Condition Assessment Programme (CAP)

May 2015

Guidance Note
NI 465 DT R01 E

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BUREAU VERITAS

MARINE & OFFSHORE DIVISION

GENERAL CONDITIONS

ARTICLE 1

1.1. - BUREAU VERITAS is a Society the purpose of whose Marine & Offshore Division (the "Society") is the classification (" Classification ") of any ship or vessel or offshore unit or structure of any type or part of it or system therein collectively hereinafter referred to as a "Unit" 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.

The Society:

- "prepares and publishes Rules for classification, Guidance Notes and other documents (" Rules ");
- "issues Certificates, Attestations and Reports following its interventions (" Certificates ");
- "publishes Registers.

1.2. - The Society also participates in the application of National and International Regulations or Standards, in particular by delegation from different Governments. Those activities are hereafter collectively referred to as " Certification ".

1.3. - The Society can also provide services related to Classification and Certification such as 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.

1.4. - The interventions mentioned in 1.1., 1.2. and 1.3. are referred to as " Services ". The party and/or its representative requesting the services is hereinafter referred to as the " Client ". **The Services are prepared and carried out on the assumption that the Clients are aware of the International Maritime and/or Offshore Industry (the "Industry") practices.**

1.5. - The Society is neither and may not be considered as an Underwriter, Broker in ship's sale or chartering, Expert in Unit's valuation, Consulting Engineer, Controller, Naval Architect, Manufacturer, Shipbuilder, Repair yard, Charterer or Shipowner who are not relieved of any of their expressed or implied obligations by the interventions of the Society.

ARTICLE 2

2.1. - Classification is the appraisement given by the Society for its Client, at a certain date, following surveys by its Surveyors along the lines specified in Articles 3 and 4 hereafter on the level of compliance of a Unit to its Rules or part of them. This appraisement is represented by a class entered on the Certificates and periodically transcribed in the Society's Register.

2.2. - Certification is carried out by the Society along the same lines as set out in Articles 3 and 4 hereafter and with reference to the applicable National and International Regulations or Standards.

2.3. - **It is incumbent upon the Client to maintain the condition of the Unit after surveys, to present the Unit for surveys and to inform the Society without delay of circumstances which may affect the given appraisement or cause to modify its scope.**

2.4. - The Client is to give to the Society all access and information necessary for the safe and efficient performance of the requested Services. The Client is 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.

ARTICLE 3

3.1. - **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 knowledge of the Industry. They are a collection of minimum requirements but 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.**

Committees consisting of personalities from the Industry contribute to the development of those documents.

3.2. - **The Society only is qualified to apply its Rules and to interpret them. Any reference to them has no effect unless it involves the Society's intervention.**

3.3. - The Services of the Society are carried out by professional Surveyors according to the applicable Rules and to the Code of Ethics of the Society. Surveyors have authority to decide locally on matters related to classification and certification of the Units, unless the Rules provide otherwise.

3.4. - **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.**

ARTICLE 4

4.1. - The Society, acting by reference to its Rules:

- "reviews the construction arrangements of the Units as shown on the documents presented by the Client;
- "conducts surveys at the place of their construction;
- "classes Units and enters their class in its Register;
- "surveys periodically the Units in service to note that the requirements for the maintenance of class are met.

The Client is to inform the Society without delay of circumstances which may cause the date or the extent of the surveys to be changed.

ARTICLE 5

5.1. - **The Society acts as a provider of services. This cannot be construed as an obligation bearing on the Society to obtain a result or as a warranty.**

5.2. - **The certificates issued by the Society pursuant to 5.1. here above are a statement on the level of compliance of the Unit to its Rules or to the documents of reference for the Services provided for.**

In particular, the Society does not engage in any work relating to the design, building, production or repair checks, neither in the operation of the Units or in their trade, neither in any advisory services, and cannot be held liable on those accounts. Its certificates cannot be construed as an implied or express warranty of safety, fitness for the purpose, seaworthiness of the Unit or of its value for sale, insurance or chartering.

5.3. - **The Society does not declare the acceptance or commissioning of a Unit, nor of its construction in conformity with its design, that being the exclusive responsibility of its owner or builder.**

5.4. - The Services of the Society cannot create any obligation bearing on the Society or constitute any warranty of proper operation, beyond any representation set forth in the Rules, of any Unit, equipment or machinery, computer software of any sort or other comparable concepts that has been subject to any survey by the Society.

ARTICLE 6

6.1. - The Society accepts no responsibility for the use of information related to its Services which was not provided for the purpose by the Society or with its assistance.

6.2. - **If the Services of the Society or their omission cause to the Client a damage which is proved to be the direct and reasonably foreseeable consequence of an error or omission of the Society, its liability towards the Client is limited to ten times the amount of fee paid for the Service having caused the damage, provided however that this limit shall be subject to a minimum of eight thousand (8,000) Euro, and to a maximum which is the greater of eight hundred thousand (800,000) Euro and one and a half times the above mentioned fee. These limits apply regardless of fault including breach of contract, breach of warranty, tort, strict liability, breach of statute, etc.**

The Society bears no liability for indirect or consequential loss whether arising naturally or not as a consequence of the Services or their omission such as loss of revenue, loss of profit, loss of production, loss relative to other contracts and indemnities for termination of other agreements.

6.3. - All claims are to be presented to the Society in writing within three months of the date when the Services were supplied or (if later) the date when the events which are relied on of were first known to the Client, and any claim which is not so presented shall be deemed waived and absolutely barred. Time is to be interrupted thereafter with the same periodicity.

ARTICLE 7

7.1. - Requests for Services are to be in writing.

7.2. - **Either the Client or the Society can terminate as of right the requested Services after giving the other party thirty days' written notice, for convenience, and without prejudice to the provisions in Article 8 hereunder.**

7.3. - The class granted to the concerned Units and the previously issued certificates remain valid until the date of effect of the notice issued according to 7.2. here above subject to compliance with 2.3. here above and Article 8 hereunder.

7.4. - The contract for classification and/or certification of a Unit cannot be transferred neither assigned.

ARTICLE 8

8.1. - The Services of the Society, whether completed or not, involve, for the part carried out, the payment of fee upon receipt of the invoice and the reimbursement of the expenses incurred.

8.2. - **Overdue amounts are increased as of right by interest in accordance with the applicable legislation.**

8.3. - **The class of a Unit may be suspended in the event of non-payment of fee after a first unfruitful notification to pay.**

ARTICLE 9

9.1. - The documents and data provided to or prepared by the Society for its Services, and the information available to the Society, are treated as confidential. However:

- "Clients have access to the data they have provided to the Society and, during the period of classification of the Unit for them, to the **classification file** consisting of survey reports and certificates which have been prepared at any time by the Society for the classification of the Unit ;
- "copy of the documents made available for the classification of the Unit and of available survey reports can be handed over to another Classification Society, where appropriate, in case of the Unit's transfer of class;
- "the data relative to the evolution of the Register, to the class suspension and to the survey status of the Units, as well as general technical information related to hull and equipment damages, may be passed on to IACS (International Association of Classification Societies) according to the association working rules;
- "the certificates, documents and information relative to the Units classed with the Society may be reviewed during certificating bodies audits and are disclosed upon order of the concerned governmental or inter-governmental authorities or of a Court having jurisdiction.

The documents and data are subject to a file management plan.

ARTICLE 10

10.1. - Any delay or shortcoming in the performance of its Services by the Society arising from an event not reasonably foreseeable by or beyond the control of the Society shall be deemed not to be a breach of contract.

ARTICLE 11

11.1. - In case of diverging opinions during surveys between the Client and the Society's surveyor, the Society may designate another of its surveyors at the request of the Client.

11.2. - Disagreements of a technical nature between the Client and the Society can be submitted by the Society to the advice of its Marine Advisory Committee.

ARTICLE 12

12.1. - Disputes over the Services carried out by delegation of Governments are assessed within the framework of the applicable agreements with the States, international Conventions and national rules.

12.2. - Disputes arising out of the payment of the Society's invoices by the Client are submitted to the Court of Nanterre, France, or to another Court as deemed fit by the Society.

12.3. - **Other disputes over the present General Conditions or over the Services of the Society are exclusively submitted to arbitration, by three arbitrators, in London according to the Arbitration Act 1996 or any statutory modification or re-enactment thereof. The contract between the Society and the Client shall be governed by English law.**

ARTICLE 13

13.1. - **These General Conditions constitute the sole contractual obligations binding together the Society and the Client, to the exclusion of all other representation, statements, terms, conditions whether express or implied. They may be varied in writing by mutual agreement. They are not varied by any purchase order or other document of the Client serving similar purpose.**

13.2. - The invalidity of one or more stipulations of the present General Conditions does not affect the validity of the remaining provisions.

13.3. - The definitions herein take precedence over any definitions serving the same purpose which may appear in other documents issued by the Society.

BV Mod. Ad. ME 545 L - 7 January 2013

GUIDANCE NOTE NI 465

Condition Assessment Programme (CAP)

May 2015

Section 1 General Principles

Section 2 Hull Structure Assessment

Section 3 Machinery and Systems Assessment

SECTION 1 GENERAL PRINCIPLES

Symbols

AUC : Area Under Consideration

CAP : Condition Assessment Programme

CVI : Close Visual Inspection

GVI : Global Visual Inspection

IACS : International Association of Classification Societies

NDT : Non Destructive Testing

UTM : Ultrasonic Thickness Measurements.

1 General

1.1 Introduction

1.1.1 The aim of this Guidance Note is to detail the methodology and criteria applied by Bureau Veritas (BV), acting within the scope of the Marine and Offshore General Conditions, to perform services under a Condition Assessment Programme (CAP).

The purpose of our CAP services is to assist the ship operator to comply with the requirements from charterers, vetting agencies, terminal and port authorities and other third parties, and their specific CAP prerequisites.

In addition, BV CAP services are designed to provide the client with a clear and transparent understanding of a vessel's condition through a detailed and illustrated report which, if the assessment is planned early enough, may assist in preparing a repair plan prior to entering the repair yard.

On completion of a CAP, a Certificate with ratings reflecting the condition of the hull structure and systems covered by the assessment programme is issued.

A CAP inspection should normally be completed within a time period not exceeding six months, however different approaches may be considered on a case by case basis.

A CAP inspection may be carried out either in dry-dock or with the vessel afloat.

1.2 Application

1.2.1 This Guidance applies to Oil Tankers, Product Tankers, Chemical Tankers, LPG Carriers and LNG Carriers.

1.3 Assessment scope and methodology

1.3.1 The client defines the scope by selecting a list of modules to be assessed from the following menu:

- Hull Structure
- Hull and Cargo Equipment and Systems
- Propulsion and Auxiliary Systems
- Cargo Containment Systems (for LPG and LNG Carriers only)
- Bridge, Navigation and Radio Equipment.

The methodology used to assess the Hull Structure is detailed within Sec 2.

Within the scope of the Hull Structure assessment, a structure and fatigue analysis may be included to identify some areas and structural details for specific close visual inspection and to comply with vetting and charterers requirements. The content of such analysis is detailed in Sec 2, [2.3].

The methodology used to assess the Hull and Cargo Equipment and Systems, the Propulsion and Auxiliary Systems or Bridge, Navigation and Radio Equipment, is detailed in Sec 3, using the method and criteria applicable to the equipment, fittings, piping, machinery and their appurtenances, as explained in Sec 3, [4] and Sec 3, [7].

The methodology used to assess the Cargo Containment System of LNG Carriers is detailed within NI623 Annex to NI 465.

1.4 CAP project preparation

1.4.1 The extent of inspection required to be carried out and the subsequent reporting requirements are to be discussed and agreed with the client prior to starting the project.

Whatever the scope, the following information should be clarified and agreed within either the contract or the planning document:

- modules included in the CAP scope
- expected rating to be achieved for each module
- specific requirements or objectives to be met, in particular the compliance with specific charterer's or other third party requirements
- places and approximate dates of inspection
- inspections condition - attendance during voyage / afloat / at yard
- safety procedures
- means of access.

The specific information expected to be clarified and agreed for each module will be detailed under the relevant sections.

1.5 Assessment process

1.5.1 Once the CAP scope and objectives have been defined, the assessment is carried out through the following steps:

- collection of records to perform the history review
- collection of drawings required to perform the Structural and Fatigue Analysis, if required
- planning preparation
- planning validation with the Owner's representative
- on-board inspection(s) for preliminary assessment
- preparation of a list of up-grades to be undertaken, if needed, to achieve the expected ratings and requirements
- on-board inspection(s) to assess the up-graded condition, further to repair and maintenance
- completion of the CAP report
- issuance of the CAP report and the CAP Certificate.

Note 1: A CAP Attestation, reflecting the condition of the vessel, limited to the scope already assessed, and based on the preliminary results of inspections and testing, may be delivered upon the Client's request at any stage of the inspection. The provisional ratings recorded within a CAP Attestation do not reflect the final condition assessment results and may be modified on completion of the project.

1.6 CAP certificate and CAP rating

1.6.1 On completion of the assessment, a CAP Certificate is issued detailing the following information:

- rating assigned to each module included in the scope of the CAP
- dates and place(s) of the inspection(s)
- date and place of issue
- name and Endorsement of the BV representative responsible for managing the CAP project.

A CAP rating has no validity date, but only reflects the condition of the vessel on the date of completion of the on-board inspection. Each charterer defines the time validity of a CAP certificate within its own vetting and marine assurance procedures.

The BV Condition Assessment quality ratings are defined in Tab 1.

1.7 Safety during inspection

1.7.1 The establishment of proper preparation and close co-operation between the attending surveyor(s) and the company's representatives onboard, prior to and during the survey, are essential to conducting the survey in a safe and efficient manner.

Applicable safety procedures and responsibilities shall be discussed and agreed to ensure that the survey is carried out under controlled conditions.

Safety Meetings shall be held prior to starting and regularly during the inspection on board.

The following guidelines in particular shall be followed as applicable:

- IACS Recommendation No.39, Safe Use Of Rafts Or Boats For Survey
- IACS Recommendation No.44, Survey Guidelines for tanks in which soft coatings have been applied §2.2
- IACS Recommendation No.72, Confined Space Safe Practice
- IACS Recommendation No.78, Safe Use of Portable Ladders for Close-up Surveys
- IACS Recommendation No.90, Ship Structure Access Manual
- IACS Recommendation No.91, Guidelines for Approval/Acceptance of Alternative Means of Access.

Table 1 : CAP Ratings definition

1	Superior condition	Examination and/or measurements carried out with the results showing either minimal or no deterioration from the 'as new' condition. Superior maintenance condition exists. No preventive or corrective maintenance is required.
2	Good condition	Examination and/or measurements carried out with the results showing a level of deterioration from the 'as new' condition. No requirement for preventive or corrective maintenance.
3	Acceptable condition	Examination and/or measurements carried out with the results showing that condition would be acceptable for class rules requirements. No imminent corrective maintenance is required. Preventive maintenance may be required to halt deterioration.
4	Poor condition	Examination and/or measurements carried out with the results showing defects, deficiencies or condition, below what would be acceptable for class rules requirements. Imminent corrective maintenance is required.

SECTION 2 HULL STRUCTURE ASSESSMENT

1 Introduction

1.1

1.1.1 The purpose of this Section is to detail the methodology used by Bureau Veritas to carry out a condition assessment of the Hull Structure.

2 Hull structure assessment preparation

2.1 Basic information

2.1.1 The extent of inspection and the subsequent reporting requirements are to be discussed and agreed with the client prior to starting the on-board assessment.

A planning document should in particular be prepared and agreed prior to starting the inspection.

The first step to prepare the assessment is to discuss and agree with the client the information detailed in Sec 1, [1.4].

Subsequently, the following additional specific details should be clarified and agreed:

- availability of records required for the structural history review
- preparation of a structural and fatigue analysis
- scope of inspection (global/close-up visual inspections, UTM, tank testing)
- acceptance of UTM report prepared prior to the assessment
- permissible thickness diminution criteria used to carry out the assessment
- use of the BV UTM Software to report the measurements and compile S-curves
- bottom assessment in dry-dock or afloat (IWS).

2.2 Structural history review

2.2.1 Investigation into the vessel's history is an important part of any Condition Assessment Programme and should be performed prior to the commencement of the physical onboard condition assessment.

The aim is to provide information on structural areas and Items that may require specific CVI during the assessment.

The ship history may also identify instances of repairs and/or modifications that may have been carried out and which may affect the outcome of any Structural and Fatigue analysis.

In general, the vessels' previous ten years maintenance and repair history is reviewed.

For non-BV classed vessels the client is expected to provide the CAP surveyor with access to the Class reports and vessel records covering this time period.

The following documents should be provided/ assembled for the structural history review:

- Class hull condition evaluation reports, where applicable, or copies of the vessels structural history based on previous class reports as well as Memorandum, Visas, recommendations, conditions of class for the timeframe being evaluated
- Class ballast tanks protection report and/or clients records
- ESP vessel survey planning documents, where applicable
- Previous vessel structural and condition assessments carried out from non-BV sources.

As far as possible, full or relevant extracts of the reviewed documents are to be filed in Appendices to the CAP report.

On completion of the ship history review, a list of structural Items is included within the planning document for CVI, as necessary. For each Item, the on-board location with a description of the previous damages and repairs history are detailed. A reference to the relevant source of information is documented.

2.3 Structural and fatigue analysis

2.3.1 A structural and fatigue analysis may be carried out prior to the inspection on-board at the request of the Owner.

The aim is to identify any potential hot spots and areas critical for fatigue for inclusion within the CVI plan. The results of the analyses are used to fine-tune the inspection plan, but have no impact on the CAP rating assigned to the vessel's structure.

The Owner is to advise the extent of the Structural and Fatigue Analysis from the below options:

- 2D Structural and Fatigue Analysis
- 2D and 3D Structural and Fatigue Analysis.

Note 1: Most of charterers and vetting departments request a 2D Structural and Fatigue Analysis to be carried out within the scope of a CAP for Hull Structure. Please contact your local BV office for more advice, if needed.

Note 2: Bureau Veritas recommend that a 2D/3D Structural and Fatigue analysis be carried out for vessels of panama size and above, but this is a recommendation and not a requirement for the BV CAP.

The reference standards used to carry out the analysis are the latest version of the rules applicable to the relevant ship type, always assuming the vessel is operated under worldwide sea going conditions.

On completion of the analysis, a list of structural Items, identified as potential hot spots or with an estimated fatigue life less than the vessel's age plus 5 years, is included within the planning document for CVI. The Inspection method based on estimated fatigue life of structural details is shown in Tab 1.

Note 3: Some charterers and vetting departments may reject a vessel for which a structural Item with a shorter estimated fatigue life has not been modified/reinforced further to a structural failure (crack…). We strongly recommend the Owner to discuss any repair with the CAP Surveyor for fatigue cracks, especially if the estimated fatigue life is less than the remaining operating life of the vessel.

Table 1 : Inspection method based on estimated fatigue life of structural details

Criteria	Inspection method
FL > Y + 5	Overall inspection
FL ≤ Y + 5	CVI

Note 1:

FL : Estimated fatigue life of a structural detail

Y : Ship's age at the date of the expected CAP Survey or, where not specified, at the date of the analysis.

2.4 Acceptance of UTM reports prepared prior to the assessment

2.4.1 Where possible the Owner should arrange for thickness measurements to be carried out in the presence of the CAP surveyor and reported using the latest version of the BV UTM software (available free of charge in website www.veristar.com).

Where the CAP Surveyor does not attend the measurements, the measurements used for CAP must be approved by a Classification Society member of IACS and endorsed accordingly.

Where the CAP Surveyor attends the measurements, but the measurements are not endorsed by a Classification Society member of IACS, the UTM report may be accepted by the CAP Surveyor on a case by case basis.

The thickness measurements should be conducted within 6 months prior to the CAP inspections.

Where the thickness measurements are conducted more than 6 months prior to the CAP inspection, the decision to use the results is made on case by case basis. Additional measurements may be required to randomly verify that the UTM report data still properly reflects the actual condition of the vessel.

Clear references to the UTM reports used within the scope of the structure assessment are to be indicated in the Executive Summary and the Global UTM assessment.

In addition, should any UTM report completed prior to the CAP inspection and not witnessed by BV Surveyor, be used, the information is to be highlighted within the planning document.

3 Scope of inspection

3.1 General

3.1.1 The extent of inspection, which varies depending on the vessel's age and findings identified at the preparation stage, is to be defined and agreed before starting the inspection.

The assessment is always carried out through the following:

- A General Visual Inspection (GVI)
- A Close Visual Inspection (CVI)
- Ultrasonic Thickness Measurements (UTM).

The purpose of the inspection is to assess the visual structure and coating conditions through the identification of visual defects such as corrosion, diminution, deformation, indents, buckling, cracks, leakages, pitting, grooving, erosion, coatings breakdown, anodes wastage.

3.2 Scope of General Visual Inspection (GVI)

3.2.1 The scope of the general inspection is to include the overall inspection of the following compartments and structural Items:

- main deck, exposed decks and superstructures, side shell and bottom
- all the compartments within the cargo area, including internal structure
- selected structural compartments outside the cargo area - void spaces, FO/LO tanks, FW tanks…
- aft peak(s) and fore peak(s).

3.3 Scope of Close Visual Inspection (CVI)

3.3.1 The scope of the CVI is to be defined in accordance with Tab 2.

Table 2 : Structural AUCs subject to CVIs

Structural AUCs	Age of ship		
	5 < age ≤ 10	10 < age ≤ 15	age > 15
Specific AUCs	AUCs identified as requiring a CVI from either the history review or the structural and fatigue analysis, if any		
Web frame(s) in ballast tanks	All web frames in ballast tank	All web frames in all ballast tanks	
	One web frame in each remaining ballast tank		
Web frame(s) in cargo tanks	One web frame in two cargo tanks	All web frames in a cargo tank	
		One web frame in each remaining cargo tank	
Transverse bulkhead(s) in ballast tanks	One transverse bulkhead in each ballast tank	All transverse bulkheads	
Transverse bulkhead(s) in cargo tanks	One transverse bulkhead in 3 cargo tanks	All transverse bulkheads	

Table 3 : Structural AUCs subject to UTM

Structural AUCs		Age of ship		
		5 < age ≤ 10	10 < age ≤ 15	age > 15
AUCs subject to CVI		All AUCs subject to CVI, except the specific AUCs		
Main deck plates	Within 0,5 L amidships	All	All	All
	Outside 0,5 L amidships	-	All	All
Bottom plates	Within 0,5 L amidships	Selected	All	All
	Outside 0,5 L amidships	-	Selected	All
Wind & water strakes	Within 0,5 L amidships	Selected	All	All
	Outside 0,5 L amidships	-	Selected	All
Transverse belts **(1)**		1 transverse belts	2 transverse belts	3 transverse belts
Superstructures			Poop, bridge and forecastle decks	
Bulkheads outside cargo ares		Collision bulkhead, forward machinery space bulkhead, aft peak bulkhead		All transverse and longitudinal bulkheads
Peak tanks			All internals in fore peak and aft peak tanks	
		Plating of sea chests Shell plating in way of overboard discharges		
(1) In way of different cargo spaces				

3.4 Scope of Ultrasonic Thickness Measurements (UTM)

3.4.1 The extent of UTM is to be defined in accordance with Tab 3.

4 Methodology for calculating the CAP rating

4.1

4.1.1 The final CAP rating assigned to the Hull Structure is determined further to the calculation of the two following ratings:

- the Overall Structural Condition rating and
- the Global UTM rating.

The Overall Structural Condition rating, which is calculated through the methodology described in Article [5], reflects the condition of the vessel's structure through an assessment of the visual condition, protective coating condition and extent of corrosion of each structural AUC of the vessel.

The Global UTM rating, which is calculated through the methodology described in [6], reflects the condition of the vessel's structure through an assessment of the extent of corrosion of groups of structural AUCs.

The final CAP rating assigned to the Hull Structure is the lesser of the ratings assigned to the Overall Structural Condition and the Global UTM assessments.

5 Overall structural condition assessment methodology

5.1

5.1.1 The Overall Structural Condition rating is calculated through a bottom-up approach which consists of:

- breaking down the ship's structure firstly into Groups and subsequently into Structural AUCs
- assessing each AUC against a set of criteria - visual condition / coating condition / measured wastage
- assessing each Group from the ratings assigned to the structural AUCs
- assessing the overall structure from the ratings assigned to the Groups

The AUCs are assessed through the following:

- visual inspection of structure for any damage, deformation, indents, buckling, cracks, leakages, pitting, grooving, erosion, etc.
- visual inspection of protective coatings for any coating breakdown, cracking, flaking, blistering, detachment etc.
- wastage of structure: assessment based on Ultrasonic Thickness Measurements (UTM) and the percentage of diminution of structure
- anodes condition (for information only).

Table 4 : Structural AUCs per group type

Groups	Structural AUCs
Main deck & superstructure decks	Main deck forward PS & SB area Main deck midship (+/- 0.5L amidships) PS & SB area Main deck aft PS & SB area Forecastle deck Poop deck Trunk deck
Side shell	Side shell forward PS & SB area Side shell midship (+/- 0.5L amidships) PS & SB area Side shell aft PS & SB area Plating of sea chests Shell plating in way of overboard discharges
Bottom	Bottom forward PS & SB area Bottom midship (+/- 0.5L amidships) PS & SB area Bottom aft PS & SB area
Individual compartment	Plating (plates + attached stiffeners **(1)** Main deck / underdeck Side shell PS & SB Longitudinal bulkheads (outer / inner) PS & SB & CL Inner bottom Transverse bulkheads **(2)** Topside tank sloping plate **(3)** Hopper plate **(4)** Inner deck Internal structure Stringers Transverse structural members **(5)**
Group of compartments	Each individual compartment listed in the group

(1) Attached stiffeners include longitudinals and girders
(2) Including upper/lower stools, vertical webs and transverse bulkhead stringers, if fitted
(3) Topside tank sloping plate is not assessed as a structural AUC if part of a longitudinal bulkhead
(4) Hopper plate is not assessed as a structural AUC if part of a longitudinal bulkhead
(5) Transverse structural members include web frames, web rings, deck transverse, bottom transverse, floors

5.2 Categorization of the ship's structure

5.2.1 To facilitate the assessment, review and reporting of the vessel's structural condition, the hull structure is first broken-down into 'Sections', which are groups of structural AUCs, as follows:

- main deck & superstructure decks
- side shell
- bottom
- individual cargo tanks and slop tanks
- individual ballast tanks
- individual cargo holds (LPG vessels)
- individual void spaces and cofferdams contributing significantly to the structural strength; (spaces with significant volume within the cargo area)
- individual aft peak(s) and fore peak(s)
- group of void spaces, stools and cofferdams assessed during the inspection
- group of lub oil and fuel oil tanks assessed during the inspection
- group of fresh water tanks assessed during the inspection.

Subsequently, the groups are split into structural AUCs, based on the list of AUCs available in Tab 4.

5.3 Structural AUC rating calculation

5.3.1 Each structural AUC is assigned a rating to assess the condition of the following set of criteria:

- Visual Structure
- Protective Coating
- Measured Wastage/extent of corrosion
- Anodes condition (for information only).

The ratings are assigned based on the rating rules defined in [7].

An average rating is then calculated and rounded to the first digit from the average of the ratings assigned for the 'Visual Structure', Protective Coating' and 'Measured Wastage' assessments.

The rating assigned for the anodes condition assessment is for information only and has no impact on the AUC average rating.

If the second digit ranges from 0 to 4, the first digit is rounded to the lower value. Otherwise, the first digit is rounded to the upper value.

If an AUC is rated 4 for Visual Structure or Measured Wastage, the AUC average rating cannot be better than 4.

The rating NI is equivalent to a rating 3, providing that no recommendation or condition of classification has been endorsed by the vessel's classification society for this AUC.

The ratings NA or NC are not taken into account in the calculation.

5.4 Group rating calculation

5.4.1 The Group rating is the average of all the AUC average ratings assigned to the group's AUCs, rounded to the first integer.

If the first digit ranges from 0 to 4, the rating is rounded to the lower value (or better rating). Otherwise, the rating is rounded to the upper value (worse rating).

If an AUC average rating is 4, the Group rating cannot be better than 4.

If an AUC rating assigned for any assessment criteria is 3, the Group rating cannot be better than 2.

The Group rating cannot be better than the worst rating assigned to the AUCs "Main deck", "Under deck" or "Bottom" for assessing the criteria 'Visual Condition' or 'Measured Wastage'

5.5 Overall structural condition rating calculation

5.5.1 The Overall structural condition rating is the average of all the Group ratings, rounded to the first integer.

If the first digit ranges from 0 to 4, the rating is rounded to the lower value (or better rating). Otherwise, the rating is rounded to the upper value (worse rating).

If a Group rating is 4, the Overall structural condition rating cannot be better than 4.

If a Group rating is 3, the Overall structural condition rating cannot be better than 2.

The Overall structural condition rating cannot be better than the worst rating assigned to any AUCs "Main deck", "Under deck" or "Bottom" for assessing the criteria 'Visual Condition' or 'Measured Wastage'

6 Global UTM assessment methodology

6.1 Global UTM rating calculation

6.1.1 The purpose of the global UTM assessment is to carry out an assessment of the structure through an assessment of the global extent of corrosion.

The structure is broken down into Groups of Structural Items, as below:

- main deck
- superstructure decks
- bottom
- wind and water strakes
- transverse belts (one group per belt)
- transverse bulkheads (including BKD Stringers)
- longitudinal bulkheads
- inner bottom
- hopper plates
- topside tank sloping plates
- transverse structural members
- stringers
- fore peak internal structure
- aft peak internal structure.

A rating is assigned to each Group of Structural Items through one of the two methodologies detailed in [6.2] and [6.3], depending on whether the UTM report has been prepared with the BV UTM Software or not.

The Global UTM rating is the average of all the Group ratings.

If the first digit ranges from 0 to 4, the rating is rounded to the lower value (or better rating). Otherwise, the rating is rounded to the upper value (worse rating).

If a Group rating is 4, the Global UTM rating is 4.

If a Group rating is 3, the Global UTM rating cannot be better than 2.

The Global UTM rating cannot be better than the rating assigned to the group 'Main Deck' or the group 'Bottom'.

6.2 Assessment of a Group of Structural Items using the BV UTM Software

6.2.1 A 'Group of Structural Items' is assigned the rating associated to its relevant S-curve, directly available in the associated S-curve diagram. Please refer to [7.3.2] for more details.

6.3 Assessment of a Group of Structural Items without using the BV UTM Software

6.3.1 General methodology

Each Group of Structural Items is broken-down into sub-groups of Items, through a methodology specific to the group of Items.

Each sub-group is assigned a rating, as detailed in the below sub-paragraphs.

If one sub-group is rated 4, then the Group rating is 4.

Otherwise, if more than 90% of the sub-groups are rated 1, then the Group rating is 1.

Otherwise, if more than 90% of the structural AUCs are rated 1 or 2, then the Group rating is 2.

Otherwise, the Group rating is 3.

6.3.2 Groups of Items contributing to the longitudinal strength

For the groups of Items contributing to the longitudinal strength of the vessel:

- main deck
- bottom
- wind and water strakes
- longitudinal bulkheads
- inner bottom
- hopper plating
- topside tank sloping plating
- stringers
- superstructure decks.

Each Group of Structural Items is broken-down into sub-groups of Items in way of compartments where the gaugings have been taken, as per the Fig 1.

A rating is assigned to each sub-group by reporting the rating assigned for 'measured wastage' to the corresponding structural AUC in the Overall Structure Condition assessment.

6.3.3 Transverse bulkheads

The Group of Structural Items 'Transverse Bulkheads' is broken-down into sub-groups of transverse bulkheads, as per the Fig 2.

A rating is assigned to each sub-group by reporting the rating assigned for 'measured wastage' to the corresponding structural AUC in the Overall Structure Condition assessment.

Figure 1 : Example for categorizing the main deck into sub-groups for the Global UTM assessment

Thickness	Side	1	2	3	4
Main deck iwo Cargo Tank 1	P	○	○	○	○
Main deck iwo Cargo Tank 1	S	○	○	○	○
Main deck iwo Cargo Tank 2	P	○	○	○	○
...		○	○	○	○
...		○	○	○	○
Main deck iwo Water Ballast Tank 1	P	○	○	○	○
Main deck iwo Water Ballast Tank 1	S	○	○	○	○
...		○	○	○	○
...		○	○	○	○
	Summary				

Figure 2 : Example for categorizing the transverse bulkheads into sub-groups for the Global UTM assessment

Thickness	Side	1	2	3	4
Trans. Bkd between Carko Tank 1 & 2	P	○	○	○	○
Trans. Bkd between Carko Tank 2 & 3	P	○	○	○	○
...		○	○	○	○
...		○	○	○	○
Trans. Bkd between Water Ballast Tank 1 & 2	S	○	○	○	○
...		○	○	○	○
...		○	○	○	○
	Summary				

Figure 3 : Example for categorizing the transverse bulkheads into sub-groups for the Global UTM assessment

Thickness	Side	1	2	3	4
Transverse members iwo Water Ballast Tank 1	P	○	○	○	○
Transverse members iwo Water Ballast Tank 1	S	○	○	○	○
Transverse members iwo Water Ballast Tank 2	P	○	○	○	○
...		○	○	○	○
...		○	○	○	○
...		○	○	○	○
...		○	○	○	○
	Summary				

6.3.4 Transverse Structural members & Internal Structure

For the following group of Items:

- transverse structural members
- fore peak internal structure
- aft peak internal structure.

The Group of Structural Items is broken-down into sub-groups, as per the Fig 3.

A rating is assigned to each sub-group by reporting the rating assigned for 'measured wastage' to the corresponding structural AUC in the Overall Structure Condition assessment.

6.3.5 Assessment of transverse belts

Each transverse belt is broken-down into sub-groups as follows:

- plating
- longitudinal stiffeners web
- longitudinal stiffeners flange.

A rating is assigned to each sub-group by assessing the relevant measurements in the UTM report based on the criteria defined in [7.3.1].

7 Structural AUCs rating rules

7.1 Visual condition

7.1.1 The visual condition is assessed against the criteria in the Tab 5.

Table 5 : Visual condition rating criteria for hull structure

Rating	Visual condition rating criteria	
1	Cracks / Fractures	None
	Deformations	Slight indent or deformation (no memorandum of class would be expected to be endorsed)
	General corrosion	Spot rusting on less than 3% AND Rusting at edges or welds on less than 20% of edges or weld lines
	Pitting / grooving	Intensity less than 5% with an average depth less than 25% of the original plate thickness
2	Cracks / Fractures	None
	Deformations	Indent or deformation for which a memorandum of class would be expected to be endorsed, but not requiring specific monitoring
	General corrosion	Rust penetration on less than 20% AND Hard rust scale rust penetration on less than 10% AND Rusting at edges or welds on less than 50 % of edges or weld lines
	Pitting / grooving	Intensity less than 20% with an average depth less than 25% of the original plate thickness
3	Cracks / Fractures	None
	Deformations	Indent or deformation within the class acceptance criteria, but which should be included in a monitoring plan for future inspection
	General corrosion	Rust penetration on more than 20% OR Hard rust scale on more than 10% OR Rusting at edges or welds on more than 50 % of edges or weld lines
	Pitting / grooving	Intensity over 20% within class acceptance criteria OR Intensity less than 20% with an average depth more than 25% of the original plate thickness, but within class acceptance criteria
4	Any defect which does not meet the rating 3 criteria	
NI	The structural AUC should have been inspected, as per the agreed planning, but has not been inspected	
NA	The structural AUC is not expected to be assessed within the scope of the CAP inspection	

7.2 Coating assessment criteria

7.2.1 The coating condition is assessed against the criteria in the Tab 6.

7.3 UTM assessment criteria

7.3.1 Criteria definition

Wastage of structure ratings are assigned by reviewing the UTM readings against permissible diminution of structure.

Except if otherwise requested by the client, the permissible diminution criteria, as given in the tables of acceptance criteria provided in BV Class Rules Part A, are used to carry out the assessment.

Should the Owner wish to use the permissible diminution criteria as defined by the vessel's current Classification Society, it is to be indicated in the planning document and the Executive Summary.

To assign a rating to an AUC, the criteria defined in Tab 7 are applied.

7.3.2 Using the S-curves to assign the Measured Wastage rating

The BV UTM Software compiles a set of 'thickness diminution distribution curves' - commonly named S-curves - as follows (see Fig 4):

- One diagram per compartment/structural section showing one S-curve per AUC
- One diagram for the Global UTM assessment sowing one S-curve per group of Structural AUcs.

The curves represent the cumulative percentage of readings with a certain percentage of wastage compared to the permissible thickness diminution.

If a curve crosses the horizontal blue 90% line before crossing a vertical boundary line, the corresponding 'AUC' or 'Group of Structural AUCs' is assigned the rating indicated on the left side of the vertical boundary line. Otherwise, it is assigned the rating indicated on the right side of the vertical boundary line.

Table 6 : Coating condition rating criteria for hull structure

Rating	Coating condition rating criteria
1	Spot rusting on less than 3% without breakdown of coating AND Rusting at edges or welds on less than 20% of edges or weld lines AND Blistering on 20% or less
2	Breakdown of coating or rust penetration on less than 20% AND Hard rust scale rust penetration on less than 10% AND Rusting at edges or welds on less than 50 % of edges or weld lines
3	Breakdown of coating or rust penetration on more than 20% OR Hard rust scale on more than 10% OR Rusting at edges or welds on more than 50 % of edges or weld lines
NC	No protective coatings fitted, as per design
NI	The AUC should have been inspected, as per the agreed planning, but has not been inspected
NA	The AUC is not expected to be assessed within the scope of the CAP inspection

Note 1:

- Spot rusting is rusting in spots without visible failure of coating.
- Blistering is identified as coating failure according to IACS Rec. 87. Appendix A.

Where blistering is on more than 20% of the AUC, the rating assigned to the AUC cannot be better than 2.

Table 7 : Measured wastage rating criteria for hull structure

Rating	Measured wastage rating criteria
1	More than 90% of measurements are found with a remaining permissible diminution over 75% AND no measurement shows excessive corrosion
2	More than 90% of measurements are found with a remaining permissible diminution over 25% AND no measurement shows excessive corrosion
3	Less than 90% measurements are found with a remaining permissible diminution over 25 % AND no measurement shows excessive corrosion
4	At least one measurement shows excessive corrosion
NI	The AUC should have been inspected, as per the agreed planning, but has not been inspected
NA	The AUC is not expected to be assessed within the scope of the CAP inspection

7.4 Anodes condition assessment criteria

7.4.1 Although it is not a class requirement that anodes are fitted in ballast tanks and other areas of the vessel hull, some clients and charterers require that the condition of anodes be reported upon. Therefore during overall and close up surveys corrosion protective anodes (if fitted) are to be assessed, according to each 'AUC' where these are fitted, and a given a rating depending on the amount of wastage of anode found.

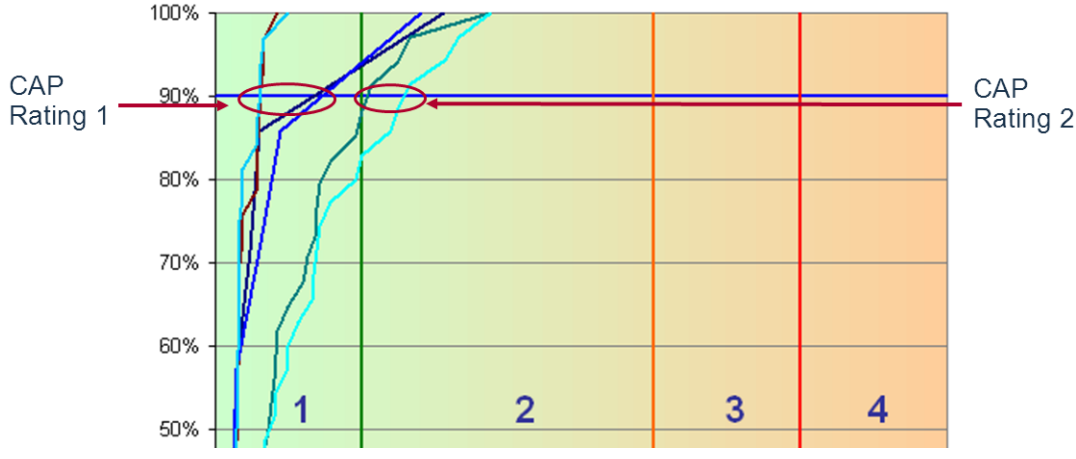
Refer to Tab 8 for the rating criteria for anodes.

Note 1: This rating is given for information purposes. The existence of, or lack of, anodes does not affect the overall CAP rating of the vessel.

Table 8 : Anodes rating criteria for hull structure

Rating	Anodes condition rating criteria
1	Up to 25% wastage
2	From 25% to 50% wastage
3	From 50% to 75% wastage
4	From 75% to 100% wastage
NF	Not fitted
NA	No applicable

Figure 4 : How to read the rating on a S-curves diagram



SECTION 3 MACHINERY AND SYSTEMS ASSESSMENT

1 Introduction

1.1

1.1.1 The purpose of this Section is to detail the methodology used by Bureau Veritas to carry out a condition assessment of the following modules:

- Hull and Cargo Equipment and Systems
- Propulsion and Auxiliary Systems
- Bridge, Navigation and Radio Equipment.

2 Assessment preparation

2.1

2.1.1 The extent of inspection and the subsequent reporting requirements are to be discussed and agreed with the client prior to starting the on-board assessment.

A planning document should in particular be prepared and agreed prior to starting the inspection.

The first step to prepare the assessment is to discuss and agree with the client the information detailed in Sec 1, [1.4].

Subsequently, the following additional specific details should be clarified and agreed:

- Availability of records of condition monitoring and planned maintenance systems
- Availability of latest records of vibration analysis, lubrication oil analysis, ultrasound sound, ultrasonic measurements, insulation tests, if carried out
- Analysis and tests planned to be carried out.

The operation and the maintenance programme declared by the clients should be in conformity with the guidance provided by the manufacturers of the equipment.

3 Scope of inspection

3.1 Hull and cargo equipment and systems assessment scope

3.1.1 The scope of inspection covers the assessment of the equipment, fittings, piping, machinery and systems which are part of the following groups of Items:

- Anchoring and Mooring Installation and Equipment
- Steering & Rudders
- Hull Machinery
- Hull Electrical Equipment and Cabling
- Hull Fittings
- Closing Appliances
- Hull Piping and Valves
- Sea Connections and Valves
- Fire/Smoke/Gas Detection and Fire Fighting Systems
- Life Saving Equipment and Fittings
- Environmental Management
- Cargo Systems Machinery
- Cargo Systems Electrical equipment and cabling
- Cargo Systems fittings
- Cargo Systems Piping and Valves.

The assessment is carried out through the following:

- A visual inspection to assess the visual condition
- A function test, if applicable
- Additional criteria specific to the Item (vibration measurements, insulation tests, UTM).

3.2 Propulsion and auxiliary systems

3.2.1 The scope of inspection covers the assessment of the equipment, fittings, piping, machinery and systems which are part of the following groups of Items:

- Engine Room, Auxiliary Machinery Spaces and Engine Store Rooms
- Main Propulsion Installations
- Shafting, Stern Tube and Propeller Systems
- Auxiliary Engines
- Oil Pumps and Purifiers
- Fresh and Sea Water Pumps
- Compressors
- Ventilation Fans
- Piping and Valves
- Boilers, Economizers and Thermal Oil Heaters
- Heat Exchangers (others)
- Miscellaneous Equipment
- Communication, Order Transmission and Remote/Emergency Stop Systems
- Generators and Switchboards
- Motors and Associated Starters
- Electrical installations (others)
- Automated installation
- Fire/Smoke/Gas Detection and Fire Fighting Systems
- Environmental Management.

The assessment is carried out through the following:

- A visual inspection to assess the visual condition
- A function test, if applicable
- Additional criteria specific to the Item (vibration measurements, insulation tests, UTM).

3.3 Bridge, navigation and radio equipment

3.3.1 The scope of inspection covers the assessment of the equipment, fittings, piping, machinery and systems which are part of the following groups of Items:

- Navigation equipment
- Bridge equipment
- Radio equipment.

The assessment is carried out through the following:

- A visual inspection to assess the visual condition
- A function test, if applicable.

4 Methodology for calculating the CAP rating

4.1

4.1.1 The final CAP rating assigned to the module is determined further to the calculation of the two following ratings:

- the Overall Operational Condition rating and
- the Global Rating for Maintenance.

The Overall operational condition rating, which is calculated through the methodology described in Article [5], reflects the condition of the equipment and systems through an assessment of the visual condition, the result of a function test and, for some equipment, some additional criteria specific to the Items.

The Global rating for Maintenance, which is calculated through the methodology described in Article [6], reflects the condition of the maintenance of the machinery and systems, through an assessment of Planned Maintenance Systems and results of lubricating and hydraulic oil analysis.

The final CAP rating assigned to module is the lower of the ratings assigned to the Overall operational condition and the Global rating for maintenance.

5 Overall operational condition assessment methodology

5.1 Categorization of equipment and systems

5.1.1 The Overall Operational Condition rating is calculated through a bottom-up approach which consists of

breaking down the module firstly into Groups and subsequently into Items:

- assessing each Item against a set of criteria - visual condition/function test/additional criteria specific to the Item
- assessing each Group from the ratings assigned to the Items
- assessing the Overall Operational Condition from the ratings assigned to the Groups.

5.2 Item rating calculation

5.2.1 General calculation rules

Each Item is assigned a rating to assess the condition of the following set of criteria:

- Visual Condition
- Function test
- Additional criteria specific to the Item.

The ratings are assigned based on the rating rules defined in Article [7].

An average rating is then calculated and rounded to the first digit from the average of the ratings assigned for the 'Visual Condition', 'Function Test' and the additional criteria, if applicable.

If the second digit ranges from 0 to 4, the first digit is rounded to the lower value. Otherwise, the first digit is rounded to the upper value.

If an ITEM is rated 4 for Visual Condition or Function Test, the ITEM average rating cannot be better than 4.

The ratings NI (Not Inspected) and NT (Not Tested) are equivalent to a rating 3, providing that no recommendation or condition of classification has been endorsed by the vessel's classification society for this ITEM.

The rating NA (Not Applicable) is not taken into account in the calculation.

5.2.2 Specific calculation rules

The average rating cannot be better than the rating assigned to the 'Function Test'.

a) Reciprocating or rotating machinery over 50 kW (Prime movers, Pumps, Compressors, Purifiers, Fans…).

   The average rating of reciprocating or rotating machinery over 50 kW cannot better than 2, except if:

   - The Item has been overhauled or replaced within the last 6 months, OR
   - The Item is maintained under a Condition Based Monitoring regime, OR
   - Vibration analysis are carried out and up-grade the average rating.

b) Electrical equipment

   The average rating of an item of electrical equipment cannot be better than 2, if no insulation test has been carried out within the last 6 months

c) Piping

   The average rating of the other piping may be up-graded if voluntary UTM show that the piping material wastage is null or very low.

5.3 Group rating calculation

5.3.1 The Group rating is the average of all the ITEM average ratings assigned to the group's ITEMs rounded to the first integer.

If the first digit ranges from 0 to 4, the rating is rounded to the lower value (or better rating). Otherwise, the rating is rounded to the upper value (worse rating).

If an ITEM average rating is 4, the Group rating cannot be better than 4.

If an ITEM rating assigned for any assessment criteria is 3, the Group rating cannot be better than 2.

5.4 Overall operational condition rating calculation

5.4.1 The Overall operational condition rating is the average of all the Group ratings, rounded to the first integer.

If the first digit ranges from 0 to 4, the rating is rounded to the lower value (or better rating). Otherwise, the rating is rounded to the upper value (worse rating).

If a Group rating is 4, the Overall operational condition rating cannot be better than 4.

If a Group has been rated 3, the Overall operational condition rating cannot be better than 2.

6 Global rating for maintenance

6.1 Global rating for maintenance calculation

6.1.1 The 'Global Rating for Maintenance' is awarded based on the results of:

- an audit of the vessel's planned maintenance system (PMS rating)
- an assessment of the records of the lubricating and hydraulic oil analysis (lub/hydraulic oil rating).

The Global Rating for Maintenance is the lower of the ratings assigned to the PMS assessment and the lubricating and hydraulic oil analysis assessment.

6.2 Audit of the vessel's planned maintenance system

6.2.1 The audit is limited to that part of the PMS system that specifically applies to the relevant systems of the module.

The audit will cover the equipment identified in the PMS system and the CAP Surveyor will not make any assessment whether the PMS system covers every Item of critical equipment.

The audit is to cover the timely implementation, frequency, scope and results of the maintenance.

Postponements and overdue Items are to be included in the audit and reporting and follow up actions are to be identified and reviewed.

For each module, a rating is assigned to each Group of Items, as defined in [3.3.1], [3.3.2] or [3.3.3], using the PMS assessment criteria in the Table 14.

The PMS rating is the average of all the Group ratings.

If the first digit ranges from 0 to 4, the rating is rounded to the lower value (or better rating). Otherwise, the rating is rounded to the upper value (worse rating).

If a Group rating is 4, the Global UTM rating is 4.

If a Group rating is 3, the Global UTM rating cannot be better than 2.

6.3 Assessment of the records of the lubricating and hydraulic oil analysis

6.3.1 The proper monitoring and maintenance of the lubricating and hydraulic oil used to run the machinery and equipment is a key component of their maintenance.

The purpose is to assess that oil samples are collected from respective systems in a timely and appropriate manner, as per manufacturer's recommendations, and that the results show no evidence of deterioration of the oil or of equipment parts and demonstrate suitability of the oil for continued use.

Oil sample reports may be accepted if carried out within 6 months prior to the completion date of the CAP assessment.

Where appropriate, lubricating and hydraulic oil samples are collected from respective systems and are to be tested for evidence of deterioration of the oil or of equipment parts and for suitability of the oil for continued use.

Systems and equipment that would normally be expected to have oil analysis carried out are usually fitted with sumps or 'top up' or 'header' tanks.

The following systems should, at least, be included within the scope of the assessment of the Hull and Cargo Equipment and Systems:

- Deck Hydraulics
- Deck gear drives
- Steering gear hydraulics.

The following systems should, at least be included within the scope of the assessment of the Propulsion and Auxiliary Systems:

- Main diesel engine
- Auxiliary engines
- Gas turbines
- Reduction gears
- Cam shaft systems
- Thrusters
- Stern tubes.

A rating is assigned to each system using the Tab 6.

The Lub/hydraulic oil rating is the average of all the systems ratings.

If the first digit ranges from 0 to 4, the rating is rounded to the lower value (or better rating). Otherwise, the rating is rounded to the upper value (worse rating).

If a Group rating is 4, the Lub/hydraulic oil rating is 4.

If a Group rating is 3, the Lub/hydraulic oil rating cannot be better than 2.

Should oil analysis not be carried out, for a system which would normally be expected to have such analysis undertaken, then the rating NT, equivalent to rating 3, is assigned.

7 Items rating rules

7.1 Visual condition

7.1.1 The Visual Condition rating is assigned through a visual inspection carried out to assess the overall condition of equipment together with its appurtenances, bedplate and supports. (See Tab 1).

7.2 Function tests

7.2.1 Function tests are carried out on equipment under working conditions with the results assessed against the manufacturers operational criteria. e.g. Pumps and compressors are to be test run and their performance assessed, closing appliances are to be tested for full range of movement, machinery safety devices are to be tested and proved, alarms and instrumentation are to be actuated and inspected, pipelines are to be pressure tested etc,.

All Machinery, Fittings and Systems' equipment is required to be function tested. It is recognized that some vessel's systems such as CO2 flooding, bulk foam systems, etc,. will not be able to have their performance fully tested however these can be assessed by supplemental means such as simulation, level testing and chemical analysis. (See Tab 2).

Table 1 : Visual condition rating criteria for machinery and equipment

Rating 1	Rating 2	Rating 3	Rating 4
All items			
Minimal or no apparent deterioration	A slight level of deterioration	A level of apparent deterioration but within the vessel's class society requirement	Significant apparent deterioration
Good cosmetic condition	Fair cosmetic condition	Poor cosmetic condition	
No system leakages			System leakages
Bearings clearance			
Measurements are within 0-25% of allowable tolerances and/or recommendations.	Measurements are within 25-75% of allowable tolerances and/or recommendations.	Measurements are within 75-100% of allowable tolerances and/or recommendations	Measurements exceed tolerances and/or recommendations.

Table 2 : Function test rating criteria

	Rating 1	Rating 2	Rating 3	Rating 4
All items (1)				
Function test	Results reaching rated values and/or full operation with either minimal or no deterioration from the 'as new' condition.	Results showing a level of deterioration in rated values and/or full operation from the 'as new' condition without affecting safe operation.	Results showing deterioration in rated values and/or full operation from the 'as new' condition but within that acceptable according to maker's and IACS requirements.	Results showing significant deterioration from the 'as new' condition below that acceptable according to maker's and IACS requirements.
Operating temperatures	Well within tolerances.	Within tolerances.	Within tolerance but approaching limits of tolerances or nearing alarm condition.	Exceed tolerances or are in alarm condition.
Attached safety devices, alarms, trips, etc.	Tested and proved 100% operational.			Tested and showing defects or deficiencies.
Main engine				
Power output	May be run at 86% or more of the rated power, as per IAPP Certificate	May be run within 81-86% of the rated power, as per IAPP Certificate	May be run within 76-81% of the rated power, as per IAPP Certificate	Not able to maintain at least 75% of the rated power, as per IAPP Certificate
Piping				
Pressure test	Reach required test pressure without leakages or pressure drop-off.			Do not reach required test pressure and/or leakages or pressure drop-off exists.
(1) Items mean the equipment and where applicable, the attached valves, operating devices, locking devices, fittings, instrumentation, etc.				

7.3 Vibration analysis

7.3.1 Vibration measurements are expected to be taken on rotating and reciprocating machinery with a power over 50kW.

7.3.2 Availability of records from the “as new” condition

Where records of vibration measurements at vessel's delivery are available, the ratings may be assigned by comparing the latest measurements to the 'as new' condition, as per Tab 3.

The measurements are normally performed under the same operating and loading conditions as the original readings and a comparison made of changes in the vibration patterns.

If there are important changes in vibration levels that infer significant deterioration of equipment then the unit should be opened up for examination of the rotating components.

7.3.3 No availability of previous records

Where no vibration history is available, the ratings may be assigned in accordance with the requirements of the ISO 10816, as applicable, or the ISO 8528-9 for auxiliary diesel engines.

An equivalent methodology to ISO standard may be considered on a case by case basis.

In general vibration analysis reports may be accepted if carried out within three months prior to the start date of CAP surveys. The surveyor may request re-measurement for any unit should vibration levels appear higher than expected during function tests.

7.4 Ultrasonic thickness measurements

7.4.1 Ultrasonic thickness measurements (UTM) are expected to be taken on main fire line, cargo, vapour, cargo stripping, ballast piping, inert gas, COW and on high pressure hydraulic lines.

The CAP Surveyor may extend the scope of the UTM measurements to other pipelines or hull machinery 'Items' that show evidence of deterioration during visual examination or are subject to leaks during pressure testing.

The surveyor may also request that pipeline sections or machinery 'Items' be disassembled for internal visual inspection depending on measurement results.

Where possible the client should arrange for thickness measurements to be carried out in the presence of the CAP surveyor. Otherwise, please refer to Sec 2, [2.4].

Refer to Tab 4 for the for the Measured Wastage rating criteria for Machinery and Systems.

7.5 Insulation testing

7.5.1 Insulation 'Megger' testing is to be carried out in accordance with Class requirements and the Rating Criteria in Tab 5 should be applied.

7.6 PMS assessment

7.6.1 The PMS assessment is to be carried out in accordance with the criteria in Tab 6.

7.7 Lubrication oil/hydraulic oil analysis

7.7.1 The lubricating and hydraulic oil assessment is to be carried out in accordance with the criteria in Tab 7.

Table 3 : Vibration analysis rating criteria based on measurements records comparison

Rating 1	Rating 2	Rating 3	Rating 4
Analysis results close to the 'as new' condition according to vibration records.	Analysis results within 25% to 74% of the allowable tolerance	Analysis results within 75% to 100% of the allowable tolerance	Analysis results outside the tolerance.

Table 4 : Measured wastage rating criteria for machinery and systems

Rating 1	Rating 2	Rating 3	Rating 4
Measurements show either minimal or no deterioration from the 'as new' condition. i.e. reduction in thickness of between 0-25% of permissible diminution.	Measurements show deterioration from the 'as new' condition of between 25-75% of permissible diminution.	Measurements show deterioration from the 'as new' condition of between 75-100% of permissible diminution.	Measurements show deterioration or wastage above the permissible diminution.

Table 5 : Insulation “Megger” - Testing rating criteria for electrical equipment

Rating 1	Rating 2	Rating 3	Rating 4
Over 100 Meg ohms.	20-100 Meg ohms.	Below 20 Meg ohms but above Class minimum requirements.	Below Class minimum requirements.

Table 6 : Global rating for maintenance criteria

Rating 1	Rating 2	Rating 3	Rating 4
- Maintenance performed in a timely manner. - Overdue or postponed Items, few in number or of minor importance, not affecting class and documented. - No Items postponed to Drydock unless the docking is imminent and these are planned in the repair specification. - No Items subject to class recommendations - No ISM Non Conformities against Maintenance.	- Maintenance performed in a timely manner. - Overdue or postponed Items, few in number, or of minor importance, not affecting class and documented. - Items postponed for docking due within 3 months and clearly planned in the repair specification. - No Items subject to class recommendations. - No ISM Non Conformities against Maintenance	- Maintenance performed generally in a timely manner with some overdue and postponed Items not affecting class. - Items postponed for docking due within 3 months and clearly planned in the repair specification. - Items subject to class recommendations but within the limit date. - Pending ISM Non Conformities against Maintenance	- Maintenance generally performed with overdue Items and postponed Items some of which affect class. - Overdue Class recommendations and ISM Non Conformities against Maintenance

Table 7 : Lubricating/hydraulic oil analysis rating rules

Rating 1	Analysis records are less than 6 months and results are within the acceptable range
Rating 2	Not applicable for this assessment criteria
Rating 3	Not applicable for this assessment criteria
Rating 4	Results are not within the acceptable range
NT	Analysis records are over 6 months or not available
NA	Not applicable