maximum period of half the specified cycle provided a Partial Survey is held.

17.5.2 The Partial Survey is to consist of the propeller being backed off in any keyed shaft and the top half of the cone examined by an efficient crack detection method for which removal of the key will be required. Oil gland and seals are to be examined and dealt with as necessary. Wear-down is to be measured and found satisfactory. Propeller and fastenings are to be examined.

17.5.3 The Committee will be prepared to give consideration to the circumstances of any special case upon application by the Owner.

Section 18 Inert gas systems

18.1 Frequency of surveys

18.1.1 Inert gas systems installed on board ships intended for the carriage of oil or liquid chemicals in bulk are to be surveyed annually in accordance with the requirements of 2.2.22. A Special Survey of the inert gas system, in accordance with the requirements of 18.2, is to be held at intervals not exceeding five years.

18.2 Scope of surveys

18.2.1 At each Special Survey of the inert gas system, the inert gas generator, scrubber and blower are to be opened out as considered necessary and examined. Gas distribution lines and shut-off valves, including soot blower interlocking devices are to be examined as considered necessary. The deck seal and non-return valve are to be examined. Cooling water systems including the effluent piping and overboard discharge from the scrubbers are to be examined. All automatic shutdown devices and alarms are to be tested. The complete installation is to be tested under working conditions on completion of survey.

Periodical Survey Regulations

Part 1, Chapter 3

Sections 18 & 19

18.2.2 When, at the request of an Owner, it has been agreed by the Committee that the Complete Survey of the inert gas systems may be carried out on the Continuous Survey basis, the various items of machinery are to be opened for survey in rotation, so far as practicable, to ensure that the interval between consecutive examinations of each item will not exceed five years. In general, approximately one-fifth of the machinery is to be examined each year.

18.2.3 If any examination during Continuous Survey reveals defects, further parts are to be opened up and examined as considered necessary by the Surveyors, and the defects are to be made good to their satisfaction.

18.2.4 See 9.7.12 for inert gas systems on ships for liquefied gases.

■ Section 19 Classification of ships not built under survey

19.1 General

19.1.1 When classification is desired for a ship not built under the supervision of LR's Surveyors, application should be made to the Committee in writing.

19.1.2 Periodical Surveys of such ships, when classed, are subsequently to be held as in the case of ships built under survey.

19.1.3 Where classification is desired for a ship which is classed by another recognized Society, special consideration will be given to the scope of the survey.

19.2 Hull and equipment

19.2.1 Plans showing the main scantlings and arrangements of the actual ship, together with any proposed alterations, are to be submitted for approval. These should comprise plans of the midship section, longitudinal section and decks, and such other plans as may be requested. If plans cannot be obtained or prepared by the Owner, facilities are to be given for LR's Surveyor to obtain the necessary information from the ship.

19.2.2 Particulars of the process of manufacture and the testing of the material of construction are to be supplied.

19.2.3 In all cases, the full requirements of Sections 5, 6, 7, 8, 9 and 10 are to be carried out as applicable. Ships of recent construction will receive special consideration.

19.2.4 During the survey, the Surveyors are to satisfy themselves regarding the workmanship and verify the approved scantlings and arrangements. For this purpose, and in order to ascertain the amount of any deterioration, parts of the structure will require to be gauged as necessary. Full particulars of the anchors, chain cables and equipment are to be submitted. For ships to which Pt 6, Ch 4 applies, fire protection, detection and extinction are to be in accordance with that Chapter. Loading instruments, where required, are to be in accordance with the Rules, see Pt 3, Ch 4,8 as applicable.

19.2.5 When the full survey requirements indicated in 19.2.3 and 19.2.4 cannot be completed at one time, the Committee may consider granting an interim record for a limited period. The conditions regarding the completion of the survey will depend on the merits of each particular case, which should be submitted for consideration.

19.3 Machinery

19.3.1 To facilitate the survey, plans of the following items (plans of piping are to be diagrammatic), together with the particulars of the materials used in the construction of the boilers, air receivers and important forgings, are to be furnished:

- General pumping arrangements, including air and sounding pipes (Shipbuilder's plan).
- Pumping arrangements at the forward and after ends of oil tankers and drainage of cofferdams and pump rooms.
- General arrangement of cargo piping in tanks and on deck of oil tankers.
- Piping arrangements for cargo oil (F.P. 60°C or above, closed cup test).
- Bilge, ballast and oil fuel pumping arrangements in the machinery space, including the capacities of the pumps on bilge service.
- Arrangement and dimensions of main steam pipes.
- Arrangement of oil fuel pipes and fittings at settling and service tanks.
- Arrangement of oil fuel piping in connection with oil burning installations.
- Oil fuel and cargo oil overflow systems, where these are fitted.
- Arrangement of boiler feed systems.
- Oil fuel settling, service and other oil fuel tanks not forming part of the ship's structure.
- Boilers, superheaters and economizers.
- Air receivers.
- Crank, thrust, intermediate and screw shafting.
- Clutch and reversing gear with methods of control.
- Reduction gearing.
- Propeller (including spare propeller if supplied).
- Electrical circuits.
- Arrangement of compressed air systems for main and auxiliary services.
- Arrangement of lubricating oil systems.
- Arrangement of flammable liquids used for power transmission, control and heating systems.
- Arrangement of cooling water systems for main and auxiliary services.

- General arrangement of cargo tank vents. The plan is to indicate the type and position of the vent outlets from any superstructure, erection, air intake, etc. Ventilation arrangements of cargo and/or ballast pump rooms and other enclosed spaces which contain cargo handling equipment.

19.3.2 Plans additional to those detailed in 19.3.1 are not to be submitted unless the machinery is of a novel or special character affecting classification.

19.3.3 Where remote and/or automatic controls are fitted to propulsion machinery and essential auxiliaries, a description of the scheme is to be submitted.

19.3.4 For new ships and ships which have been in service less than two years, calculations of the torsional vibration characteristics of the propelling machinery are to be submitted for consideration, as required for ships constructed under Special Survey. For older ships, the circumstances will be specially considered in relation to their service record and type of machinery installed. Where calculations are not submitted, the Committee may require that the machinery certificate be endorsed to this effect. When desired by the Owner, the calculations and investigation of the torsional vibration characteristics of the machinery may be carried out by LR upon special request.

19.3.5 The main and auxiliary machinery, feed pipes, compressed air pipes and boilers are to be examined as required at Complete Surveys. Working pressures are to be determined from the actual scantlings in accordance with the Rules.

19.3.6 The screwshaft is to be drawn and examined.

19.3.7 The steam pipes are to be examined and tested as required by Section 16.

19.3.8 The bilge, ballast and oil fuel pumping arrangements are to be examined and amended, as necessary, to comply with the Rules.

19.3.9 Oil burning installations are to be examined as required at Complete Surveys and found, or modified, to comply with the requirements of the Rules; they are also to be tested under working conditions.

19.3.10 The electrical equipment is to be examined as required at Complete Surveys.

19.3.11 Where an inert gas system is fitted on ships intended for the carriage of oil in bulk having a flashpoint not exceeding 60°C, the requirements of Pt 5, Ch 15,7, apply.

19.3.12 The whole of the machinery, including essential controls, is to be tried under working conditions to the Surveyor's satisfaction.

19.3.13 First entry reports are to be prepared by the Surveyors.

19.4 Refrigerated cargoes

19.4.1 When classification is desired for an installation not constructed under the supervision of LR's Surveyors, application is to be made to the Committee in writing.

19.4.2 Full particulars and plans are to be forwarded for consideration, together with the particulars of the materials of the crankshafts, pressure vessels and pressure piping. The requirements of Pt 6, Ch 3,1 and Ch 3,4 are to be used for guidance in regard to the information required.

19.4.3 A special examination is to be made at least to the extent required for subsequent Special Surveys, see 20.3.

19.4.4 The thickness and material of the insulation, the particulars of the frames, beams, stiffeners and other steelwork within the insulation, the air coolers and/or chamber grid piping, the compressors, evaporators and condensers are to be verified so far as practicable.

19.4.5 The installation is to conform to the requirements of the relevant Sections of Pt 6, Ch 3.

19.4.6 Acceptance tests are to be carried out in accordance with the requirements of Pt 6, Ch 3,5.

■ Section 20 Refrigerated cargo installations

20.1 Annual Surveys

20.1.1 The Surveyors are to examine the machinery under working conditions as soon as practicable after a ship's arrival at a port of discharge before the cargo is unloaded. An examination of the refrigerated cargo installation log book (or other records) is to be made and any breakdowns or malfunctions of the plant during the previous twelve months are to be noted and reported to the Committee.

20.1.2 A General Examination of the refrigerating plant is to be carried out, and satisfactory operation of safety devices, controls and thermometry is to be verified. Insulated cargo spaces are to be inspected, and the condition of insulation, lining, scuppers, hatches, coolers, air ducting and air refreshing arrangements are to be checked. The Surveyors may request opening out of suspected items, or recommend repair or renewal of defective items, as a result of inspection.

20.1.3 A General Examination is to be made of electrical motors driving refrigerant compressors, pumps and fans, together with their control gear and cables. Random tests for insulation resistance are to be made on the cables, switchgear, motors, etc., and this resistance is to be not less than 1 MΩ between individual conductors and between those conductors and earth. The installation may be subdivided for the purpose of this test, and the Surveyor may at his discretion accept the results of tests carried out by a competent member of staff or contractor.

Periodical Survey Regulations

Part 1, Chapter 3

Section 20

20.1.4 A survey book or other permanent record is to be kept on board the ship to show the date of examination of the various parts. This is to be available to the Surveyor at all times, and is to be signed by the Surveyor on the occasion of each survey.

20.2 Special Surveys

20.2.1 At the first Special Survey, the examinations outlined below are to be carried out. Where there is a programme of replacement instead of maintenance on board, alternative survey arrangements will be considered. Each case will be given individual consideration.

20.2.2 Detailed internal examination of each reciprocating compressor, opened up for inspection of cylinders, pistons, connection rods, valves, seats, glands, relief devices, filters, lubrication and crankshaft.

20.2.3 For screw-type compressors, the period before opening up may be extended to six years or 25 000 running hours, whichever is the earlier. Examination should be made of rotors, clearances, gearing, etc.

20.2.4 Refrigerant condenser cooling water pumps, including standby pump(s) which may be used on other services, are to be opened up and their working parts exposed.

20.2.5 Primary and secondary refrigerant pumps are to be opened up and their working parts exposed.

20.2.6 The water end covers of condensers are to be removed for examination of the tubes, tubeplates and covers.

20.2.7 In the case of pressure vessels covered by insulation, any evidence of dampness or deterioration of the insulation which could lead to external corrosion of the vessels or their connections is to be investigated.

20.2.8 Sufficient insulation is to be stripped from insulated pressure vessels to allow the condition of the vessels and their connections to be ascertained. Care is to be taken that in replacement of the insulation, the vapour sealing of the outer covering is made good.

20.2.9 Sufficient insulation is to be stripped from pipes carrying the refrigerant at various points of the system both outside and inside the insulated chambers to permit the condition of the pipes to be ascertained. Sections of piping exposed are to include locations where lengths of piping have been connected by screwed couplings or butt welding. Care is to be taken that when ungalvanized portions of the piping in way of joints have been exposed, they are to be suitably coated and taped, after pressure testing, to prevent corrosion. On replacement of the insulation, the vapour sealing of the outer covering is to be made good.

20.2.10 A General Examination is to be made of all pressure relief valves and/or safety discs throughout the refrigerating plant to ensure that they are in good order and covered by current certification. However, no attempt is to be made to test primary refrigerant pressure relief on board ship. Relief valves are to be removed, overhauled and recalibrated every five years or in accordance with the manufacturer's recommendations, whichever is sooner.

20.2.11 Sea connections to refrigerant condenser cooling water pumps are to be opened up on the occasion of the hull and/or main machinery Special Survey.

20.2.12 The electric motors driving refrigerant compressors, pumps and fans, together with their control gear and cables, are to have their insulation resistance tested and this is to be not less than 1 M Ω between individual conductors and between those conductors and earth. The installation may be subdivided to any desired extent by opening switches, removing fuses or disconnecting appliances for the purpose of this test.

20.2.13 All automatic controls, alarms and safety systems are to be tested and correct operation confirmed.

20.2.14 Sufficient air ducting and insulation lining is to be stripped from the cargo spaces or chamber's overhead and vertical surfaces to allow the condition of the insulation, insulation linings, grounds, supports, hangers and fixtures which support the insulation, grids, meat rails, etc., to be ascertained. Care is to be taken that on replacement, the ducts and linings are sealed against air blowing into the insulation, or against moisture ingress from refrigerated cell or space atmosphere.

20.2.15 Sufficient tank top insulation is to be stripped to allow the condition of the grounds and inner insulation lining to be ascertained.

20.2.16 Due consideration is to be given to the type of insulation used in the cargo spaces and chambers when determining the amount of insulation lining to be removed. Where organic foam insulants have been used, including panel systems or foamed *in situ*, or other insulants in slab form, the removal of panels or linings is to be at the Surveyor's discretion.

20.2.17 Under normal circumstances, the condition of the cargo space and chamber insulation, grounds, etc., can be ascertained when the Special Survey of the ship's steel structure is being held.

20.2.18 Arrangements made for defrosting air coolers, and for draining condensate from trays below coolers, are to be examined to ascertain that they are in working order. Trace heating elements around drain pipes should be specially examined.

20.2.19 Any air refreshing arrangements are to be examined.

20.3 Subsequent Special Survey

20.3.1 A subsequent Special Survey is to be held approximately five years from the date of the previous Special Survey. Where a Continuous Survey procedure has been agreed, the interval between consecutive examinations of each item should not exceed five years.

20.3.2 In addition to the requirements for the first Special Survey as detailed in 20.2, paragraphs 20.3.3 to 20.3.5 are to be complied with.

20.3.3 'Shell-and-tube' condensers and evaporators (secondary refrigerant coolers) in which the primary refrigerant is in the shell, are to have the shell pneumatically tested with the refrigerant, or air, or a mixture of inert gas and refrigerant (with the end covers removed) at pressures as stated in Pt 6, Ch 3,2.5.5.

20.3.4 Shell-and-tube evaporators (secondary refrigerant coolers) in which the secondary refrigerant is in the shell are to have the shell hydraulically tested (with the end covers removed) to 1,5 times the design pressure, but in no case less than 2,9 bar g. After refitting the end covers, the primary refrigerant side is to be pneumatically tested as stated in 20.3.3, and an examination made as far as practicable for gas leakage in the shell with the secondary refrigerant connection removed.

20.3.5 Heat exchangers used for cooling refrigerant liquid by the suction return gas to a compressor are not subject to internal corrosion, and would normally require to be specially examined internally only if leakage is suspected between high and low pressure sides. This type of heat exchanger, together with others using brine or water, are to be examined and tested at the discretion of the Surveyor according to the design of such equipment.

20.4 Loading Port Survey

20.4.1 When a Loading Port Certificate is required by the Owner or his representative, a survey as detailed in 20.4.2 to 20.4.7 is to be carried out at the loading port. The certificate is not in respect of the cargo to be loaded or the manner in which it is to be stowed.

20.4.2 The refrigerating installation is to be examined under working conditions, and the temperatures in the cargo chambers are to be noted.

20.4.3 A General Examination of the generating plant supplying electric power to the refrigerated cargo installation is to be carried out to confirm that it complies with Pt 6, Ch 3,6.1.

20.4.4 The refrigerated cargo spaces and chambers are to be examined in an empty state to ascertain that they are clean and free from odour which may adversely affect the cargo to be loaded, that the air cooler coils and cooling grids and their connections are free from leakage, that cargo battens, where fixed to the vertical surfaces, are in good order, that cargo gratings or dunnage battens (see Pt 6, Ch 3) are available as necessary for the floors or decks, and that no damage has been sustained to the insulation or its lining prior to the loading of the refrigerated cargo. Any indications of defective insulation not considered to warrant immediate attention are to be noted and specially reported.

20.4.5 All scuppers and bilge suctions draining insulated spaces are to be examined to ensure that they are in good working order, and that any liquid seals are primed.

20.4.6 If the ship loads at more than one port, one survey only at the first loading port will be required, provided that it includes the examination of all spaces or chambers which are to be used for refrigerated cargo during the voyage, and that general cargo is not subsequently carried in any of the spaces or chambers prior to loading the refrigerated cargo.

20.4.7 In the case of ships engaged on voyages of less than two months' duration, a Loading Port Certificate will be considered as valid for two months, provided that the cargoes carried are of such a nature as not to damage the insulation or appliances in the insulated chambers, nor to affect, by taint or mould, the refrigerated cargoes loaded during that period. For longer voyages, the certificate is valid for only one cargo from the loading port(s) to the discharge port(s).

20.4.8 If there is no LR Surveyor available at the loading port(s), or if none is obtainable from a port within a reasonable distance, the Committee will accept the report of a survey held at the loading port by two competent engineers of the ship.

20.5 Refrigerating plant on ships not classed with LR

20.5.1 In the case of refrigerating installations being constructed under Special Survey on ships not intended to be classed with LR, the installation is to comply with the applicable requirements of Pt 6, Ch 3.

20.5.2 The generator engines and electrical equipment, which supply power to the refrigerating installations are to be constructed in accordance with the requirements of the Classification Society concerned and the installation is also to comply with the requirements of Pt 6, Ch 3,6.1.2. Such a plant is to be examined generally and under working conditions by the Surveyors.

■ Section 21 Controlled atmosphere systems

21.1 Retention of class

21.1.1 It is a prerequisite of the **CA** notation that the refrigeration installation on board already conforms to a **⌘Lloyd's RMC** notation, see Pt 1, Ch 2,2.5.1.

21.1.2 For the retention of Class, the CA systems are to be submitted for Periodical Surveys by LR's Surveyors as specified in 21.2 and 21.3.

21.2 Annual Surveys

21.2.1 Annual Surveys are to be carried out from the date of the Initial Classification Survey to verify that the CA system remains satisfactory.

21.2.2 The complete CA installation is to be visually examined and tested for the following main aspects:

- (a) CA zone sealing arrangements including cleats and hinges, pressure/vacuum (P/V) valves, door locks, ventilation of adjacent spaces, warning notices.
- (b) CA zones to be individually tested for airtightness to the design pressure. Testing by ship's staff, within one month prior to the survey may be accepted, based on a written report by the Master subject to visual inspection confirming the airtightness.
- (c) Operation and performance testing of the gas supply equipment, including controls, alarms, interlocks, safety devices.
- (d) Ventilation arrangements including fans.
- (e) Electrical supply arrangements.
- (f) Gas analyzers and analyzing equipment and calibration.
- (g) RH sensors and calibrations.
- (h) Permanent and portable gas monitoring, calibration and personnel safety equipment.
- (j) Witnessing of the air leakage.
- (k) Voyage logs, records of CA zone airtightness and calibration of instruments.
- (l) Verification that an Operating and Safety Manual is on board, is complete and that the responsible officers have countersigned to confirm that they are familiar with its contents.

21.2.3 On satisfactory completion of this survey, a new Annual Survey 'AS', with date, will be assigned.

21.3 Special Surveys

21.3.1 Special Surveys are to be carried out at intervals of five years from the date of the Initial Classification Survey to verify that all machinery, CA zones and safety arrangements remain satisfactory. On request from Owners, all surveyable items may be examined on a continuous basis. With this option, 20 per cent of all items are to be presented for survey annually.

21.3.2 Each CA zone is to be subjected to an airtightness test.

21.3.3 The extent of dismantling is to be at the LR Surveyor's discretion, but is to be sufficient for the Surveyor to be satisfied as to the condition of the installation.

21.3.4 On satisfactory completion of this survey, a new Special Survey 'SS', or 'RMC CS' with date, will be assigned.

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