



**BUREAU
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Requirements for Thickness Measurements Applicable to Inland Navigation Vessels

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Bureau Veritas Marine & Offshore General Conditions

1. INDEPENDENCY OF THE SOCIETY AND APPLICABLE TERMS

1.1 The Society shall remain at all times an independent contractor and neither the Society nor any of its officers, employees, servants, agents or subcontractors shall be or act as an employee, servant or agent of any other party hereto in the performance of the Services.

1.2 The operations of the Society in providing its Services are exclusively conducted by way of random inspections and do not, in any circumstances, involve monitoring or exhaustive verification.

1.3 The Society acts as a services provider. This cannot be construed as an obligation bearing on the Society to obtain a result, or as a warranty. The Society is not and may not be considered as an underwriter, broker in Unit's sale or chartering, expert in Unit's valuation, consulting engineer, controller, naval architect, manufacturer, shipbuilder, repair or conversion yard, charterer or shipowner; none of them above listed being relieved of any of their expressed or implied obligations as a result of the interventions of the Society.

1.4 The Services are carried out by the Society according to the applicable Rules and to the Bureau Veritas' Code of Ethics. The Society only is qualified to apply and interpret its Rules.

1.5 The Client acknowledges the latest versions of the Conditions and of the applicable Rules applying to the Services' performance.

1.6 Unless an express written agreement is made between the Parties on the applicable Rules, the applicable Rules shall be the rules applicable at the time of the Services' performance and contract's execution.

1.7 The Services' performance is solely based on the Conditions. No other terms shall apply whether express or implied.

2. DEFINITIONS

2.1 "Certificate(s)" means class certificates, attestations and reports following the Society's intervention. The Certificates are an appraisal given by the Society to the Client, at a certain date, following surveys by its surveyors on the level of compliance of the Unit to the Society's Rules or to the documents of reference for the Services provided. They cannot be construed as an implied or express warranty of safety, fitness for the purpose, seaworthiness of the Unit or its value for sale, insurance or chartering.

2.2 "Certification" means the activity of certification in application of national and international regulations or standards, in particular by delegation from different governments that can result in the issuance of a certificate.

2.3 "Classification" means the classification of a Unit that can result or not in the issuance of a class certificate with reference to the Rules.

2.4 "Client" means the Party and/or its representative requesting the Services.

2.5 "Conditions" means the terms and conditions set out in the present document.

2.6 "Industry Practice" means International Maritime and/or Offshore industry practices.

2.7 "Intellectual Property" means all patents, rights to inventions, utility models, copyright and related rights, trade marks, logos, service marks, trade dress, business and domain names, rights in trade dress or get-up, rights in goodwill or to sue for passing off, unfair competition rights, rights in designs, rights in computer software, database rights, topography rights, moral rights, rights in confidential information (including know-how and trade secrets), methods and protocols for Services, and any other intellectual property rights, in each case whether capable of registration, registered or unregistered and including all applications for and renewals, reversions or extensions of such rights, and all similar or equivalent rights or forms of protection in any part of the world.

2.8 "Parties" means the Society and Client together.

2.9 "Party" means the Society or the Client.

2.10 "Register" means the register published annually by the Society.

2.11 "Rules" means the Society's classification rules, guidance notes and other documents. The Rules, procedures and instructions of the Society take into account at the date of their preparation the state of currently available and proven technical minimum requirements but are not a standard or a code of construction neither a guide for maintenance, a safety handbook or a guide of professional practices, all of which are assumed to be known in detail and

carefully followed at all times by the Client.

2.12 "Services" means the services set out in clauses 2.2 and 2.3 but also other services related to Classification and Certification such as, but not limited to: ship and company safety management certification, ship and port security certification, training activities, all activities and duties incidental thereto such as documentation on any supporting means, software, instrumentation, measurements, tests and trials on board.

2.13 "Society" means the classification society **Bureau Veritas Marine & Offshore SAS**, a company organized and existing under the laws of France, registered in Nanterre under the number 821 131 844, or any other legal entity of Bureau Veritas Group as may be specified in the relevant contract, and whose main activities are Classification and Certification of ships or offshore units.

2.14 "Unit" means any ship or vessel or offshore unit, or structure of any type or part of it or system whether linked to shore, river, bed or sea bed or not, whether operated or located at sea or in inland waters or partly on land, including submarines, hovercrafts, drilling rigs, offshore installations of any type and of any purpose, their related and ancillary equipment, subsea or not, such as well head and pipelines, mooring legs and mooring points or otherwise as decided by the Society.

3. SCOPE AND PERFORMANCE

3.1 The Society shall perform the Services according to the applicable national and international standards and Industry Practice and always on the assumption that the Client is aware of such standards and Industry Practice.

3.2 Subject to the Services performance and always by reference to the Rules, the Society shall:

- review the construction arrangements of the Unit as shown on the documents provided by the Client;
- conduct the Unit surveys at the place of the Unit construction;
- class the Unit and enters the Unit's class in the Society's Register;
- survey the Unit periodically in service to note that the requirements for the maintenance of class are met. The Client shall inform the Society without delay of any circumstances which may cause any changes on the conducted surveys or Services.

The Society will not:

- declare the acceptance or commissioning of a Unit, nor its construction in conformity with its design, such activities remaining under the exclusive responsibility of the Unit's owner or builder;
- engage in any work relating to the design, construction, production or repair checks, neither in the operation of the Unit or the Unit's trade, neither in any advisory services, and cannot be held liable on those accounts.

4. RESERVATION CLAUSE

4.1 The Client shall always: (i) maintain the Unit in good condition after surveys; (ii) present the Unit after surveys; (iii) present the Unit for surveys; and (iv) inform the Society in due course of any circumstances that may affect the given appraisal of the Unit or cause to modify the scope of the Services.

4.2 Certificates referring to the Society's Rules are only valid if issued by the Society.

4.3 The Society has entire control over the Certificates issued and may at any time withdraw a Certificate at its entire discretion including, but not limited to, in the following situations: where the Client fails to comply in due time with instructions of the Society or where the Client fails to pay in accordance with clause 6.2 hereunder.

5. ACCESS AND SAFETY

5.1 The Client shall give to the Society all access and information necessary for the efficient performance of the requested Services. The Client shall be the sole responsible for the conditions of presentation of the Unit for tests, trials and surveys and the conditions under which tests and trials are carried out. Any information, drawings, etc. required for the performance of the Services must be made available in due time.

5.2 The Client shall notify the Society of any relevant safety issue and shall take all necessary safety-related measures to ensure a safe work environment for the Society or any of its officers, employees, servants, agents or subcontractors and shall comply with all applicable safety regulations.

6. PAYMENT OF INVOICES

6.1 The provision of the Services by the Society, whether complete or not, involve, for the part carried out, the payment of fees thirty (30) days upon issuance of the invoice.

6.2 Without prejudice to any other rights hereunder, in case of Client's payment default, the Society shall be entitled to charge, in addition to the amount not properly paid, interests equal to twelve (12) months LIBOR plus two (2) per cent as of due date calculated on the number of days such payment is delinquent. The Society shall also have the right to withhold certificates and other documents and/or to suspend or revoke the validity of certificates.

6.3 In case of dispute on the invoice amount, the undisputed portion of the invoice shall be paid and an explanation on the dispute shall accompany payment so that action can be taken to solve the dispute.

7. LIABILITY

7.1 The Society bears no liability for consequential loss. For the purpose of this clause consequential loss shall include, without limitation:

- Indirect or consequential loss;
 - Any loss and/or deferral of production, loss of product, loss of use, loss of bargain, loss of revenue, loss of profit or anticipated profit, loss of business and business interruption, in each case whether direct or indirect.
- The Client shall save, indemnify, defend and hold harmless the Society from the Client's own consequential loss regardless of cause.

7.2 In any case, the Society's maximum liability towards the Client is limited to one hundred and fifty per-cent (150%) of the price paid by the Client to the Society for the performance of the Services. This limit applies regardless of fault by the Society, including breach of contract, breach of warranty, tort, strict liability, breach of statute.

7.3 All claims shall be presented to the Society in writing within three (3) months of the Services' performance or (if later) the date when the events which are relied on were first discovered by the Client. Any claim not so presented as defined above shall be deemed waived and absolutely time barred.

8. INDEMNITY CLAUSE

8.1 The Client agrees to release, indemnify and hold harmless the Society from and against any and all claims, demands, lawsuits or actions for damages, including legal fees, for harm or loss to persons and/or property tangible, intangible or otherwise which may be brought against the Society, incidental to, arising out of or in connection with the performance of the Services except for those claims caused solely and completely by the negligence of the Society, its officers, employees, servants, agents or subcontractors.

9. TERMINATION

9.1 The Parties shall have the right to terminate the Services (and the relevant contract) for convenience after giving the other Party thirty (30) days' written notice, and without prejudice to clause 6 above.

9.2 In such a case, the class granted to the concerned Unit and the previously issued certificates shall remain valid until the date of effect of the termination notice issued, subject to compliance with clause 4.1 and 6 above.

10. FORCE MAJEURE

10.1 Neither Party shall be responsible for any failure to fulfil any term or provision of the Conditions if and to the extent that fulfilment has been delayed or temporarily prevented by a force majeure occurrence without the fault or negligence of the Party affected and which, by the exercise of reasonable diligence, the said Party is unable to provide against.

10.2 For the purpose of this clause, force majeure shall mean any circumstance not being within a Party's reasonable control including, but not limited to: acts of God, natural disasters, epidemics or pandemics, wars, terrorist attacks, riots, sabotages, impositions or sanctions, embargoes, nuclear, chemical or biological contamination, laws or action taken by a government or public authority, quotas or prohibition, expropriations, destructions of the worksite, explosions, fires, accidents, any labour or trade disputes, strikes or lockouts

11. CONFIDENTIALITY

11.1 The documents and data provided to or prepared by the Society in performing the Services, and the information made available to the Society, are treated as confidential except where the information:

- is already known by the receiving Party from another source and is property and lawfully in the possession of the receiving Party prior to the date that it is disclosed;
- is already in possession of the public or has entered the public domain, otherwise than through a breach of this obligation;
- is acquired independently from a third party that has the right to disseminate such information;
- is required to be disclosed under applicable law or by a governmental order, decree, regulation or rule or by a stock exchange authority (provided that the receiving Party shall make all reasonable efforts to give prompt written notice to the disclosing Party prior to such disclosure).

11.2 The Society and the Client shall use the confidential information exclusively within the framework of their activity underlying these Conditions.

11.3 Confidential information shall only be provided to third parties with the prior written consent of the other Party. However, such prior consent shall not be required when the Society provides the confidential information to a subsidiary.

11.4 The Society shall have the right to disclose the confidential information if required to do so under regulations of the International Association of Classifications Societies (IACS) or any statutory obligations.

12. INTELLECTUAL PROPERTY

12.1 Each Party exclusively owns all rights to its Intellectual Property created before or after the commencement date of the Conditions and whether or not associated with any contract between the Parties.

12.2 The Intellectual Property developed for the performance of the Services including, but not limited to drawings, calculations, and reports shall remain exclusive property of the Society.

13. ASSIGNMENT

13.1 The contract resulting from these Conditions cannot be assigned or transferred by any means by a Party to a third party without the prior written consent of the other Party.

13.2 The Society shall however have the right to assign or transfer by any means the said contract to a subsidiary of the Bureau Veritas Group.

14. SEVERABILITY

14.1 Invalidation of one or more provisions does not affect the remaining provisions.

14.2 Definitions herein take precedence over other definitions which may appear in other documents issued by the Society.

14.3 In case of doubt as to the interpretation of the Conditions, the English text shall prevail.

15. GOVERNING LAW AND DISPUTE RESOLUTION

15.1 The Conditions shall be construed and governed by the laws of England and Wales.

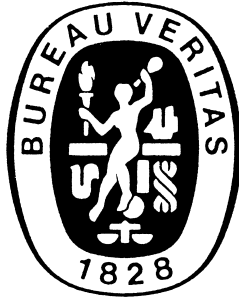
15.2 The Society and the Client shall make every effort to settle any dispute amicably and in good faith by way of negotiation within thirty (30) days from the date of receipt by either one of the Parties of a written notice of such a dispute.

15.3 Failing that, the dispute shall finally be settled by arbitration under the LCIA rules, which rules are deemed to be incorporated by reference into this clause. The number of arbitrators shall be three (3). The place of arbitration shall be London (UK).

16. PROFESSIONAL ETHICS

16.1 Each Party shall conduct all activities in compliance with all laws, statutes, rules, and regulations applicable to such Party including but not limited to: child labour, forced labour, collective bargaining, discrimination, abuse, working hours and minimum wages, anti-bribery, anti-corruption. Each of the Parties warrants that neither it, nor its affiliates, has made or will make, with respect to the matters provided for hereunder, any offer, payment, gift or authorization of the payment of any money directly or indirectly, to or for the use or benefit of any official or employee of the government, political party, official, or candidate.

16.2 In addition, the Client shall act consistently with the Society's Code of Ethics of Bureau Veritas. <http://www.bureauveritas.com/home/about-us/ethics-and-compliance/>



RULE NOTE NR 597

NR 597

Requirements for Thickness Measurements Applicable to Inland Navigation Vessels

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SECTION 1 GENERAL

SECTION 2 PROCEDURE FOR THICKNESS MEASUREMENTS

SECTION 1

GENERAL

1 Application

1.1 General

1.1.1 Thickness measurements are a major part of surveys to be carried out for the maintenance of class, and the analysis of these measurements is a prominent factor in the determination and extent of the repairs and renewals of the vessel's structure.

1.1.2 This Rule note is intended to provide Owners, companies performing thickness measurements and the Society's Surveyors with a uniform means with a view to fulfilling Rule requirements for thickness measurements. In particular, it will enable all the above-mentioned parties to carry out:

- the planning and preparation
- the determination of extent and location, and
- the analysis,

of the thickness measurements in cooperation.

2 Objectives of thickness measurements

2.1 General

2.1.1 The corrosion and wear tolerances stipulate limits of wastage which are to be taken into account for reinforce-

ments, repairs or renewals of hull structure. They are classified and determined by the Society, depending on the local conditions of the structural elements into:

- criteria on global and buckling strength
- criteria on local strength and pitting.

Each measured structural item is to be checked against these criteria, as far as applicable. When the criteria are not met, reinforcements, repairs and renewals are to be carried out as appropriate.

2.1.2 The thickness of structural elements is checked by measurements, in order to assess whether or not the values stipulated in the Rules are kept, taking into account the admissible corrosion tolerances. Unless severe corrosion has occurred owing to particular service conditions, thickness measurements will not be required until class renewal II.

2.1.3 Thickness measurements are to be carried out in accordance with recognized methods and by authorized personnel or companies.

Note 1: Rule Note NR 533 Approval of Service Suppliers gives details about the authorisation.

2.1.4 Rust and contamination are to be removed from the components to be examined. The Surveyor is entitled to require check measurements or more detailed measurements to be performed in his presence. The thickness measurements are to be witnessed by the Surveyor on board to the extent necessary to control the process.

SECTION 2 PROCEDURE FOR THICKNESS MEASUREMENTS

1 Terminology related to hull survey

1.1 Ballast tank

1.1.1 A ballast tank is a tank that is being primarily used for water ballast. A tank which is used for both cargo and water ballast will be treated as a ballast tank when substantial corrosion has been found in such tank, see [1.8].

1.2 Spaces

1.2.1 Spaces are separate compartments such as holds and tanks.

1.3 Overall survey

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

1.4 Close-up survey

1.4.1 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 Transverse section

1.5.1 A transverse section includes all longitudinal members contributing to longitudinal hull girder strength, such as plating, longitudinals and girders at the deck, side shell, bottom, inner bottom, longitudinal bulkheads, and plating in side tanks, as well as relevant longitudinals, as applicable for the different vessels. For a transversely framed vessel, a transverse section includes adjacent frames and their end connections in way of transverse sections.

1.6 Representative tanks or spaces

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

1.7 Critical structural area

1.7.1 Critical structural areas are locations which have been identified from calculations to require monitoring or from the service history of the subject vessel or from similar

vessels or sister vessels, if applicable, to be sensitive to cracking, buckling or corrosion which could impair the structural integrity of the vessel.

1.8 Substantial corrosion

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

1.9 Pitting corrosion

1.9.1 Pitting corrosion is defined as scattered corrosion spots/ areas with local material reductions which are greater than the general corrosion in the surrounding area. Pitting intensity is defined in Ch 4, Sec 4, Fig 1.

1.10 Coating condition

1.10.1 Coating condition is defined as follows:

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

1.10.2 A guidance to evaluation of coating condition is given in Ch 4, App 2.

1.11 Suspect areas

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

1.12 Cargo area for vessels carrying liquid cargo in bulk

1.12.1 The cargo area is that part of the vessel 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 vessel over the above-mentioned spaces.

1.13 Cargo area for dry cargo vessels

1.13.1 The cargo area is that part of the vessel which includes all cargo holds and adjacent areas including fuel tanks, cofferdams, ballast tanks and void spaces.

1.14 Class renewal number

1.14.1 Class renewals for hull are numbered in the sequence I, II, III, etc., depending upon the age of the vessel, in years, at time of class renewal survey:

I	: Age ≤ 5
II	: 5 < Age ≤ 10
III	: 10 < Age ≤ 15
IV	: 15 < Age

1.15 Transverse bulkhead

1.15.1 Adjacent structural members

“Adjacent structural members” means plating and stiffeners of deck, bottom, double bottom, sides and longitudinal bulkheads in the vicinity of the transverse bulkhead.

1.15.2 Complete transverse bulkhead

“Complete transverse bulkhead” means the whole bulkhead including stringers and stiffeners and adjacent structural members as defined in [1.15.1].

1.15.3 Transverse bulkhead lower part

“Transverse bulkhead lower part” means lower part of bulkhead up to 1/4 of vessel’s depth or 1 metres above the lower stringer, whichever is the greater (stringers, stiffeners and adjacent structural members included).

1.16 Vessel parts

1.16.1 Fore part

The fore part includes the structures of the stems and those:

- located in the part before the cargo zone in the case of vessels with a separated cargo zone (separated by bulkheads)
- located in the part extending over 0,1L behind the stem in all other cases unless otherwise mentioned.

1.16.2 Central part

The central part includes the structures within the greater of:

- the region extending over 0,5L through the midship section
- the region located between the fore part and:
 - the machinery space, if located aft
 - the aft part, otherwise.

1.16.3 Aft part

The aft part includes the structures located aft of the after peak bulkhead.

2 External service suppliers

2.1 General

2.1.1 Personnel or firms engaged in services affecting classification and statutory work are subject to approval by the Society.

The inspection, measuring and test equipment used in workshops, Building Yards and on board vessels, which may form the basis for Surveyor's decisions affecting classification or statutory work, shall be appropriate for the services to be performed. The firms shall individually identify and calibrate each unit of such equipment to a recognized national or international standard.

3 General requirements for thickness measurements

3.1 General

3.1.1 When required as per the scope of surveys, thickness measurements are normally to be carried out under the responsibility of the Owner, and in the presence of the Surveyor, by a service supplier independent from the Owner.

3.1.2 For all vessels, the following applies:

- thickness measurements required in the context of surveys of hull structure are to be witnessed by a Surveyor. This requires the Surveyor to be on board while the gaugings are taken, enabling him at any time to intervene and to control the process.
- prior to commencement of the survey, a meeting is to be held between the attending surveyor(s), the Owner representative(s) in attendance and the thickness measurement firm’s representative(s) so as to ensure the safe and efficient execution of the surveys and thickness measurements to be carried out on board.

3.1.3 Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required. The thickness measurements are to be carried out by a company authorised by the Society.

The Society reserves the right to limit the scope of authorisation of the Company.

Note 1: Rule Note NR 533 Approval of Service Suppliers gives details about the authorisation.

3.1.4 For acceptance criteria stipulating limits of wastage to be taken into account for reinforcements, repairs or renewal of structure, see Chapter 4.

3.2 Main hull structural elements

3.2.1 As applicable, in class renewal II and all subsequent ones, the plate thickness of the main and essential longitudinal and transverse structural hull elements are to be checked by thickness measurements. The number of measurements depends on the vessel's maintenance condition and is left to the Surveyor's discretion. The minimum requirements for thickness measurements on the occasion of class renewal

surveys are stated in Ch 2, Sec 2, depending on the vessel's class renewal survey number. The number and locations of measurements are defined in Ch 2, Sec 3.

3.3 Reduction of thickness measurement scope

3.3.1 The thickness measurements may be waived or their extent may be reduced in comparison with those stated in Ch 2, Sec 2 after satisfactory examination, when structural elements in the considered area are found in good condition.

3.4 Extension of thickness measurement scope

3.4.1 The Surveyor may extend the scope of the thickness measurement as deemed necessary. This applies especially to areas with substantial corrosion. When thickness measurements indicate substantial corrosion, as defined in [1.8], the number of thickness measurements is to be increased to determine the extent of substantial corrosion.

3.5 Transverse sections

3.5.1 Transverse sections shall be chosen where largest corrosion rates are suspected to occur or are revealed by deck plating measurements.

3.6 Ballast tanks

3.6.1 If applicable, in the case of major corrosion damages, the structural elements of ballast tanks are to be checked by thickness measurements.

3.7 Substantial corrosion and suspect areas

3.7.1 Where special reasons exist, the Surveyor may demand thickness measurements to be carried out already on the occasion of class renewal I, also outside the area of 0,5 L amidships. The same applies in the case of conversion or repair of a vessel.

4 Hull surveys at class renewal surveys

4.1 General

4.1.1 Overall survey

Each class renewal survey is to include an overall survey of cargo tanks, cargo holds and all spaces. The extent of thickness measurements are given in Ch 2, Sec 2. For number and locations of measurements, see Ch 2, Sec 3.

4.1.2 Close-up survey

A close-up survey may be required depending on the vessel age and/or condition.

EXTENT, NUMBER AND LOCATIONS OF MEASUREMENTS

SECTION 1 GENERAL

SECTION 2 EXTENT OF THICKNESS MEASUREMENTS

SECTION 3 NUMBER AND LOCATIONS OF MEASUREMENTS

SECTION 1 GENERAL

1 Scope of thickness measurements

1.1 General

1.1.1 The thickness measurements required by the Rules consist of:

- systematic thickness measurements, i.e. measurements of different parts of the structure, in order to assess the overall and local strength of the vessel
- measurements of suspect areas as defined in Ch 1, Sec 2, [1.11]
- additional measurements on areas determined as affected by substantial corrosion as defined in Ch 1, Sec 2, [1.8].

SECTION 2

EXTENT OF THICKNESS MEASUREMENTS

1 General

1.1 General requirements

1.1.1 Thickness measurements are to be carried out according to the procedure detailed in Ch 1, Sec 2, [3].

The extent of thickness measurements is detailed in [2.1] to [2.3], according to the vessel's type and age. The Surveyor may extend the thickness measurements as deemed necessary. When thickness measurements indicate substantial corrosion, the extent of thickness measurements is to be increased to determine areas of substantial corrosion in accordance with the requirements of Tab 1. These extended thickness measurements are to be carried out before the survey is credited as completed.

Thickness measurements 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.

Thickness measurements of internals may be specially considered by the Surveyor if the hard protective coating is in good condition.

1.1.2 When pitting is found on a plating and its intensity is 20% or more, thickness measurements are to be extended in order to determine the actual plate thickness out of the pits and the depth of the pits. Where the wastage is in the substantial corrosion range or the average depth of pitting is 1/3 or more of the actual plate thickness, the pitted plate is to be considered as a substantially corroded area.

1.2 Application of the requirements for thickness measurements

1.2.1 Tab 2 provides interpretations for the application of the requirements for thickness measurements related to the locations and number of points to be measured.

Table 1 : Guidance for additional thickness measurements in way of substantial corrosion areas

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

2 Minimum requirements for thickness measurements

2.1 Tank vessels

2.1.1 The extent of thickness measurements at class renewal survey is given in Tab 3, depending on the vessel age at time of class renewal survey. For number and locations of thickness measurements, see Sec 3, [2].

2.2 Cargo vessels

2.2.1 "Cargo vessel" applies to vessels intended to carry dry cargoes and covers the following type and service notations:

- Bulk cargo vessel
- Container vessel
- General cargo vessel, and
- RoRo cargo vessel.

2.2.2 The extent of thickness measurements at class renewal survey is given in Tab 4, depending on the vessel age at time of class renewal survey. For number and locations of thickness measurements, see Sec 3, [3].

2.3 Other vessels

2.3.1 The extent of thickness measurements at class renewal survey is given in Tab 5, depending on the vessel age at time of class renewal survey. For number and locations of thickness measurements, see Sec 3, [3], taking into account the vessel's specific particulars.

Table 2 : Interpretations of the requirements for the locations and number of points to be measured

SYSTEMATIC MEASUREMENTS		
ITEM	INTERPRETATION	FIGURE
Selected plates on deck, tank top, bottom, inner bottom and side.	"Selected" means at least a single point on one out of three plates, to be chosen on representative areas of average corrosion.	No figure
All deck, tank top, bottom, inner bottom and side plates.	At least two points on each plate to be taken either at each 1/4 extremity of plate or at representative areas of average corrosion.	No figure
Transverse section	Refer to the definition given in Ch 1, Sec 2, [1.5]. One point to be taken on each plate. Both web and flange to be measured on longitudinals, if applicable.	Sec 3, Fig 1 to Sec 3, Fig 4, for tank vessels Sec 3, Fig 5 to Sec 3, Fig 8, for cargo vessels
Bulkheads	"Selected bulkheads" means at least 50% of the bulkheads.	Sec 3, Fig 9, for watertight bulkheads on double hull cargo vessels Sec 3, Fig 10, for plane bulkheads Sec 3, Fig 11, for corrugated bulkheads
Selected internal structure such as floors, longitudinals, transverse frames, web frames, deck beams and girders.	The internal structural items to be measured in each space internally surveyed are to be at least 20% within the cargo area and 10% outside the cargo area.	No figure

Table 3 : Minimum Requirements for thickness measurements - Tank vessels

Class renewal survey I	Class renewal survey II	Class renewal survey III	Class renewal survey IV and subsequent
Suspect areas throughout the vessel			
	Within the cargo area: - one transverse section - selected side / inner side plates - selected bottom / inner bottom plates	Within the cargo area: - two transverse sections - all side / inner side plates - selected bottom / inner bottom plates - selected transverse and longitudinal cargo tank bulkhead (1)	Within the cargo area: - three transverse sections - all side / inner side plates - all bottom / inner bottom plates - all transverse and longitudinal cargo tank bulkheads (1)
	Selected deck / trunk plates within the cargo area.	All deck /trunk plates within the cargo area	All deck / trunk plates full length.
		Selected deck plates, bottom plates and side plates outside the cargo area	All deck plates, bottom plates and side plates outside the cargo area
	Collision bulkhead, forward machinery space bulkhead, aft peak bulkhead (1)		Selected transverse and longitudinal bulkheads outside cargo area (1)
	<ul style="list-style-type: none"> - river water manifold in engine room - plating of river chests - shell plating in way of overboard discharges as considered necessary by the attending Surveyor 		
		Internals in fore peak tank.	Internals in fore peak and after peak tanks.
		Selected internal structure such as floors and longitudinals, transverse frames, web frames, deck beams, girders	
			Representative exposed superstructure deck plates.
(1) Including plates and stiffeners.			

Table 4 : Minimum Requirements for thickness measurements - Cargo vessels

Class renewal survey I	Class renewal survey II	Class renewal survey III	Class renewal survey IV and subsequent
Suspect areas throughout the vessel			
	Within the cargo area: - one transverse section - selected side / inner side plates - selected bottom / inner bottom plates	Within the cargo area: - two transverse sections - all side / inner side plates - selected bottom / inner bottom plates - selected cargo hold transverse bulkheads (1)	Within the cargo area: - three transverse sections - all side / inner side plates - all bottom / inner bottom plates - all cargo hold transverse bulkheads (1)
	Selected top structure plates within the cargo area (1), (2) .	All top structure plates within the cargo area (1), (2) .	All top structure plates full length (1), (2) .
		Selected deck plates, bottom plates and side plates outside the cargo area	All deck plates, bottom plates and side plates outside the cargo area
	Collision bulkhead, forward machinery space bulkhead, aft peak bulkhead (1)		Selected transverse and longitudinal bulkheads outside cargo area (1)
	<ul style="list-style-type: none"> - river water manifold in engine room - plating of river chests - shell plating in way of overboard discharges as considered necessary by the attending Surveyor 		
		Internals in fore peak tank.	Internals in fore peak and after peak tanks.
		Selected internal structure such as floors and longitudinals, transverse frames, web frames, deck beams, girders	
			Representative exposed superstructure deck plates.
(1) Including plates and stiffeners.			
(2) Top structure includes deck, stringer plate, hatch coaming and shear strake.			

Table 5 : Minimum Requirements for thickness measurements - Other vessels

Class renewal survey I	Class renewal survey II	Class renewal survey III	Class renewal survey IV and subsequent
Suspect areas throughout the vessel			
	Within the central part: - one transverse section - selected side / inner side plates - selected bottom / inner bottom plates	Within the central part: - two transverse sections - all side / inner side plates - selected bottom / inner bottom plates - selected transverse bulkheads (1)	Within the central part: - three transverse sections - all side / inner side plates - all bottom / inner bottom plates - all transverse bulkheads (1)
	Selected exposed main deck plates within the central part.	All exposed main deck plates within the central part.	All exposed main deck plates full length.
		Selected deck plates, bottom plates and side plates outside the central part.	All deck plates, bottom plates and side plates outside the central part.
	Collision bulkhead, forward machinery space bulkhead, aft peak bulkhead (1)		Selected transverse and longitudinal bulkheads outside central part. (1)
	<ul style="list-style-type: none"> - river water manifold in engine room - plating of river chests - shell plating in way of overboard discharges as considered necessary by the attending Surveyor 		
		Internals in fore peak tank.	Internals in fore peak and after peak tanks.
		Selected internal structure such as floors and longitudinals, transverse frames, web frames, deck beams, girders	
			Representative exposed superstructure deck plates.
(1) Including plates and stiffeners.			

SECTION 3

NUMBER AND LOCATIONS OF MEASUREMENTS

1 General

1.1 Scope

1.1.1 Considering the extent of thickness measurements as required in Sec 2, the locations of the points to be measured are given in this Section for the most important items of the structure. Thus the number of points can be estimated.

1.1.2 Measurements are to be taken on both port and star-board sides of the selected transverse section or transverse bulkhead.

1.2 Definition

1.2.1 Cargo vessels include vessels assigned one of the following type and service notations:

- Bulk cargo vessel
- Container vessel
- General cargo vessel
- RoRo cargo vessel.

2 Locations of measurement points

2.1 General

2.1.1 Figures are given to facilitate the explanations and/or interpretations concerning locations of thickness measurements according to Tab 1.

2.1.2 The figures listed in Tab 1 show typical arrangements of tankers and cargo vessels. Due to the various designs of the other vessel types, figures are not given to cover all the different cases. However, the figures provided here may be used as guidance for vessels other than those illustrated.

2.1.3 The locations of measurement points on tank vessels fitted with independent cargo tank will be determined as follows:

- independent cargo tank: according to the requirements applicable to integrated cargo tanks
- surrounding vessel structure: according to the requirements applicable to a cargo vessel having similar structural arrangement.

2.2 Examples of locations of measurement points

2.2.1 Examples of locations of measurements points are shown in Fig 1 to Fig 11.

Table 1 : Locations of measurements

Vessel type	Structural item	Figure	Structural configuration
Tank vessels <ul style="list-style-type: none"> • Flush deck vessel • Integrated cargo tank 	Transverse section - ordinary frame	Fig 1	Single hull Combination framing system
	Transverse section - web frame	Fig 2	
	Transverse section - ordinary frame	Fig 3	Double hull Combination framing system
	Transverse section - web frame	Fig 4	
	Transverse tank bulkhead	Fig 10	Plane bulkhead
	Transverse tank bulkhead	Fig 11	Corrugated bulkhead
Cargo vessels <ul style="list-style-type: none"> • Open deck vessel 	Transverse section - web frame	Fig 5	Double hull Longitudinal framing system
	Transverse section - ordinary frame	Fig 6	
	Transverse section - ordinary frame	Fig 7	Double hull Transverse framing system
	Transverse section - web frame	Fig 8	
	Transverse watertight bulkhead	Fig 9	Plane bulkhead
	Transverse hold bulkhead	Fig 10	Plane bulkhead
	Transverse hold bulkhead	Fig 11	Corrugated bulkhead

Figure 1 : Locations of measurements on a transverse section of single hull tank vessels: ordinary frame

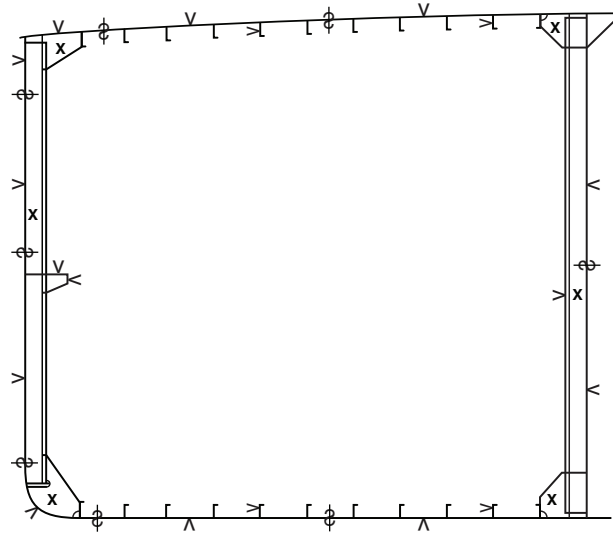


Figure 2 : Locations of measurements on a transverse section of single hull tank vessels: web frame

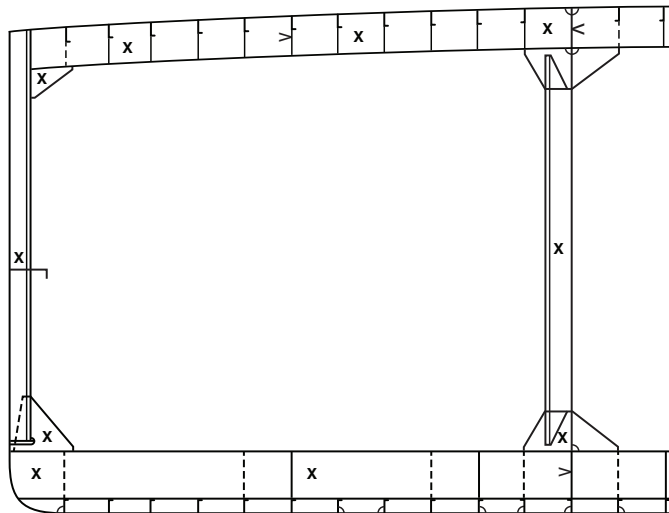


Figure 3 : Locations of measurements on a transverse section of double hull tank vessels: ordinary frame

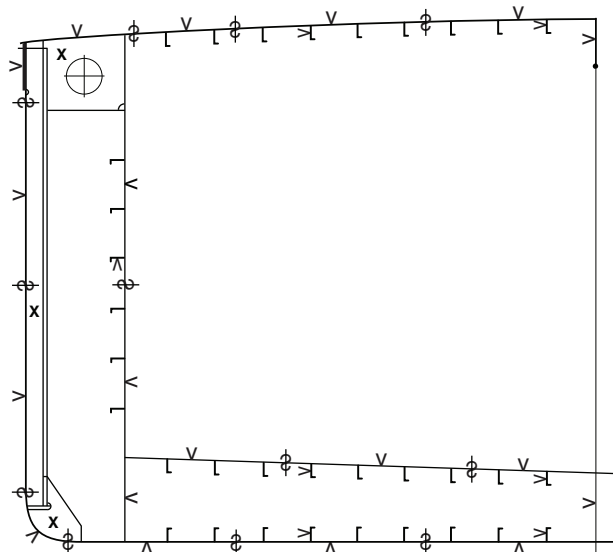


Figure 4 : Locations of measurements on a transverse section of double hull tank vessels: web frame

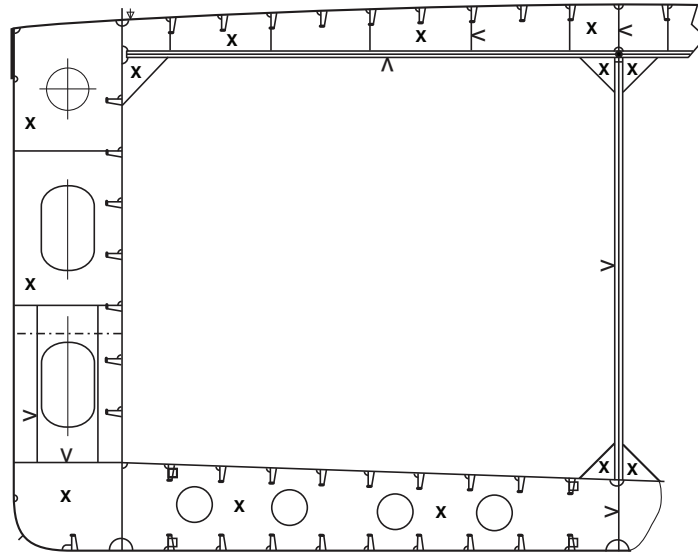


Figure 5 : Locations of measurements on a transverse section of double hull cargo vessels - web frame

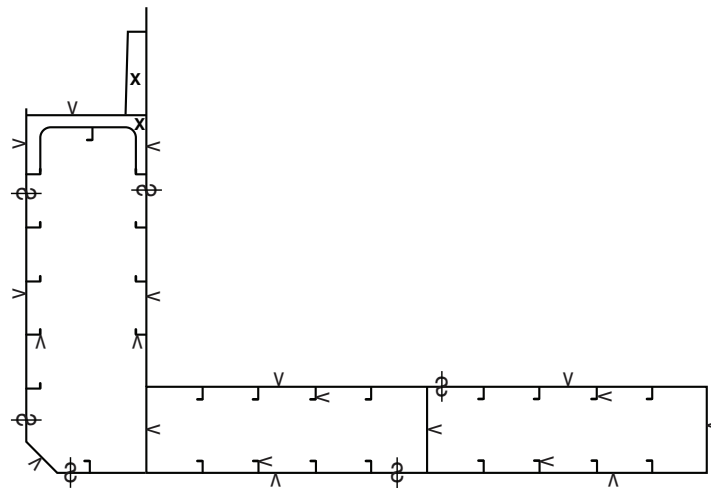


Figure 6 : Locations of measurements on a transverse section of double hull cargo vessels - ordinary frame

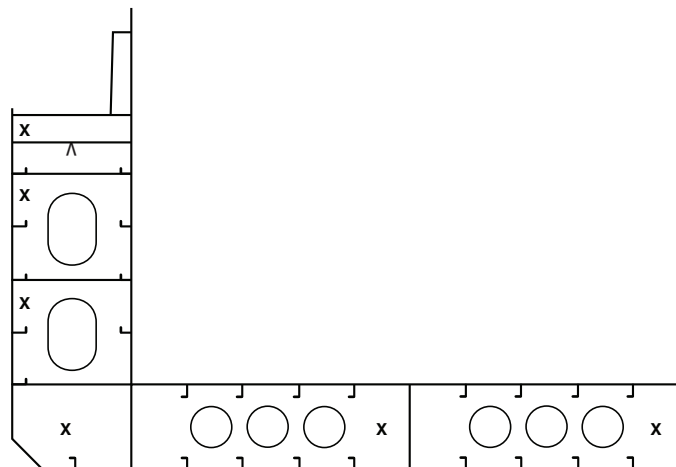


Figure 7 : Locations of measurements on a transverse section of double hull cargo vessels - ordinary frame

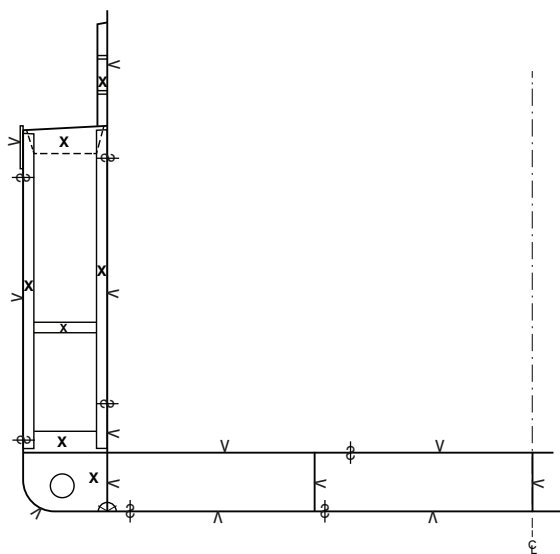


Figure 8 : Locations of measurements on a transverse section of double hull cargo vessels - web frame

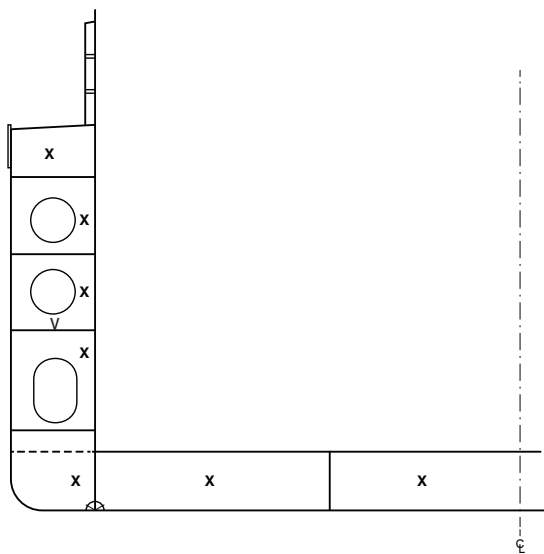


Figure 9 : Locations of measurements on watertight bulkheads - cargo vessels

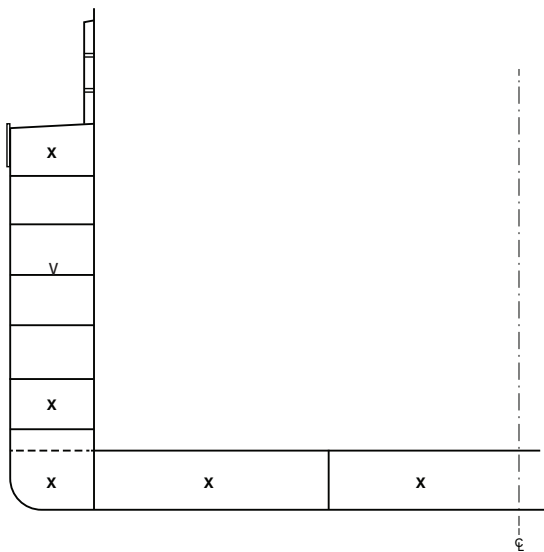


Figure 10 : Locations of measurements on tank bulkheads

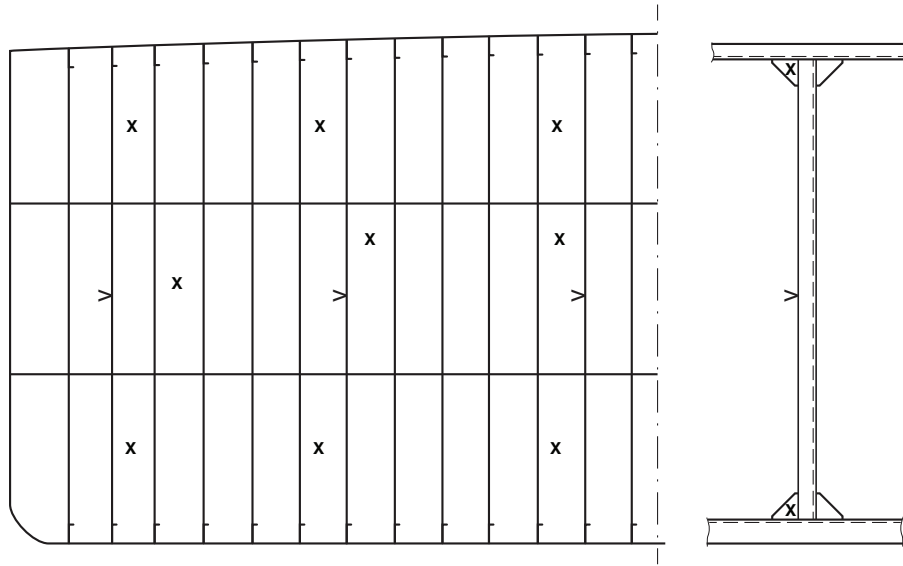
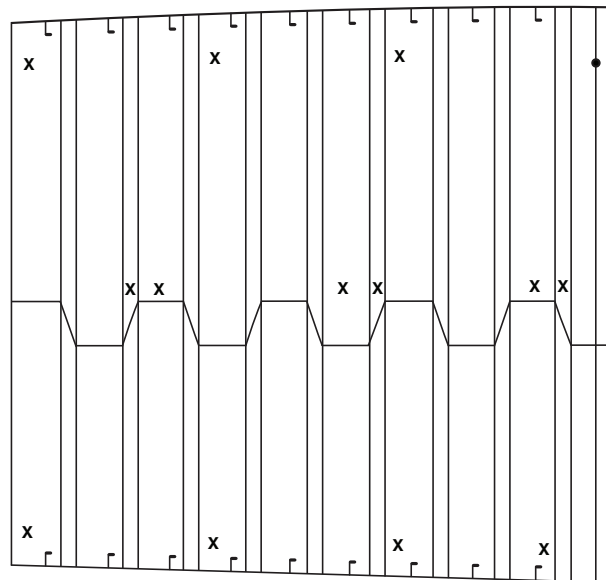


Figure 11 : Locations of measurements on transverse corrugated bulkheads



MEASUREMENTS REPORTING AND PROCESSING

SECTION 1 THICKNESS MEASUREMENTS REPORTING

SECTION 2 THICKNESS MEASUREMENTS PROCESSING

SECTION 1

THICKNESS MEASUREMENTS REPORTING

1 Application

1.1 General

1.1.1 This Section contains reporting forms to be used for recording thickness measurements as required in Chapter 2.

2 Reporting forms

2.1 General particulars

2.1.1 The first sheet of the report is to include general particulars information listed in Tab 1.

2.2 Deck plating, bottom shell plating or side shell plating

2.2.1 Appropriate reporting form is given in Tab 2.

2.2.2 This report is to be used for recording the thickness measurement of:

- a) all strength deck plating within central part area
- b) all keel, bottom shell plating and bilge plating within central part area
- c) side shell plating, within central part area.

2.2.3 The strake position is to be clearly indicated as follows (see also Ch 4, App 1):

- a) For strength deck, indicate the number of the strake of plating inboard from the stringer plate
- b) For bottom plating, indicate the number of the strake of plating outboard from the keel plate
- c) For side shell plating, give the number of the strake of plating below sheerstrake and letter as shown on shell expansion.

2.2.4 Measurements are to be taken at the forward and aft areas of plates.

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

Table 1 : General particulars

GENERAL PARTICULARS	
Vessel name:	
Type and service notation:	
Bureau Veritas register number:	
Port of registry:	
Deadweight:	
Date of build:	
Classification Society:	
Name of company performing thickness measurement:	
Thickness measurement company certified by:	
Certificate No:	
Certificate valid from to	
Place of measurement:	
First date of measurement:	
Last date of measurement:	
Type of survey:	
Scantling approach:	
Rule length (m):	
Details of measurement equipment:	
Qualification of operators:	
Report Number:consisting of sheets	
Name of operator:.....	Name of Surveyor:
Signature of operator:	Signature of Surveyor:
Company official stamp:	Society official stamp

Table 2 : Deck plating, bottom shell plating or side shell plating

REPORT ON THICKNESS MEASUREMENT OF DECK PLATING, BOTTOM SHELL PLATING OR SIDE SHELL PLATING (1)																		
Vessel's name: Register No..... Report No.....																		
STRAKE POSITION	Strake / Deck N°..... (2)																	
PLATE POSITION	No or Lett.	Org. Thk. (3)	Forward Reading						Aft Reading						Mean dimin %		Max. allo. dim. mm	
			Gauged		Diminution P		Diminution S		Gauged		Diminution P		Diminution S		P	S		
			P	S	mm	%	mm	%	P	S	mm	%	mm	%				
12th fore																		
11th																		
10th																		
9th																		
8th																		
7th																		
6th																		
5th																		
4th																		
3rd																		
2nd																		
1st																		
amid-ships																		
1st aft																		
2nd																		
3rd																		
4th																		
5th																		
6th																		
7th																		
8th																		
9th																		
10th																		
11th																		
12th aft																		
Operator signature: Surveyor's signature.....																		
(1) Delete as appropriate (2) For multiple deck vessels (3) Rule thickness or as-built thickness																		

2.3 Shell and deck plating at transverse sections - strength deck and sheerstrake plating

2.3.1 Appropriate reporting form is given in Tab 3.

2.3.2 This report is to be used for recording the thickness measurement of strength deck plating and sheerstrake plating at transverse sections within the central part area comprising of the following structural items:

- Strength deck plating
- Stringer plate
- Sheerstrake
- Hatch coaming.

2.3.3 For flush deck and trunk deck vessels, the topside area comprises stringer plate and sheerstrake.

For open deck vessels, the topside area comprises hatch coaming plating, stringer plate and sheerstrake.

2.3.4 The exact frame station of measurement is to be stated.

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

2.4 Shell and bottom plating at transverse sections

2.4.1 Appropriate reporting form is given in Tab 4.

2.4.2 This report is to be used for recording the thickness measurement of shell and bottom plating at transverse sections within the central part area comprising of the following structural items:

- Side shell plating
- Bilge plating
- Bottom shell plating
- Keel plate.

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

2.4.4 The exact frame station of measurement is to be stated.

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

Table 3 : Strength deck and sheerstrake plating at transverse sections

REPORT ON THICKNESS MEASUREMENT OF STRENGTH DECK AND SHEERSTRAKE PLATING AT TRANSVERSE SECTIONS									
Vessel's name:Register No.....;Report No.....									
	Transverse section at frame number								
STRAKE POSITION	No or lett.	Org Thk (1)	Max allow. dim.	Gauged		Diminution P		Diminution S	
		mm	mm	P	S	mm	%	mm	%
Hatch coaming (2) / Trunk longit. bulk-head									
Stringer plate									
1st strake inboard									
2nd									
3rd									
4th									
5th									
6th									
7th									
8th									
9th									
10th									
centre strake									
sheerstrake									
topside. total									
Operator's signature.....Surveyor's signature.....									
(1) Rule thickness or as-built thickness									
(2) For open deck vessels									

Table 4 : Side and bottom plating at transverse sections

REPORT ON THICKNESS MEASUREMENT OF SIDE AND BOTTOM PLATING AT TRANSVERSE SECTIONS									
Vessel's name:Register No.....Report No.....									
Transverse section at frame number									
STRAKE POSITION	No or lett.	Org. Thk. (1)	Max. allow. dim.	Gauged		Diminution P		Diminution S	
		mm	mm	P	S	mm	%	mm	%
1st strake below sheerstr.									
2nd									
3rd									
4th									
5th									
6th									
7th									
8th									
9th									
10th									
11th									
12th									
13th									
14th									
keel strake									
Bott. total									
Operator's signature.....Surveyor's signature.....									
(1) Rule thickness or as-built thickness									

2.5 Longitudinal members at transverse sections

2.5.1 Appropriate reporting form is given in Tab 5.

2.5.2 This report is to be used for recording the thickness measurement of longitudinal members at transverse sections within the central part area.

2.5.3 The exact frame station of measurement is to be stated.

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

2.6 Transverse structural members

2.6.1 Appropriate reporting form is given in Tab 6.

2.6.2 This report is to be used for recording the thickness measurement of transverse structural members.

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

2.7 Transverse bulkheads

2.7.1 Appropriate reporting form is given in Tab 7.

2.7.2 This report is to be used for recording the thickness measurement of transverse bulkheads including bulkhead stiffeners.

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

2.8 Miscellaneous structural members

2.8.1 Appropriate reporting form is given in Tab 8.

2.8.2 This report is to be used for recording the thickness measurement of miscellaneous structural members including items such as:

- Coaming of separate hatchways
- Hatch covers
- Superstructure
- Fore peak
- After peak.

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

SECTION 2

THICKNESS MEASUREMENTS PROCESSING

1 General

1.1 Purpose

1.1.1 Thickness measurements may be processed using the UTM reporting and analysis software intended for Service Suppliers and BV Surveyors.

The UTM reporting and analysis software allows BV Surveyors to:

- verify compliance of thickness measurements with BV classification requirements
- generate the thickness measurement report.

1.2 Program requirements

1.2.1 The software is compatible with Excel 2010 and further versions.

1.2.2 The Excel Security Macro required is “Low” or “Medium”.

1.2.3 PDF Creator is required to generate a PDF of the final report.

1.3 Access to reporting forms

1.3.1 The UTM software gives access to thickness measurements reporting forms. See Sec 1, for more information on data to be recorded.

1.4 Report print-out

1.4.1 The report print-out section is to be used to compile the final report in PDF.

2 Verification and analysis

2.1 Report analysis

2.1.1 The function ‘Report analysis’ is to be used by the Surveyor to:

- assess the UTM results according to acceptance criteria defined in Ch 4, Sec 2, Ch 4, Sec 3 and Ch 4, Sec 4.
- identify areas with substantial or excessive corrosion.

ACCEPTANCE CRITERIA

SECTION 1	GENERAL
SECTION 2	ACCEPTANCE CRITERIA FOR VESSELS BUILT ACCORDING TO GROSS SCANTLING CONCEPT
SECTION 3	ACCEPTANCE CRITERIA FOR VESSELS BUILT ACCORDING TO NET SCANTLING CONCEPT
SECTION 4	PITTING
APPENDIX 1	EXAMPLES OF DESIGNATION AND LOCATION OF PLATING STRAKES
APPENDIX 2	GUIDE TO EVALUATION OF COATING CONDITION

SECTION 1

GENERAL

1 Application

1.1 General

1.1.1 The acceptance criteria for measured thicknesses are indicated in:

- Sec 2 for vessels built according to gross scantling concept
- Sec 3 for vessels built according to net scantling concept
- Sec 4 for pitting.

When the acceptance criteria are not fulfilled, actions according to [2.1] to [2.3] are to be taken.

2 Definitions

2.1 Isolated area

2.1.1 The thickness diminution of an isolated area of an item is the localised diminution of the thickness of that item such as, for example, the grooving of a plate or a web or a local severe corrosion. It is expressed as a percentage of the relevant as built thickness.

It is not to be confused with pitting (see Sec 4).

If the criteria of acceptable diminution are not fulfilled for an isolated area, then this isolated area is to be repaired or replaced. In any case, the criteria of thickness diminution are to be considered for the corresponding item (see [2.2]).

2.2 Item

2.2.1 For each item, thicknesses are measured at several points and the average value of these thicknesses is to satisfy the acceptance criteria for the relevant item.

If the criteria of measured thicknesses are not fulfilled for an item, then this item is to be repaired or replaced.

Where the criteria are fulfilled but substantial corrosion as defined in Is Ch 1, Sec 2, [1.8] is observed, adequate provision is to be made in the report.

In any case, for the items which contribute to the hull girder longitudinal strength, the criteria in [2.3] are to be considered.

2.3 Zone

2.3.1 For consideration of the hull girder longitudinal strength, the transverse section of the vessel is divided into three zones defined in Tab 1 to Tab 3:

- deck zone
- neutral axis zone
- bottom zone.

Each zone is to be evaluated separately.

The sectional area diminution of a zone, expressed as a percentage of the relevant as built sectional area, is to fulfil the criteria of acceptable diminution for that zone.

If the criteria of acceptable diminution are not fulfilled for a zone, then some items belonging to that zone are to be replaced (in principle, those which are most worn) in order to obtain after their replacement an increased sectional area of the zone fulfilling the relevant criteria.

Table 1 : Zone definition - Flush deck vessels

Group of items	Zone structural items	Remarks
	DECK ZONE	
1	<ul style="list-style-type: none"> Deck plating Deck longitudinals Deck girders 	Including stringer plate
2	<ul style="list-style-type: none"> Sheerstrake Sheerstrake longitudinals 	The height of a sheerstrake having the same thickness as the adjacent side shell is to be taken equal to 0,08D
3	<ul style="list-style-type: none"> Inner side upper strake Inner side upper strake longitudinals 	The height of the inner side upper strake is to be taken equal to that of the sheerstrake
4	<ul style="list-style-type: none"> Longitudinal bulkhead upper strake Longitudinal bulkhead upper strake longitudinals 	The height of the longitudinal bulkhead upper strake is to be taken equal to that of the sheerstrake
	NEUTRAL AXIS ZONE	
5	Side and inner side shell plating	
6	Side and inner side shell longitudinals	
7	Side and inner side shell stringers	
8	Longitudinal bulkhead plating	
9	Longitudinal bulkhead longitudinals	
10	Longitudinal bulkhead stringers	
	BOTTOM ZONE	
11	<ul style="list-style-type: none"> Bottom plating Bottom longitudinals Bottom girders 	Including keel plate
12	<ul style="list-style-type: none"> Bilge plating Bilge longitudinals 	
13	<ul style="list-style-type: none"> Inner bottom plating Inner bottom longitudinals Inner bottom girders 	
14	<ul style="list-style-type: none"> Inner side lower strake Inner side lower strake longitudinals 	The height of the inner side lower strake is to be taken equal to: <ul style="list-style-type: none"> - height of the bilge, for single bottom vessels - height of the double bottom
15	<ul style="list-style-type: none"> Longitudinal bulkhead lower strake Longitudinal bulkhead lower strake longitudinals 	The height of the longitudinal bulkhead lower strake is to be taken equal to: <ul style="list-style-type: none"> - height of the bilge, for single bottom vessels - height of the double bottom

Table 2 : Zone definition - Trunk deck vessels

Group of items	Zone structural items	Remarks
	DECK ZONE	
1	<ul style="list-style-type: none"> Trunk deck plating Trunk deck longitudinals Trunk deck girders 	
2	<ul style="list-style-type: none"> Trunk longitudinal bulkhead plating Trunk longitudinal bulkhead longitudinals Trunk longitudinal bulkhead girders 	
3	<ul style="list-style-type: none"> Stringer plate Stringer plate longitudinals 	In way of the vessel depth D
4	<ul style="list-style-type: none"> Sheerstrake Sheerstrake longitudinals 	The height of a sheerstrake having the same thickness as the adjacent side shell is to be taken equal to 0,08D
5	<ul style="list-style-type: none"> Inner side upper strake Inner side upper strake longitudinals 	The height of the inner side upper strake is to be taken equal to that of the sheerstrake
6	<ul style="list-style-type: none"> Longitudinal bulkhead upper strake Longitudinal bulkhead upper strake longitudinals 	The height of the longitudinal bulkhead upper strake is to be taken equal to that of the sheerstrake
	NEUTRAL AXIS ZONE	
7	Side and inner side shell plating	
8	Side and inner side shell longitudinals	
9	Side and inner side shell stringers	
10	Longitudinal bulkhead plating	
11	Longitudinal bulkhead longitudinals	
12	Longitudinal bulkhead stringers	
	BOTTOM ZONE	
13	<ul style="list-style-type: none"> Bottom plating Bottom longitudinals Bottom girders 	Including keel plate
14	<ul style="list-style-type: none"> Bilge plating Bilge longitudinals 	
15	<ul style="list-style-type: none"> Inner bottom plating Inner bottom longitudinals Inner bottom girders 	
16	<ul style="list-style-type: none"> Inner side lower strake Inner side lower strake longitudinals 	The height of the inner side lower strake is to be taken equal to: <ul style="list-style-type: none"> - height of the bilge, for single bottom vessels - height of the double bottom
17	<ul style="list-style-type: none"> Longitudinal bulkhead lower strake Longitudinal bulkhead lower strake longitudinals 	The height of the longitudinal bulkhead lower strake is to be taken equal to: <ul style="list-style-type: none"> - height of the bilge, for single bottom vessels - height of the double bottom

Table 3 : Zone definition - Open deck vessels

Group of items	Zone structural items	Remarks
	DECK ZONE	
1	<ul style="list-style-type: none"> Hatch coaming plating Hatch coaming longitudinals Hatch coaming girders 	Including under deck strake
2	<ul style="list-style-type: none"> Stringer plate Stringer plate longitudinals 	
3	<ul style="list-style-type: none"> Sheerstrake Sheerstrake longitudinals 	The height of a sheerstrake having the same thickness as the adjacent side shell is to be taken equal to 0,08D
4	<ul style="list-style-type: none"> Inner side upper strake Inner side upper strake longitudinals 	The height of the inner side upper strake is to be taken equal to that of the sheerstrake
5	<ul style="list-style-type: none"> Longitudinal bulkhead upper strake Longitudinal bulkhead upper strake longitudinals 	The height of the longitudinal bulkhead upper strake is to be taken equal to that of the sheerstrake
	NEUTRAL AXIS ZONE	
6	Side and inner side shell plating	
7	Side and inner side shell longitudinals	
8	Side and inner side shell stringers	
9	Longitudinal bulkhead plating	
10	Longitudinal bulkhead longitudinals	
11	Longitudinal bulkhead stringers	
	BOTTOM ZONE	
12	<ul style="list-style-type: none"> Bottom plating Bottom longitudinals Bottom girders 	Including keel plate
13	<ul style="list-style-type: none"> Bilge plating Bilge longitudinals 	
14	<ul style="list-style-type: none"> Inner bottom plating Inner bottom longitudinals Inner bottom girders 	
15	<ul style="list-style-type: none"> Inner side lower strake Inner side lower strake longitudinals 	The height of the inner side lower strake is to be taken equal to: <ul style="list-style-type: none"> height of the bilge, for single bottom vessels height of the double bottom
16	<ul style="list-style-type: none"> Longitudinal bulkhead lower strake Longitudinal bulkhead lower strake longitudinals 	The height of the longitudinal bulkhead lower strake is to be taken equal to: <ul style="list-style-type: none"> height of the bilge, for single bottom vessels height of the double bottom

SECTION 2

ACCEPTANCE CRITERIA FOR VESSELS BUILT ACCORDING TO GROSS SCANTLING CONCEPT

1 General

1.1 Application

1.1.1 Acceptance criteria stipulate limits of wastage which are to be taken into account for reinforcements, repairs or renewals of steel structure. These limits are generally expressed for each structural item as a maximum percentage of acceptable wastage (W). When the maximum percentage of wastage is indicated, the minimum acceptable thickness (t_{\min}) is that resulting from applying this percentage to the rule thickness (t_{rule}), according to the following formula:

$$t_{\min} = \left(1 - \frac{W}{100}\right) t_{\text{rule}}$$

However, when the rule thickness is not available, the as-built thickness can be used.

Only for criteria related to an item (see [2.1.4] item b), the Society may establish a list of renewal thicknesses tailored to the different structural items. In such a case these thicknesses are used in lieu of the minimum thicknesses calculated from the percentage of wastage.

Note 1: In any case, at the request of the Owner, the Society may perform a direct calculation based on the current measurements.

1.1.2 In cases where the vessel has some structural elements with reduced wear margins (e.g. due to vessel conversion, increase of draught), the minimum acceptable thickness for these elements is to be calculated with reference to the rule scantlings without taking account of any reduction originally agreed.

1.1.3 Decisions on steel renewals are taken by the attending Surveyor applying the criteria given in this Article and based on his judgment and the actual condition of the vessel. Should advice be needed to support his decision, the Surveyor may refer to the relevant technical office of the Society.

1.2 Criteria

1.2.1 The acceptance criteria for the minimum thicknesses are divided into:

- criteria on local strength, given in [2]
- criteria on global strength, given in [2]
- criteria on buckling strength, given in [3]
- criteria on pitting, given in Sec 4.

1.2.2 Each measured structural item is to be checked against these four criteria, as far as applicable. When the criteria are not met, reinforcements, repairs and renewals are to be carried out as appropriate.

2 Local and global strength

2.1 General

2.1.1 Local and global strength criteria are given for the following vessel types:

- Cargo vessels

Cargo vessels include vessels carrying dry cargoes, i.e., bulk cargo vessels, container vessels, general cargo vessels and Ro-Ro cargo vessels

- Tank vessels.

These criteria may also be used for other vessel types taking into consideration the equivalence or similarity of structural elements and their contribution to local and/or global strength.

2.1.2 Structural items to be assessed are listed in Tab 1 for cargo vessels, Tab 2 for tankers and Tab 3 for other vessels, grouped according to their position and contribution to the local or global strength of the vessel.

2.1.3 Each structural item is to be assessed according to three different criteria which vary with regard to the domain under which it is considered, namely:

- a) an isolated area, which is meant as a part of a single structural item. This criterion takes into consideration very local aspects such as grooving of a plate or web, or local severe corrosion; however, it is not to be used for pitting for which separate criteria are considered (see Sec 4)
- b) an item, which is meant as an individual element such as a plate, a stiffener, a primary supporting member web or flange, etc. This criterion takes into consideration the average condition of the item, which is assessed by determining its average thickness using the various measurements taken on the same item
- c) a zone, which is meant as all and only longitudinal elements contributing to the longitudinal strength of the vessel; in this regard, the three main zones are defined as deck zone, neutral axis zone and bottom zone.

Table 1 : Local and global acceptance criteria for cargo vessels (given in % of wastage)

Group of items	Description of items	1 Isolated area	2 Item	3 Zone
ITEMS CONTRIBUTING TO THE LONGITUDINAL STRENGTH (TRANSVERSE SECTION)				
	DECK ZONE (1)	–	–	10
1	Hatch coaming plating, stringer plate, sheer strake, inner side upper strake and longitudinal bulkhead upper strake	30	25 15 (3)	–
2	Hatch coaming, stringer plate, sheer strake, inner side upper strake and longitudinal bulkhead upper strake longitudinals	25	20	–
	NEUTRAL AXIS ZONE (1)	–	–	15
3	Side and inner side shell plating	30	25 15 (3)	–
4	Side and inner side longitudinals	25	20	–
5	Side and inner side shell stringers	25	20	–
	BOTTOM ZONE (1)	–	–	10
6	Bilge and bottom strakes, longitudinal bulkhead lower strake and inner side lower strake	30	25 15 (3)	–
7	Bilge and bottom longitudinals, longitudinal bulkhead lower strake and inner side lower strake longitudinals	25	20	–
8	Inner bottom plating	30	25 15 (3)	–
9	Inner bottom longitudinals	25	20	–
10	Bottom girders	25	20	–
OTHER ITEMS				
11	Hatch coaming plating (2)	25	20	–
12	Hatch coaming stiffeners	30	20	–
	stays	30	25	–
13	Hatch cover plating	25	20	–
15	Hatch cover stiffeners	30	20	–
16	Transverse bulkheads	30	20	–
	plating	30	20	–
	stringer web	25	20	–
	stringer flange	25	20	–
	stiffener	30	20	–
	brackets	25	20	–
17	Side and inner side frames	25	20	–
	brackets	30	20	–
18	Deck beams	25	20	–
19	Bottom transverse web frames / floors	30	20	–
	web	20	15	–
	flange	30	20	–
	brackets / stiffeners	25	20	–
20	Cross tie	25	20	–
	web	20	15	–
	flange	20	15	–
	brackets	25	20	–
21	Forward and aft peak bulkheads (4)	30	20	–
	plating	25	20	–
	stiffener	25	20	–
<p>(1) Each zone is to be evaluated separately. (2) If continuous, to be included in item 1. (3) When transverse framing. (4) Including forward and aft peak bulkheads.</p>				

Table 2 : Local and global acceptance criteria for tankers (given in % of wastage)

Group of items	Description of items	1 Isolated area	2 Item	3 Zone
ITEMS CONTRIBUTING TO THE LONGITUDINAL STRENGTH (TRANSVERSE SECTION)				
	DECK ZONE (1)	–	–	10
1	Deck plating, deck stringer, sheer strake and longitudinal bulkhead upper strake, trunk longitudinal bulkhead and inner side upper strake	30	25 15 (2)	–
2	Deck and sheer strake longitudinals, trunk longitudinal bulkhead longitudinals and inner side upper strake longitudinals	25	20	–
3	Deck longitudinal girders	25	20	–
4	Longitudinals connected to long. bulkhead upper strake	25	20	–
	NEUTRAL AXIS ZONE (1)	–	–	15
5	Side and inner side shell plating	30	25 15 (2)	–
6	Side and inner side shell longitudinals	25	20	–
7	Side and inner side shell stringers	25	20	–
8	Longitudinal bulkhead plating	30	25 15 (2)	–
9	Longitudinal bulkhead longitudinals	25	20	–
10	Longitudinal bulkhead stringers	25	20	–
	BOTTOM ZONE (1)	–	–	10
11	Bilge and bottom strakes, longitudinal bulkhead lower strake and inner side lower strake	30	25 15 (2)	–
12	Bilge and bottom longitudinals, longitudinal bulkhead lower strake and inner side lower strake longitudinals	25	20	–
13	Inner bottom plating	30	25 15 (2)	–
14	Inner bottom longitudinals	25	20	–
15	Bottom girders	25	20	–
OTHER ITEMS				
16	Deck beams	25	20	–
17	Deck transverse web frames	25	20	–
	web	20	15	–
	flange	25	20	–
	brackets / stiffeners	25	20	–
18	Expansion tank	25	20	–
	plating	25	20	–
	stiffeners	25	20	–
19	Side frames	25	20	–
	Side frame brackets	30	20	–
20	Side shell web frames	25	20	–
	web	20	15	–
	flange	25	20	–
	brackets / stiffeners	25	20	–
<p>(1) Each zone is to be evaluated separately. (2) When transverse framing. (3) Including swash bulkheads, forward and aft peak bulkheads.</p>				

Group of items	Description of items	1 Isolated area	2 Item	3 Zone
21	Longitudinal bulkheads vertical stiffeners brackets	25	20	–
		30	20	–
22	Longitudinal bulkhead web frames web flange brackets / stiffeners	25	20	–
		20	15	–
		25	20	–
23	Bottom transverse web frames / floors web flange brackets / stiffeners	25	20	–
		20	15	–
		25	20	–
24	Cross tie web flange brackets / stiffeners	25	20	–
		20	15	–
		20	15	–
25	Transverse bulkheads (3) plating stringer web stringer flange stiffener	25	20	–
		25	20	–
		20	15	–
		25	20	–
(1) Each zone is to be evaluated separately.				
(2) When transverse framing.				
(3) Including swash bulkheads, forward and aft peak bulkheads.				

2.1.4 The assessment of the thickness measurements is to be performed using the values given in the Tables for each structural element with regard to the three criteria defined above, in the following order:

- a) assessment of isolated areas (column 1 in Tab 1, Tab 2 and Tab 3)

If the criterion is not met, the wasted part of the item is to be dealt with as necessary.

- b) assessment of items (column 2 in Tab 1, Tab 2 and Tab 3)

If the criterion is not met, the item is to be dealt with as necessary in the measured areas as far as the average condition of the item concerned is satisfactory. In cases where some items are renewed, the average thicknesses of these items to be considered in the next step are the new thicknesses.

- c) assessment of zones (column 3 in Tab 1, Tab 2 and Tab 3).

The criterion applicable to the zones is based on the general rule that the current hull girder section modulus is not to be less than 90% of the original section modulus within 0,5L amidships. At the request of the Owner, a direct calculation using the vessel's current thicknesses may be performed by the Society in order to accept greater diminutions than those given for this criterion.

2.1.5 These criteria take into consideration two main aspects:

- the overall strength of the hull girder
- the local strength and integrity of the hull structure, such as hatch covers, bulkheads, etc.

As a rule, they are applicable to the structure within the cargo area of vessels having a length equal to or greater than 90 metres. However, they may also be used for smaller vessels and for structure outside the cargo area according to the following principles:

- for vessels having a length less than 90 metres, the percentages of acceptable wastage given in the tables can be increased by 5 (%) (e.g. 15% instead of 10%, etc.), except for those of deck and bottom zones.
- for structure outside the cargo area, the same 5 (%) increase can be applied

on the understanding, however, that both conditions cannot be applied at the same time.

3 Buckling strength criterion

3.1 General

3.1.1 In general, the applicable criterion on buckling strength will be decided by the Society, if needed, on a case by case basis.

Table 3 : Local and global acceptance criteria for other vessels (given in % of wastage)

Group of items	Description of items	1 Isolated area	2 Item	3 Zone
ITEMS CONTRIBUTING TO THE LONGITUDINAL STRENGTH (TRANSVERSE SECTION)				
	DECK ZONE (1)	–	–	10
1	Deck plating, deck stringer and sheer strake	30	25 15 (2)	–
2	Deck and sheer strake longitudinals	25	20	–
3	Deck longitudinal girders	25	20	–
	NEUTRAL AXIS ZONE (1)	–	–	15
4	Side shell plating	30	25 15 (2)	–
5	Side shell longitudinals	25	20	–
6	Side shell stringers	25	20	–
7	Longitudinal bulkhead plating	30	25 15 (2)	–
8	Longitudinal bulkhead longitudinals	25	20	–
9	Longitudinal bulkhead stringers	25	20	–
	BOTTOM ZONE (1)	–	–	10
10	Bilge and bottom strakes and longitudinal bulkhead lower strake	30	25 15 (2)	–
11	Bilge and bottom longitudinals and longitudinal bulkhead lower strake	25	20	–
12	Inner bottom plating	30	25 15 (2)	–
13	Inner bottom longitudinals	25	20	–
14	Bottom girders	25	20	–
OTHER ITEMS				
15	Deck beams	25	20	–
16	Deck transverse web frames	25	20	–
	web	20	15	–
	flange	25	20	–
	brackets / stiffeners	25	20	–
17	Side frames	25	20	–
	brackets	30	20	–
18	Side shell web frames	25	20	–
	web	20	15	–
	flange	25	20	–
	brackets / stiffeners	25	20	–
19	Longitudinal bulkheads	25	20	–
	vertical stiffeners	30	20	–
	brackets	30	20	–
20	Longitudinal bulkhead web frames	30	20	–
	web	20	15	–
	flange	30	20	–
	brackets / stiffeners	30	20	–
21	Bottom transverse web frames / floors	30	20	–
	web	20	15	–
	flange	30	20	–
	brackets / stiffeners	30	20	–
22	Transverse bulkheads (3)	30	20	–
	plating	30	20	–
	stringer web	25	20	–
	stringer flange	25	20	–
	stiffener	25	20	–
<p>(1) Each zone is to be evaluated separately.</p> <p>(2) When transverse framing.</p> <p>(3) Including forward and aft peak bulkheads.</p>				

SECTION 3

ACCEPTANCE CRITERIA FOR VESSELS BUILT ACCORDING TO NET SCANTLING CONCEPT

1 General

1.1 Application

1.1.1 Acceptance criteria stipulate limits of wastage which are to be taken into account for reinforcements, repairs or renewals of steel structure.

1.1.2 Decisions on steel renewals are taken by the attending Surveyor applying the criteria given in this Section and based on his judgment and the actual condition of the vessel. Should advice be needed to support his decision, the Surveyor may refer to the relevant technical office of the Society.

1.1.3 Acceptance criteria on pitting, are given in Sec 4.

1.2 Values of corrosion additions

1.2.1 General

The values of the corrosion additions specified in this Article are to be applied in relation to the relevant corrosion protection measures.

The designer may define values of corrosion additions greater than those specified in [1.2.2] and [1.2.3].

1.2.2 Corrosion additions for steel other than stainless steel

The corrosion addition for each of the two sides of a structural member, t_{C1} or t_{C2} , is specified in Tab 1.

- for plating with a gross thickness greater than 10 mm, the total corrosion addition t_C , in mm, for both sides of the structural member is obtained by the following formula:

$$t_C = t_{C1} + t_{C2}$$

- for plating with a gross thickness less than or equal to 10 mm, the smallest of the following values:
 - 20% of the gross thickness of the plating
 - $t_C = t_{C1} + t_{C2}$

For an internal member within a given compartment, the total corrosion addition t_C is to be determined as follows, where t_{C1} is the value of the corrosion addition specified in Tab 1 for one side exposure to that compartment:

- for plating/stiffener plating with a gross thickness greater than 10 mm, the total corrosion addition t_C , in mm, is twice the value of t_{C1} :

$$t_C = 2 t_{C1}$$
- for plating/stiffener plating with a gross thickness less than or equal to 10 mm, the smallest of the following values:
 - 20% of the gross thickness of the plating / stiffener plating
 - $t_C = 2 t_{C1}$

1.2.3 Corrosion additions for stainless steel and aluminium alloys

For structural members made of stainless steel or aluminium alloys, the corrosion addition is to be taken equal to 0.

Table 1 : Corrosion additions, in mm, for one side exposure (t_{C1} or t_{C2})

Compartment type		Corrosion addition (1)
Ballast tank		1,00
Cargo tank and fuel oil tank	Plating of horizontal surfaces	0,75
	Plating of non-horizontal surfaces	0,50
	Ordinary stiffeners and primary supporting members	0,75
Dry bulk cargo hold	General	1,00
	Inner bottom plating Side plating for single hull vessel Inner side plating for double hull vessel Transverse bulkhead plating	1,75
	Frames, ordinary stiffeners and primary supporting members	1,00
	Hopper well of dredging vessels	2,00
Accommodation space		0,00
Compartments and areas other than those mentioned above		0,50
(1) Corrosion additions are applicable to all members of the considered item.		

2 Acceptance criteria for isolated areas

2.1 General

2.1.1 The thickness diminution of isolated areas of items is not to be greater than $1,25 t_c$, where t_c is the value of corrosion addition as defined in [1.2]. Otherwise, actions according to Sec 1, [2.1] are to be taken.

3 Acceptance criteria for items

3.1 General

3.1.1 The thickness diminution of isolated items is not to be greater than the value of corrosion addition as defined in [1.2]. Otherwise, actions according to Sec 1, [2.2] are to be taken.

4 Acceptance criteria for zones

4.1 General

4.1.1 The sectional area diminution of a zone (measured according to Sec 1, [2.3]) is not to be greater than 10% of the original sectional area. Otherwise, actions according to Sec 1, [2.3] are to be taken.

4.1.2 The criterion applicable to the zones is based on the general rule that the current hull girder section modulus is not to be less than 90% of the original section modulus within $0,5L$ amidships. At the request of the Owner, a direct calculation using the vessel's current thicknesses may be performed by the Society in order to accept greater diminutions than those given for this criterion.

SECTION 4

PITTING

1 Pitting corrosion

1.1 General

1.1.1 Pitting corrosion is one of the most common forms that can be noted in ballast tanks. It is a localised corrosion that occurs on bottom plating, other horizontal surfaces and at structural details that trap water, particularly the aft bays of tank bottoms. For coated surfaces the attack produces deep and relatively small diameter pits that can lead to hull penetration.

Pitting of uncoated tanks, as it progresses, forms shallow but very wide scabby patches (e.g. 300mm diameter); the appearance resembles a condition of general corrosion.

Pitting is caused by the action of a localised corrosion cell on a steel surface due to the breaking of the coating (if present), to the presence of contaminants or impurities on the steel (e.g. mill scale) or to impurities present in the steel.

2 Acceptance criteria

2.1 General

2.1.1 The maximum acceptable depth for isolated pits is 35% of the as-built thickness.

2.1.2 For areas with different pitting intensity, the intensity diagrams shown in Fig 1 are to be used to identify the percentage of affected areas.

For areas having a pitting intensity of 50% or more, the maximum acceptable average depth of pits is 20% of the as-

built thickness. For intermediate values between isolated pits and 50% of affected area, the interpolation between 35% and 20% is made according to Tab 1.

2.1.3 In addition, the thickness outside the pits in the area considered is to be assessed according to Sec 2 and Sec 3.

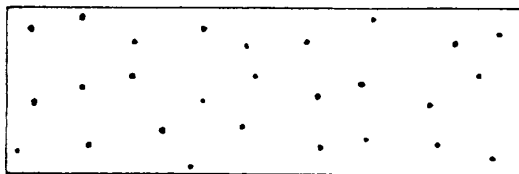
Note 1: Application of filler material (plastic or epoxy compounds) is recommended as a means to stop or reduce the corrosion process, but it is not considered an acceptable repair for pitting exceeding the maximum allowable wastage limits. Welding repairs may be accepted when performed in accordance with procedures agreed with the society.

Table 1 : Pitting intensity and corresponding maximum average depth of pitting

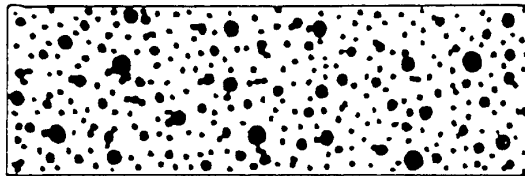
Pitting intensity (%)	Maximum average pitting depth (% of the as-built thickness)
Isolated	35,0
5	33,5
10	32,0
15	30,5
20	29,0
25	27,5
30	26,0
40	23,0
50	20,0

Figure 1 : Pitting intensity diagrams (from 1% to 50% intensity)

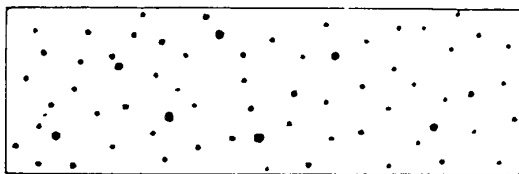
1% SCATTERED



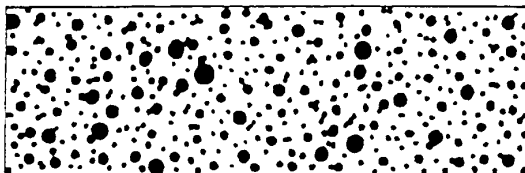
20% SCATTERED



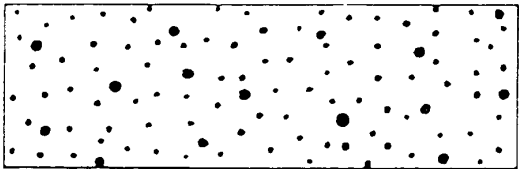
3% SCATTERED



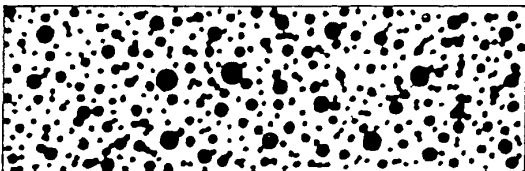
25% SCATTERED



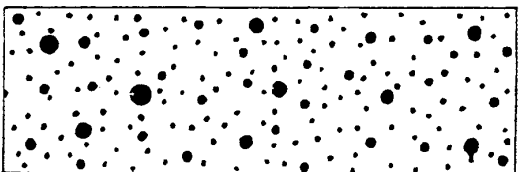
5% SCATTERED



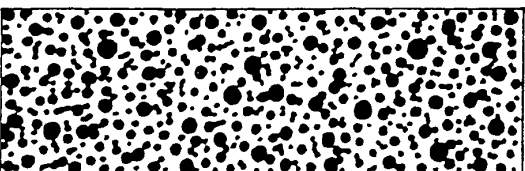
30% SCATTERED



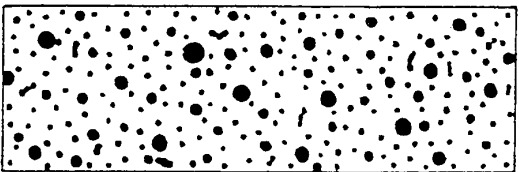
10% SCATTERED



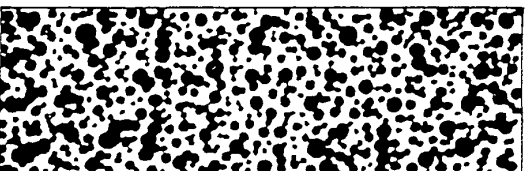
40% SCATTERED



15% SCATTERED



50% SCATTERED



APPENDIX 1

EXAMPLES OF DESIGNATION AND LOCATION OF PLATING STRAKES

1 Shell expansion

1.1 Non-propelled cargo vessel

1.1.1 See Fig 1.

1.2 Pontoon

1.2.1 See Fig 2.

1.3 Tug and Pusher

1.3.1 See Fig 3.

1.4 Other vessels

1.4.1 For vessels other than those specified under [1.1] to [1.3], see Fig 4.

2 Main deck

2.1 Flush/trunk deck

2.1.1 See Fig 5.

2.2 Open deck

2.2.1 See Fig 6.

Figure 1 : Non-propelled cargo vessel

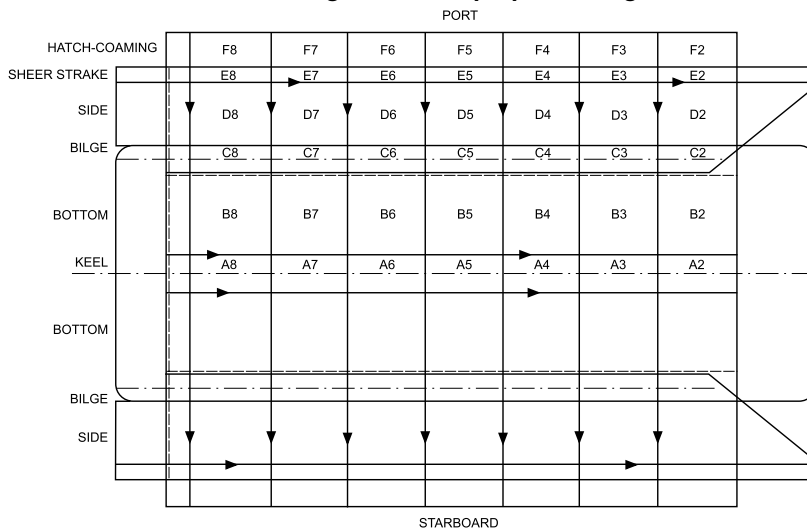


Figure 2 : Pontoon

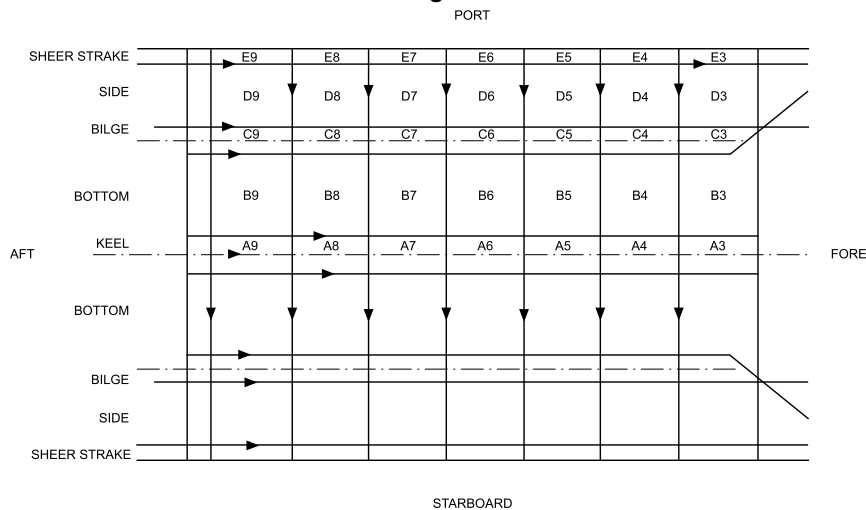


Figure 3 : Tug and pusher

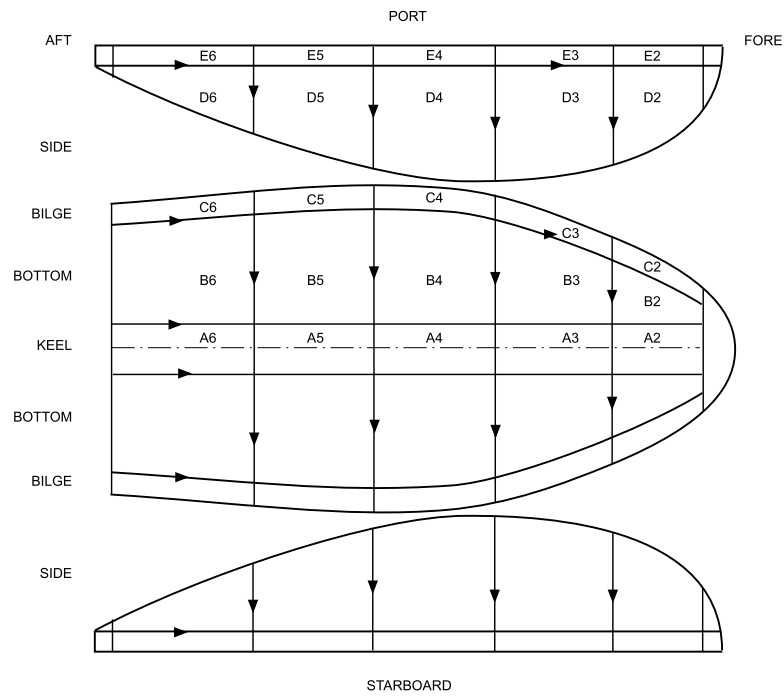


Figure 4 : Other vessels - shell plating

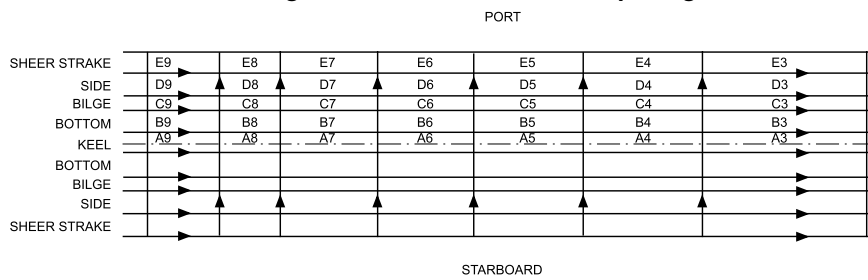


Figure 5 : Deck plating - flush deck vessels

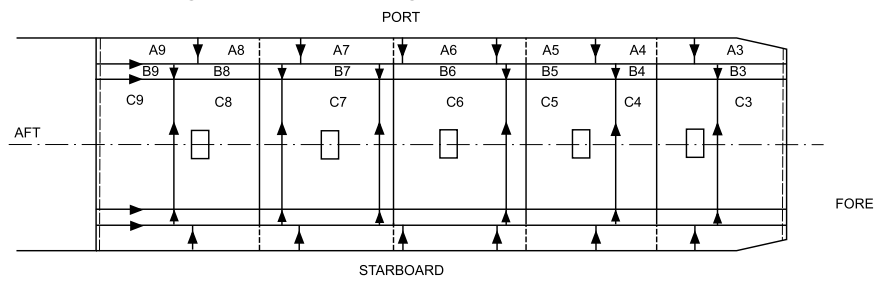
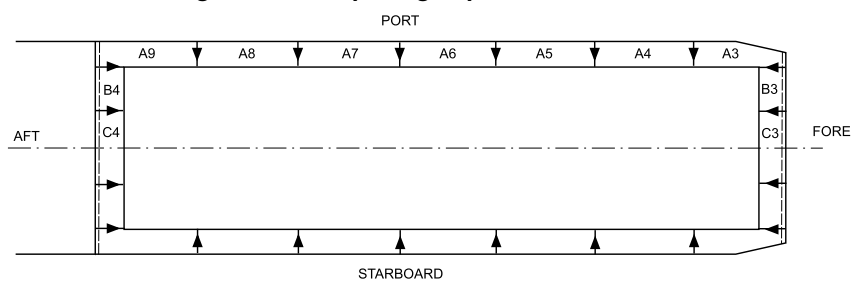


Figure 6 : Deck plating - open deck vessels



APPENDIX 2

GUIDE TO EVALUATION OF COATING CONDITION

1 General

1.1 Introduction

1.1.1 This Appendix is developed to assist the surveyor to evaluate the condition of vessel structure protective coatings when performing surveys.

1.1.2 This appendix does not replace applicable rules, regulations, procedures and instructions. The contents of this Appendix is limited to referential information that surveyors may find useful in the course of their surveys, where access to more complete documents may be difficult.

2 Coating Condition

2.1 Ratings

2.1.1 The present definitions of coating conditions "GOOD", "FAIR" and "POOR" are defined in Ch 1, Sec 2, [1.10]. Tab 1 offers a clarification of these definitions in order to achieve unified assessment of coating conditions.

3 Types of Coating Failures

3.1 Cracking

3.1.1 Definition

Cracking of coating is defined as a break-down in which the cracks penetrate at least one layer and which may be expected to result ultimately in complete failure. Such cracks may result from:

- Over thicknesses of paint
- Plastic structure deformations exceeding the elongation properties of paint film
- Localised fatigue stress

Fig 1 shows photographic evidence of coating cracking.

3.2 Flaking

3.2.1 Definition

Flaking of coating is defined as the lifting of the paint from the underlying surface in the form of flakes or scales. The causes of a loss of adhesion may be the following ones:

- Unsatisfactory surface preparation
- Incompatibility with underlayer
- Contamination between layers
- Excessive curing time between layers

Fig 2 shows photographic evidence of coating flaking.

3.3 Blistering

3.3.1 Definition

Blistering appears as a bubble formation scattered on the surface of a paint film with a diameter ranging from 3-4 mm to 20-30 mm. Blisters contain liquid, vapour or gas. Blistering is a localised loss of adhesion and lifting of the film, coming generally from osmosis due to one of the following causes:

- Solvent retention
- Improper coating application
- Soluble salt contamination under the paint film due to insufficient cleaning of the surface

Table 1 : Coating Condition Rating Criteria

Description	Definition
GOOD	Condition with spot rusting is less than 3% of the area under consideration without visible failure of the coating. Rusting at edges or welds, must be less than 20% of edges or weld lines in the area under consideration.
FAIR	Condition with breakdown of coating or rust penetration is less than 20% of the area under consideration. Hard rust scale rust penetration must be less than 10% of the area under consideration. Rusting at edges or welds must be less than 50% of edges or weld lines in the area under consideration.
POOR	Condition with breakdown of coating or rust penetration is more than 20% or hard rust scale is more than 10% of the area under consideration or local breakdown concentrated at edges or welds is more than 50% of edges or weld lines in the area under consideration.

Note 1: Spot rusting is rusting in spots without visible failure of coating
Note 2: Blistering of coatings is identified as coating failure. (See [3.3]).

Figure 1 : Example of coating cracking



Figure 2 : Example of coating flaking



3.3.2 Examples

It is to be noted that in most cases there is no corrosion in an unbroken blister and many years of protection can be obtained if these blisters are left untouched.

Due to a heavy overlap coating and poor workmanship, blisters have often been observed.

Blisters have sometimes been observed on flat plates and often are observed on areas of structure where access causes difficulties for painters to work on, such as the back of face plates e.g. Longitudinal, webs, etc.

Blisters is designated as coating failure (although Tab 2 shows that the blistered coating is still protecting the steel-work after 20 years.) The coating condition in the photo is in the transition stage between FAIR/POOR, but could still be designated as fair condition.

Although blistering of coating implies a coating failure this may not mean that these coatings are failing to provide protection to the steel surface. Blistering may be a coating failure, but may not mean a complete coating breakdown.

However, where blisters are burst, (e.g. exposing shop primer or rusting of the substrate) then in these areas this is a coating breakdown.

3.3.3 Guideline for Assessment of Blistering

Tab 3 takes into consideration actual breakdown of the coating which allows the formation of rust.

This guideline should be read in conjunction with the information and definitions tabulated in [2].

Table 2 : Examples of coating blistering

<p>a) Coating blistering on flat plate after 5 years</p>
<p>b) Coating blistering after 8 years</p>
<p>c) Intact coating blistering after 20 years</p>

Table 3 : Coating Condition Rating for Assessment of Blistering

Description	Definition
GOOD	Blistering is 20% or less in the area under consideration with spot rusting is less than 3% of the AUC and rusting at edges or welds must be less than 20% of edges or weld lines.
FAIR	Blistering is more than 20% of the AUC with rust penetration is less than 20% in the area under consideration. Hard rust scale rust penetration must be less than 10% of the AUC. Rusting at edges or welds must be less than 50% of edges or weld lines in the AUC.
POOR	Blistering is more than 20% of the AUC with rust penetration is more than 20% at the AUC, or hard rust scale is more than 10% of the AUC or, rusting at edges is more than 50% of edges or weld lines in the area under consideration.