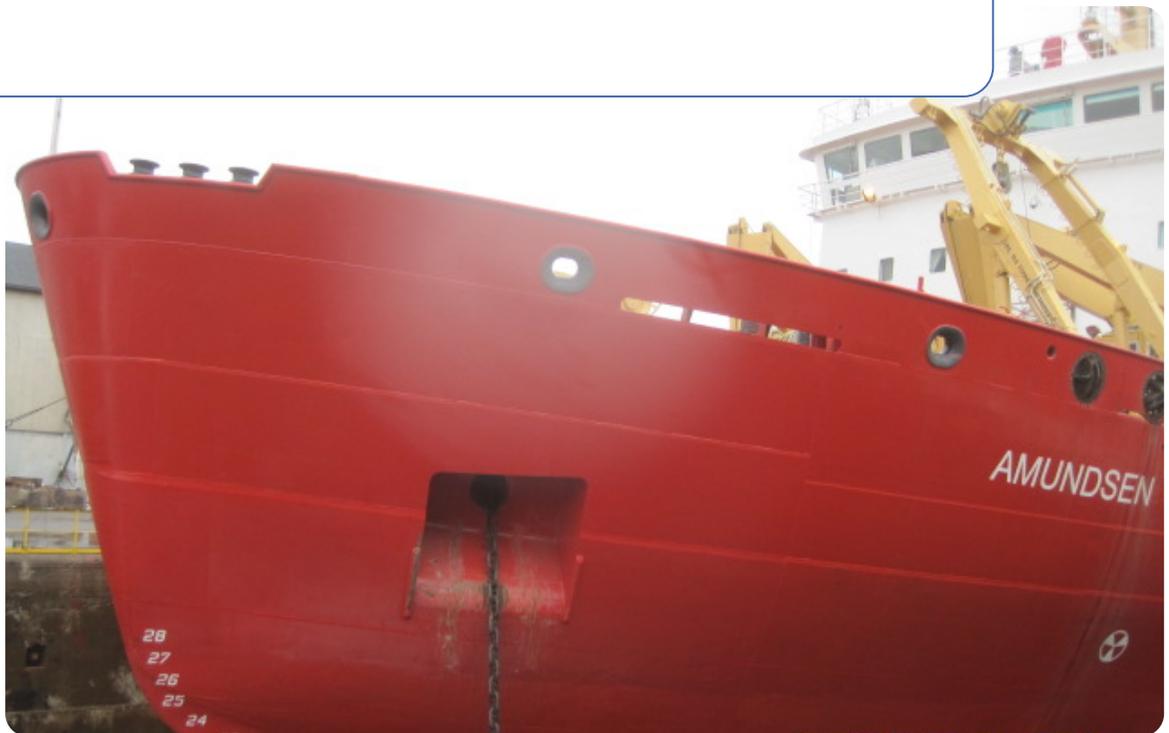


CCGS Amundsen

# Condition Assessment Report

June 2013



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## Technical Report Document Page

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| 16. Summary<br><p><b>This report details a Condition Assessment for the CCGS Amundsen undertaken to determine the current condition of the ship hull structure. Hull Renovation Scheme level 2SS standard was used as a basis for assessment of the current condition and in identifying likely hull elements that will require maintenance for the remaining life of the ship.</b></p> <p><b>The report and supporting surveys concluded that the ship's hull and tanks were generally found in good condition, and at a standard comparable to a classed ship of similar type and age.</b></p> |   |                       |                                   |
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## 1. INTRODUCTION

In accordance with instructions received from Government of Canada, Canadian Coast Guard, Lloyd's Register Hull Renovation Scheme survey has been undertaken on the vessel "AMUNDSEN". Vessel particulars are presented in Table 1-1 below.

Table 1-1: Vessel Details

<b>VESSEL NAME:</b>		AMUNDSEN	
<b>IMO No.</b>		383347 (7510846)	
<b>FLAG:</b>		CANADA	
<b>PORT OF REGISTRY:</b>		Ottawa, ON	
<b>TYPE:</b>		MEDIUM ICEBREAKER	
<b>DATE OF BUILD:</b>		1979	
<b>CLASSIFICATION:</b>		CLASSED	
<b>TONNAGES</b>		<b>DIMENSIONS</b>	
<b>GT</b>	5,910	<b>LENGTH</b>	98.33 m
<b>NT</b>	1,678	<b>BREADTH</b>	19.51 m
<b>DWT</b>	2,865	<b>DRAUGHT</b>	7.16 m

The vessel was built at Burrard Dry Dock, North Vancouver and commissioned into the Canadian Coast Guard as CCGS Sir John Franklin in 1979. In 2002, CCGS Sir John Franklin was converted to a dedicated Arctic Ocean research vessel at the shipyard in Les Mechins, Quebec and re-commissioned into the Canadian Coast Guard as CCGS Amundsen.

The performance and service life of a vessel is highly dependent upon the condition of the asset and the procedures and practices utilised to maintain the vessel in optimum condition to achieve operational requirements. Recognising that the AMUNDSEN is over 30 years old, the CCG contracted Lloyd's Register Canada to report on the baseline condition of the vessel's hull structure. The extensive experience of Lloyd's Register was utilised to assess the baseline data against the equivalent of a 10 year old asset and thereby provide recommendations regarding hull structural items that may need renewal in order to achieve an expected 10-15 years of service.

Since the Government of Canada, Canadian Coast Guard require an assessment based upon a Lloyd's Register Hull Renovation Scheme Level-2SS, the renovated hull may be considered to be in a condition approximately equivalent to that of a ship which has just undergone its second Hull Special Survey at an age of approximately 10 years.

The Hull Renovation is not a Classification requirement, and will not affect the vessel's Classification status.

### 1.1. Scope of Close-up Surveys

Close-up survey was carried out in the fuel tanks, water ballast tanks, fresh water tanks, grey water tanks, and void spaces listed in Table 1-2 below. The underwater area of the hull was also inspected while in drydock. The inspection reports for close-up surveys are included in the following section.

**Table 1-2: Scope of Close-up Surveys**

Hull	Bottom Shell and Appendages
	Main Deck and Fittings
	Side Shell Plating(P&S)
Ballast Tanks	Aft Peak Tank
	Aft Trimming Tank
	Fore Peak Tank
	Fwd Trimming Tank
Sea Bays	Sea Bay Motor Propulsion Room
	Aft Sea Bay
	Fwd Sea Bay
Fuel Oil Tanks	Aft Engine room F.O. Wing Tank(P&S)
	Center Diesel Oil Day Tank
	D.O. Settling Tank Port Side
	Dirty Oil Tank Port Side
	F.O. Deep Tank (P&S)
	F.O. settling Tank
	Fwd Engine Room Wing Tank(P&S)
	Fwd F.O. Tank(P&S)
	Fwd Lower Side D.O. Tank Stbd Side
	Fwd Lower Side F.O. Tank
	Heeling Tank Stbd Side
	Helicopter Fuel Tank Cofferdam
	Helicopter Fuel Tank
	Lower Flume D.O. Tank
No.1 D.B.F.O. Tanks(P&S)	
No.2 D.B.F.O. Tanks(P&S)	
No.3 D.B.F.O. Tanks(P&S)	
No.4 D.B. Bilge F.O. Tanks(P&S)	
Upper Flume D.O. Tank	

Fresh Water Tanks	Feed Water Tanks(P&S)
	Fresh Water Tanks(P&S)
	Jacket Water Tank
Void Spaces	Aft Void Spaces(P&S)
	Chain Lockers(P&S)
	Cofferdam Fr.0-14
	Cofferdam Under Water Tanks(P&S)
	Fwd D.B. Void Space Port Side
	Fwd DP Thruster Compartment
	No.2 Void Space
	No.5 Void Space
	Pipe Tunnel

## 1.2. Hull Thickness Measurement

Hull Thickness Measurements were taken by technicians from Diversified Naval Architects, under direction of the attending surveyor. Extent of thickness measurements as previously agreed in line with classification survey requirements for Special Survey. Additional readings were taken at the discretion of the attending surveyor. Complete Thickness Measurement Report is included in Appendix 1 of this report.

## 2. METHODOLOGY

### 2.1. Definitions

In the assessment reports for the structural components, the following terms have been used:

GOOD	Unimpaired condition without significant wear or deviation from original strength and operation efficiency. No maintenance or repair required.
SATISFACTORY	Condition with wear and tear and other deficiencies of a minor nature not requiring correction or repair.
UNSATISFACTORY	Condition in which the adequacy of strength and/or operational efficiency is marginally below acceptable limits or is in doubt. Remedial action required.
POOR	Condition of undoubtedly inadequate strength or operational efficiency. Immediate extensive repair or renewal required to reinstate serviceability.

In reporting the condition of protective coatings, the following terms have been used:

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

### 2.2. HRS Criteria

Lloyd's Register Hull Renovation Scheme (HRS) was used for assessment of structural diminutions. The scheme is based on the steel renewal criteria from Class Rules and the assumption that steel corrosion/wastage allowance built into the Rules should allow for 15 years of service before extensive renewals are required. Wastage allowance is defined as difference between as-built scantlings and renewal limits specified in Class Rules. Assuming linear corrosion rate, ships should experience one third of the allowed wastage by the first Special Survey (five years after commissioning) and two thirds by the second Special Survey (ten years of service).

Ships can be assessed against HRS level 1SS or level 2SS criteria, as chosen by the owner. The average permissible scantlings diminution for level 1SS is one third of the way between the requirements at the time of build and the appropriate renewal limit for Classification. For level 2SS the permissible diminution is two thirds of the way. Therefore, ships compliant with 1SS or 2SS criteria could be considered to be in a condition comparable to that of a typical five or ten years old ship, respectively.

The Amundsen was assessed primarily against the 2SS criteria as this should provide indication of urgent and other short-term (5 years) maintenance needs. As the CCG wants to keep the vessel in service for longer period (10 to 15 years), the thickness measurements results were also evaluated against the 1SS levels to provide guidance on what can be expected for future work.

Having Rule length less than 90 m, the Amundsen is considered a Category 3 ship (Thickness Measurement and Close-up Survey Guidance 2012, Pt1Ch5Sec6, Table 1.5.6, Note 6). Therefore, maximum permissible diminution of individual plates is 30% (Thickness measurement and Close-up Survey Guidance, Pt1Ch5Sec5, Table 1.5.5). Frames, brackets and other stiffeners are allowed 25% diminution. . For a Category 3 vessel and the 2SS standard, allowed diminutions are 20% for plates and 16.7% for stiffeners.

### **2.3. Structural Survey**

A full assessment Close-up survey of the hull structure has been carried out by Lloyd's Register Group Surveyors on behalf of Marine Consultancy Services (MCS) against the requirements of the Hull Renovation Scheme (HRS). The survey was undertaken in the Seaway Marine and Industrial dry-dock in St. Catharines, Ontario , from 21st January 2013 to 12th April 2013 by Jun Tang and Milan Zoric.

Close-up survey consists of visual inspection of the vessel structure, including hull envelope, all water ballast tanks and a selection of other tanks or spaces. The aim of the survey is to assess general condition of the structure, including presence of deformations, corrosion as well as the condition of the coating. The survey findings are also used to guide the thickness measurement: the surveyor will request denser measurement grid for areas with pronounced corrosion.

Summary of the findings is provided in Section 3.1. Detailed close-up survey reports (including photographs) are provided in Section 4 of this report.

### **2.4. Hull Thickness Gauging**

Ultrasonic Thickness Measurements of representative hull structure were taken by technicians from Diversified Naval Architects Inc. under the direction of attending surveyor. The measurements were conducted concurrently with the Special Survey to avoid redundant surveys. The extent of thickness measurements was in line with the Hull Renovation Scheme requirements:

- Within 0,5L amidships; a minimum of 3 transverse sections;
- All exposed main deck plating over full length of ship;
- All wind and water strakes over the full length of the ship, port and starboard;
- Representative exposed superstructure deck plating (i.e. poop, bridge and forecastle decks);
- All transverse webs with associated plating and longitudinals, and the transverse bulkhead complete in the fore peak tank and aft peak tank;
- All keel plates over the full length of the ship;
- Additional bottom plates in way of cofferdams, machinery space and aft end of tanks;
- Plating of sea chests and side shell plating in way of overboard discharges; and
- Critical areas, **as considered necessary by the Surveyor.**

Analysis of the TM results is provided in Section 3.2. Complete Thickness Measurement Report is attached as Appendix 1 to this report. In addition to the measured values, the report includes original (as-built) thicknesses as well as diminutions, expressed in absolute and relative terms.

### 3. RESULTS SUMMARY AND RECOMMENDATIONS

#### 3.1. Results of Structure Survey

Following the hull structural survey, certain areas of hull structure examined were identified as requiring further investigation and possible repairs for compliance with the Hull Renovation Scheme; these areas are summarised below and detailed within the TM reports (Appendix 1) and Close-up survey report forms (Section 4). Summary of notable observations and main issues that may require maintenance in the near future is provided in Table 3-1.

Table 3-1: Summary of Notable Hull Defects

Item No.	Tank / Space	Findings and Recommendations
1	Hull	Welds at the forward and aft extremes show signs of erosion. May require repairs at the next drydocking.
2	No.2 DBFO Tk Stbd	Bottom plating pitting at various locations. Quite a few individual pits look deep, further examination by thickness measurement inspector to be carried out in order to confirm whether necessary to have immediate repair. (Post-survey update: TM did not indicate severe wastage, repairs can be postponed until next opportunity)  Bilge brackets buckled at F99,107 and 112; 500-1500mm in length and 40-90mm in depth. F116 floor buckled 500mm in length and 40mm in depth between 1 <sup>st</sup> and 2 <sup>nd</sup> girder from outboard. No immediate repair is needed.
3	No.3 DBFO Tk Stbd	Bottom pitting at F61-65 extreme inboard was marked - to be repaired by welding. Repairs can be postponed until next opportunity.  Bottom plate dent at F61-71, no immediate repair is needed.  Bottom floor and bottom angle bar bent at F61-71, between 1 <sup>st</sup> and 2 <sup>nd</sup> girder from inboard. Floor bent at approx 38mm in depth and 300x150mm in area, no immediate repair is needed.
4	No.4 DB Bilge FO Tk Port	Pronounced pitting found along bottom plate longitudinal butt seam, especially at scallop cut. Areas marked for TM/repair. (Post-survey update: TM did not indicate severe wastage, repairs can be postponed until next opportunity)
5	Various	Coating in cofferdams and sea water tanks is breaking down to various degrees. No immediate repair is required but the condition should be monitored annually.

Pronounced pitting identified in several fuel tanks and broken coating identified in some dry spaces and sea water tanks were brought to the attention of owner's representative. No repairs could have been done at this drydocking due to budgetary constraints. As the identified problems are not critical, repairs can be postponed by a year or two, possibly even until next drydocking period. Condition of the plating and coatings should be monitored annually.

### 3.2. Results of Thickness Measurement Analysis

The raw results of thickness measurement are tabulated and provided as Appendix 1.

The results were compared against the HRS-2SS criteria (20% diminution for plating and 16.7% for stiffeners) and no reading exceeded the limit.

Summary of all TM results is presented in Table 3-3. In addition to the 2SS criteria, the Thickness Measurement results were further reviewed against the HRS Level 1SS criteria (10% diminution on plating and 8.3% on stiffeners) in order to better estimate future maintenance needs as items exceeding these limits will likely require renewals within next 10 years of service.

Table 3-2: Summary of TM results

Page	Structural Element	Meets 1SS	Meets 2SS	Remark
5	Side Shell Plating Strake 'K'	Y	Y	
6	Side Shell Plating Strake 'J'	Y	Y	
7	Side Shell Plating Strake 'H'	Y	Y	
8	Side Shell Plating Strake 'G'	Y	Y	
9	Side Shell Plating Strake 'F'	Y	Y	
10	Side Shell Plating Strake 'E'	Y	Y	
11	Bottom Shell Plating Strake 'D'	Y	Y	
12	Bottom Shell Plating Strake 'C'	Y	Y	
13	Bottom Shell Plating Strake 'B'	Y	Y	
14	Bottom Shell Plating Strake 'A'	Y	Y	
15	Bottom Shell Keel Strake	Y	Y	
16	Main Deck Plating	Y	Y	
18	Strength Deck and Sheerstrake Plating - Fr. 65, 91 & 120	Y	Y	
20	Shell Plating - Fr. 65, 91 & 120	Y	Y	
22	Inner Bottom Plating - Fr. 65, 91 & 120	Y	Y	
23	Inner Bottom Girders - Fr. 65, 91 & 120	Y	Y	
24	Longitudinal Bulkhead Plating - Fr. 65, 91 & 120	Y	Y	
26-28	Transverse Web Fr. 120	Y	Y	
29-31	Transverse Web Fr. 91	Y	Y	

Page	Structural Element	Meets 1SS	Meets 2SS	Remark
32-34	Transverse Web Fr. 65	Y	Y	
35-48	Aftpeak - Transverse Webs	Y	Y	
49-69	Forepeak - Transverse Webs	N	Y	Minor exceedance
71-72	Watertight Transverse Bulkhead Fr. 92-93	Y	Y	
73-74	Watertight Transverse Bulkhead Fr. 123	Y	Y	
75-76	Watertight Transverse Bulkhead Fr. 97	Y	Y	
77	Watertight Transverse Bulkhead Fr. 95	Y	Y	
78-79	Watertight Transverse Bulkhead Fr. 125	Y	Y	
80-83	Watertight Transverse Bulkhead Fr. 61	Y	Y	
84	Watertight Transverse Bulkhead Fr. 183	Y	Y	
85	Watertight Transverse Bulkhead Fr. 0	Y	Y	
86-87	Watertight Transverse Bulkhead Fr. 27	Y	Y	
88-91	Watertight Transverse Bulkhead Fr. 30	Y	Y	
92-95	Watertight Transverse Bulkhead Fr. 18	Y	Y	
96-97	Watertight Transverse Bulkhead Fr. 13	Y	Y	
98-102	Watertight Transverse Bulkhead Fr. 138	Y	Y	
103	Watertight Transverse Bulkhead Fr. 165	Y	Y	
104	Watertight Transverse Bulkhead Fr. 127	Y	Y	
105	Watertight Transverse Bulkhead Fr. 138	Y	Y	
106	Watertight Transverse Bulkhead Fr. 127	Y	Y	
107-117	Watertight Transverse Bulkhead Fr. 138	Y	Y	
118-121	Watertight Transverse Bulkhead Fr. 146	Y	Y	
122	Watertight Transverse Bulkhead Fr. 165	Y	Y	
123	Watertight Transverse Bulkhead Fr. 176	Y	Y	
124	Watertight Transverse Bulkhead Fr. 183	Y	Y	
125	Tanktop Plating @ Bell Mouth	Y	Y	
126	Forepeak Stringers	Y	Y	
127	Fuel Oil Tank - Keel Plate	Y	Y	
128-131	Exposed Deck - Upper Deck	Y	Y	
132-133	Exposed Deck - Boat Deck	Y	Y	
134	Exposed Deck - Officers Deck	Y	Y	
135	Exposed Deck - Navigation Deck	Y	Y	
136	Exposed Deck - Wheelhouse Top	Y	Y	
137-140	Bottom Shell Plating - Aft end of Tanks	Y	Y	
141-142	Sea Bay/Chest Plating	Y	Y	
144	Shell Frames and Longitudinal Bulkhead Frames	Y	Y	
145	Topside and Bottom Area Assessments Fr. 65	Y	Y	
146	Topside and Bottom Area Assessments Fr. 91	Y	Y	

Page	Structural Element	Meets 1SS	Meets 2SS	Remark
147	Topside and Bottom Area Assessments Fr. 120	Y	Y	

Only one reading exceeded the 1SS limit and only by a small margin. Therefore, no significant steel renewals should be expected at the next Special Survey.

### 3.3. Conclusion

While the overall condition of the structure and the coating system were assessed as good, given the age of the vessel, coating re-application will be required if the vessel is to be kept in service for another 10 to 15 years. No significant steel renewals are expected in this period.

Hull maintenance should focus on keeping the coating system in good condition to prevent accelerated thickness diminution. Regular visual inspection of water ballast tanks and cofferdams is recommended.

Sacrificial zinc anodes which have little material left should be replaced at the next opportunity.

Areas with current diminution in excess of 1SS levels and those with pronounced pitting, see Table 3-1, should be inspected annually, and when possible through enhanced thickness measurement programme. Fine-grid measurements are recommended for all such areas.

## 4. CLOSE-UP SURVEY REPORT FORMS

### 4.1. Underwater Hull – Flat Bottom

General condition of shell plating	GOOD
Type of coatings	Epoxy
General condition of coatings	GOOD
<p><b>Limit of Inspection</b> A visual examination carried out to full area</p> <p><b>Condition of the hull plating, including sea chests on flat bottom.</b> Good condition No obvious defects found to tank bottom plug openings, neither to echo sounder and other sensor areas.</p> <p><b>Indents (location, extent and effect on the structure)</b> Slight indents found in No.2 stbd D.B. F.O. tank area at Fr.99-100</p> <p><b>Damage (location extent and effect on the structure)</b> No damage found</p> <p><b>Visible loss of thickness (including grooving of welds)</b> No visual thickness loss found</p> <p><b>Other defects</b> None noted</p>	



4.1 Bottom Plating

## 4.2. Underwater Hull - Sides

General condition of shell plating	GOOD
Type (not maker) of coatings	Epoxy
General condition of coatings	GOOD
<p><b>Limit of Inspection (including drafts if afloat)</b> Visual examination carried out of the full area</p> <p><b>Condition of the hull plating, appendages</b> Good condition, except for Port and Stbd fwd and aft end hull welding seams found eroded. The seams are lower than side shell plating surface in various depths. Details as follows:</p> <ol style="list-style-type: none"> <li>1.both vertical and horizontal welding seams affected</li> <li>2.covered with rust/scale and/or fouling (marine growth) in places</li> <li>3.of hole type in some seams, especially in butt welds between stern tube and side shell plating</li> <li>4. in some areas coating looks well if viewed from a distance, but corrosion present underneath.</li> <li>5. erosion at aft port side found heavier compared to those at stbd side</li> <li>6.stem eroded to varying degree, including welds between stem and fwd side shell</li> </ol> <p>All sea chests conditions found good and anodes in sea chests found in various breaking down conditions</p> <p><b>Indents (location, extent and effect on the structure)</b> No indents found</p> <p><b>Damage (location extent and effect on the structure)</b> No damage found</p> <p><b>Visible loss of thickness (including grooving of welds)</b> No visible thickness loss found</p>	



4.2: Port Side Stern



4.3: Port Side Hull Fwd Half – Eroded Weld



4.4: Bow Stb Side



4.5: Stb Side – Mid-length

### 4.3. Topsides (Including sides of F'cle and Poop)

General condition of shell plating	GOOD
Type (not maker) of coatings	Epoxy
General condition of coatings	GOOD
<p><b>Limit of Inspection (including drafts if afloat)</b> Visual examination carried out of the full area</p> <p><b>Condition of the hull plating</b> Good condition</p> <p><b>Indents (location, extent and effect on the structure)</b> No indents found</p> <p><b>Damage (location extent and effect on the structure)</b> No damage found</p> <p><b>Visible loss of thickness (including grooving of welds)</b> No visual thickness loss found</p> <p><b>Other defects</b> None noted</p>	



4.6: Bow



4.7: Stern

**4.4. Upper Decks / Main Deck**

General condition of deck plating	GOOD
General condition of any external stiffening	GOOD
Type of coatings	Epoxy
General condition of coatings	GOOD
<p><b>Limit of Inspection</b> Visual examination carried out of the full area</p> <p><b>Condition of the deck plating, including hatch coamings and supports, external deck stiffening</b> Good condition</p> <p><b>Major defects (location, extent and effect on the structure)</b> No major defects found</p> <p><b>Visible loss of thickness (including plate and edge corrosion, grooving of welds, etc.)</b> No visual thickness loss found</p> <p><b>Pitting (location, depth and extent)</b> No pitting found</p> <p><b>Other defects</b> None noted</p>	



4.8: Main Deck Fwd



4.9: Port Upper Deck



4.10: Main Deck Fwd - Mooring

#### 4.5. Forward Trimming Tank

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		FAIR,SEE NOTE BELOW	
Type of coatings:	Intertuf JBA 016	Extent	FULL
<p><b>Limit of Inspection</b> Full Visual inspection of tank Located between Frames 176-183, Cleanliness was satisfactory except for bottom plating to be cleaned</p> <p><b>Deckhead</b> Tank top found in good condition no corrosion noted</p> <p><b>Transverse Bulkheads</b> Found satisfactory no damage noted. Welds brackets &amp; stiffeners all found satisfactory</p> <p><b>Deck or Space bottom</b> Found satisfactory no damage noted</p> <p><b>Internal structure</b> Found satisfactory no damage noted</p> <p><b>Other structure</b> None noted</p> <p><b>Coating Details</b> Upper part 15-20% broken down Middle part 10-15% broken down Lower part 10-20% broken down Coating near welding or at not easy access corner found poor</p>			



4.11: Fwd Trimming tank F176-183 - ship side



4.12: Fwd Trimming Tank F176-183 – Side Shell



4.13: Fwd Trimming Tank F176-183 – Swash Bhd & Fwd Bhd

**4.6. Aft Trimming Tank**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		FAIR see details below	
Type of coatings:	Intertuf JBA016	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 0-18  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Generally coating in way of upper part is good and fair in the lower part</p>			



4.14: Aft Trimming Tank - Deck and Side Shell

**4.7. Aft Peak Tank**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		FAIR	
Type of coatings:	Intertuf JBA016	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 0-aft end  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.15: Aft Peak Tank – Deckhead



4.16: 7 Aft Peak Tank - Bilge

**4.8. Fore Peak Tank**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		SEE DETAILS BELOW	
Type of coatings:	Intertuf JBA016	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 183-210  Space under chain lockers to be examined after chain locker cleaning  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good Condition</p> <p><b>Deck or Space bottom</b>  Good condition</p> <p><b>Internal structure</b>  Center longitudinal bulkhead F191-193 buckled at openings, approx. 12mm in depth.</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Stbd lower part F191-200 coating 20% broken down  Port aft and other areas coating 10-15% broken down  Stbd F183-191 coating 5-10% broken down  Center longitudinal bulkhead F191-203 coating 20% broken down</p>			



4.17: FPT Side Shell & Structure



4.18: FPT Side Shell & Aft Bhd



4.19: FPT Under Chain Locker - Side Shell

**4.9. Sea Bay – Propulsion Motor Room**

General condition of structure		GOOD	
General condition of cathodic protection		FAIR	
General condition of coatings		Poor, SEE DETAILS BELOW	
Type of coatings:	cement	Extent	FULL
<p><b>Limit of Inspection</b>  Visual inspection of tank located between frames 55-61. Bottom plate covered with ice approx. 1 inch thick.</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Bottom plate covered with ice.</p> <p><b>Internal structure</b>  Good condition</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Cement broken down approx 30%.</p> <p><b>Anode condition</b>  Anode wasted approx. 15%.</p>			



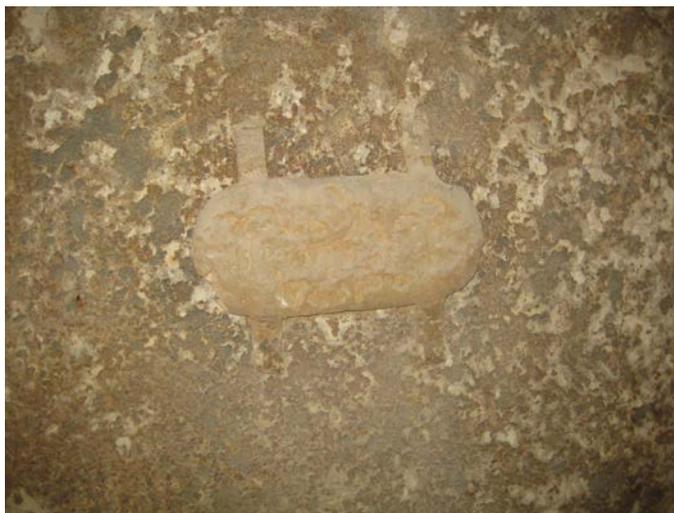
4.20: Sea Bay Motor Propulsion Room-Fwd Bulkhead



4.21: Sea Bay Motor Propulsion Room-Starboard

**4.10. Aft Sea Bay**

General condition of structure		GOOD	
General condition of cathodic protection		FAIR	
General condition of coatings		POOR, SEE DETAILS BELOW	
Type of coatings:	cement	Extent	FULL
<p><b>Limit of Inspection</b>  Visual inspection of tank located between frames 93-95. Stbd access blocked by vertical pipes, access not possible. Cleanliness was satisfactory</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Good condition</p> <p><b>Internal structure</b>  Good condition</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Cement broken down more than 50%.</p> <p><b>Anode condition</b>  Anode wasted approx 20%.</p>			



4.22: Aft Sea Bay - Aft Bulkhead



4.23: Aft Sea Bay- Port Side

**4.11. Fwd Sea Bay**

General condition of structure		GOOD	
General condition of cathodic protection		Fair	
General condition of coatings		FAIR see details below	
Type of coatings:	cement	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 95-97. Stbd part not inspected - manhole not opened. Cleanliness was satisfactory.</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Cement coating generally fair.  Anodes wastage at various levels: 5-40%.</p>			



4.24: Fwd Sea Bay (Port Side) - Anode



4.25: Fwd Sea Bay (Port Side) - Stbd View

**4.12. Aft Engine room F.O. Wing Tank - Port**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	N/A
<p><b>Limit of Inspection</b>  Upper part Frame 61-91, lower part Frame 61-95  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Good condition</p> <p><b>Internal structure</b>  Good condition  Structure was cut previously for machinery removal and is now closed. New welds examined visually and found satisfactory.</p> <p><b>Other structure</b>  Pipe condition good</p>			



4.26: Aft Engine Room F.O. Tank Port - Overhead

**4.13. Aft Engine room F.O. Wing Tank S**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	N/A
<p><b>Limit of Inspection</b> Upper part Frame 61-91, lower part Frame 61-95 Cleanliness was satisfactory</p> <p><b>Deckhead</b> Good condition</p> <p><b>Transverse Bulkheads</b> Good condition</p> <p><b>Deck or Space bottom</b> Good condition</p> <p><b>Internal structure</b> Good condition</p> <p><b>Other structure</b> Pipe condition good</p>			



4.27: Aft Engine Room F.O. Tank Starboard - Side Bottom

**4.14. Center Diesel Oil Day Tank**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 123-127  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.28: Center D.O.Day Tank - Starboard Longitudinal Bhd



4.29: Center D.O.Day Tank - Port Longitudinal Bhd

**4.15. D.O. Settling Tank Port Side**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 123-127  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.30: D.O. Settling Tank Port Inboard Bhd



4.31: D.O. Settling Tank Port Bottom

**4.16. Dirty Oil Tank Port Side**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 112-115  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.32: Dirty Oil Tank Bottom

**4.17. F.O. Deep Tank (Port)**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 18-30  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.33: F.O. Deep Tankk Port - Structure



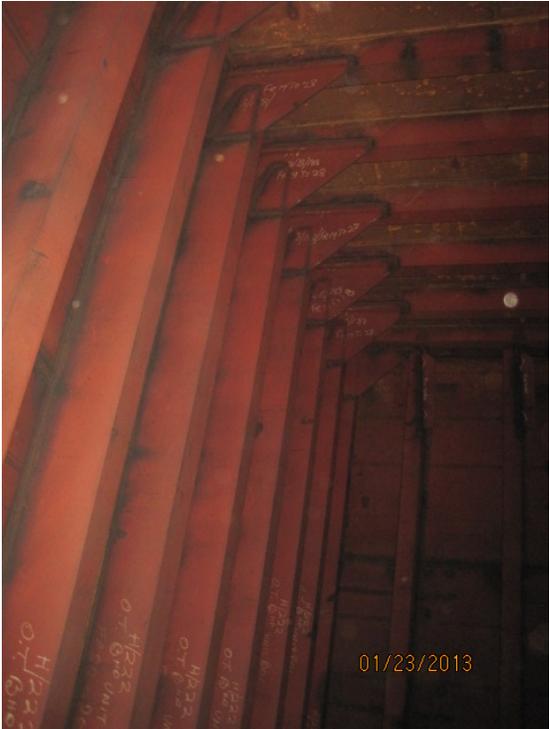
4.34: F.O. Deep Tank Port - Longitudinal Bhd & Deck

**4.18. F.O. Deep Tank Starboard**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 18-30  Ice and water between F18-21, area not inspected  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.35: F.O. Deep Tank Starboard - Longitudinal Bhd



4.36: F.O. Deep Tank Starboard - Overhead & Fwd Bhd

**4.19. F.O. settling Tank**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Visual inspection of tank located between frames 123-127. Cleanliness was satisfactory</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Good condition</p> <p><b>Internal structure</b>  Good condition</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Bottom plate primer broken around 50%. In general, coating broken down at welds.</p>			



4.37: F.O. Settling Tank - Upper Level Fwd Bulkhead



4.38: F.O. Settling Tank - Lower Level Bottom

**4.20. Fwd Engine Room Wing Tank Port**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Visual inspection of tank located between frames 95-123  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Good condition</p> <p><b>Internal structure</b>  Good condition.</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Aft bulkhead plate primer broken around 30%. In general, coating broken down at welds.</p>			



4.39: Fwd Engine Room Wing Tank Port - Upper Level - Aft Bulkhead



4.40: Fwd Engine Room Wing Tank Port - Lower Level Bottom

**4.21. Fwd Engine Room Wing Tank Starboard**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Visual inspection of tank located between frames 95-123  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Good condition</p> <p><b>Internal structure</b>  Good condition.  Side shell and attached structures was cut previously for machinery removal and is now closed. New welds examined visually and found satisfactory.</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Aft bulkhead plate primer broken around 25%. In general, coating broken down at welds.</p>			



4.41: Fwd Engine Room Wing Tank Starboard - Upper Level



4.42: Fwd Engine Room Wing Tank Starboard - Typical Corrosion At Lower Level

**4.22. Fwd F.O. Tank Port**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	N/A
<p><b>Limit of Inspection</b>  Frame 146-165  Cleanliness was satisfactory</p> <p><b>Deck head</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Good condition</p> <p><b>Internal structure</b>  Good condition</p> <p><b>Other structure</b>  Good condition</p>			



4.43: Fwd F.O. Tank Port - Longitudinal Bhd & Structure



4.44: Fwd F.O. Tank - Bottom

**4.23. Fwd F.O. Tank Starboard**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	N/A
<p><b>Limit of Inspection</b>  Frame 146-165  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Good condition</p> <p><b>Internal structure</b>  Good condition</p> <p><b>Other structure</b>  None noted</p>			



4.45: Fwd F.O. Tank Starboard - Fwd Structure & Bhd



4.46: Fwd F.O. Tank Starboard - Bottom

**4.24. Fwd Lower Side D. O. Tank (Starboard)**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 138-158  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.47: Fwd Lower D.O. Side Tank – Aft Bhd



4.48: Fwd Lower D.O. Side Tank – Bottom

**4.25. Fwd Lower Side F. O. Tank**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		GOOD, SEE BELOW	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Visual inspection of tank located between frames 138-158. Cleanliness was satisfactory</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Good condition</p> <p><b>Internal structure</b>  Good condition.</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Primer locally broken less than 5%.</p>			



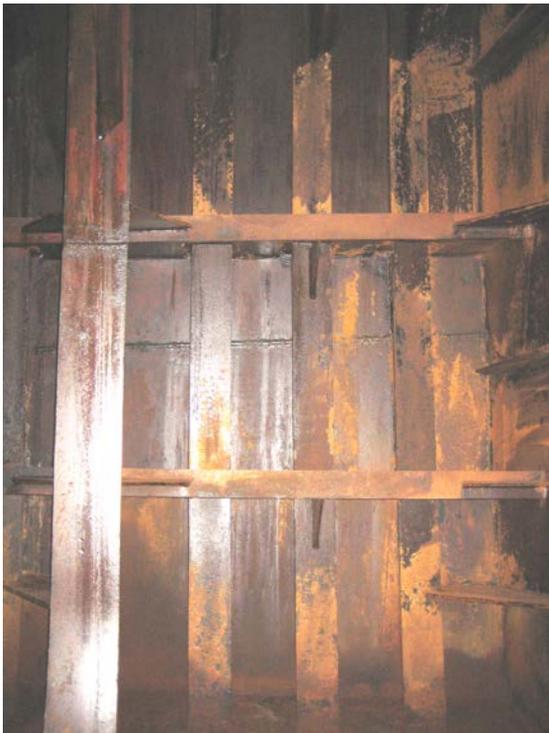
4.49: Fwd Lower Side Fuel Tank – Port



4.50: Fwd Lower Side Fuel Tank - Bottom

**4.26. Heeling Tank Stbd Side**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		SEE NOTE BELOW	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b> Full Visual inspection of tank located between Frames 138-165. Cleanliness was satisfactory.</p> <p><b>Deckhead</b> Tank top found in good condition no corrosion noted</p> <p><b>Transverse Bulkheads</b> Found satisfactory no damage noted.</p> <p><b>Deck or Space bottom</b> Found satisfactory no damage noted</p> <p><b>Internal structure</b> Corroded welds noted at shell frames above top side shell stringer Fr. 138-Fr. 142, 149-151 and top stringer at Fr. 158.</p> <p><b>Other structure</b> None noted</p> <p><b>Coating details</b> Primer found generally broken on welds. Coating poor at bottom and side bulkheads up to 0.5m up from bottom plate.</p>			



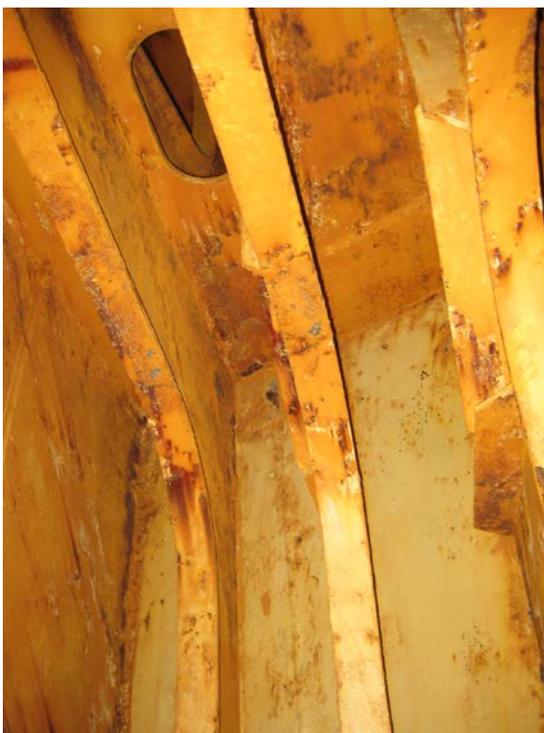
4.51: Heeling Tank Stbd – Port View



4.52: Heeling Tank Stbd – Stbd View

**4.27. Helicopter Fuel Tank Cofferdam**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		GOOD, SEE DETAIL	
Type of coatings:	EPOXY	Extent	FULL
<p><b>Limit of Inspection</b>  Visual inspection of tank located between frames 0-15. Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition</p> <p><b>Coating details</b>  Coating in general gone approx 10-15%.</p>			



4.53: Helicopter Fuel Tank Cofferdam - Stbd



4.54: Helicopter Fuel Tank Cofferdam – Port View

**4.28. Helicopter Fuel Tank**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 4-11  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.55: Helicopter Fuel Tank – Deck



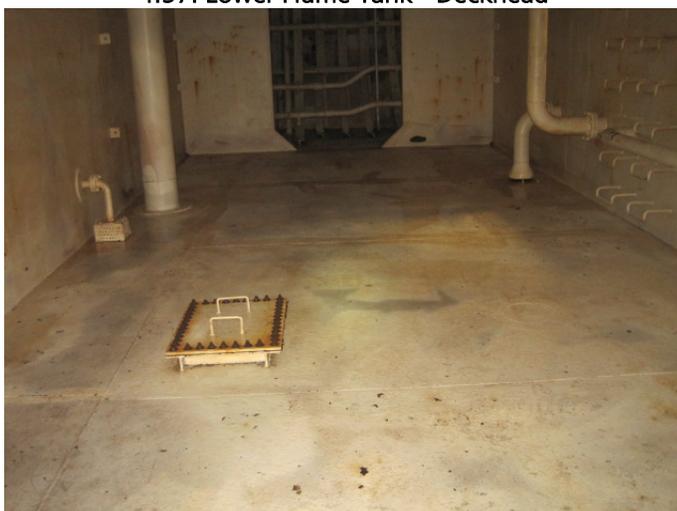
4.56: Helicopter Fuel Tank - Bottom

**4.29. Lower Flume D.O. Tank**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 127-138  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.  Shallow pits covered with coating and coating found stable.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.57: Lower Flume Tank - Deckhead



4.58: Lower Flume Tank - Bottom

**4.30. No.1 D. B. F. O. Tanks Port**

General condition of structure		GOOD, SEE BELOW	
General condition of cathodic protection		N/A	
General condition of coatings		GOOD	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Full Visual inspection of tank located between Frames 123-165.  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Good condition</p> <p><b>Internal structure</b>  Good condition</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Coating broken down locally less than 5%.</p>			



4.59: Double Bottom F.O Tank No. 1 Port – Port View



4.60: Double Bottom F.O Tank No. 1 Port - Bottom

**4.31. No.1 D. B. F. O. Tank Starboard**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		GOOD	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Tank located between Frames 123-165. Portion of the tank aft of Fr. 146 not accessible. Cleanliness was satisfactory</p> <p><b>Deck head</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Good condition</p> <p><b>Internal structure</b>  Good condition</p> <p><b>Other structure</b>  Good condition</p>			



4.61: Double Bottom F.O Tank No. 1 Stbd – Top



4.62: Double Bottom F.O Tank No. 1 Stbd - Bottom

**4.32. No.2 D. B. F. O. Tank Port**

General condition of structure		good	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 97-123  Bottom plating covered with oil at F97-103 between longitudinal bhd and 1<sup>st</sup> girder from inboard, were not inspected  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  Poor welding repair found-welding seam height is lower than base steel plate surface at F99-100 between 1<sup>st</sup> and 2<sup>nd</sup> girder from inboard.  Pitting initiated along bottom plate longitudinal weld seam between 2<sup>nd</sup> and 3<sup>rd</sup> girder from inboard  All other area found good</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



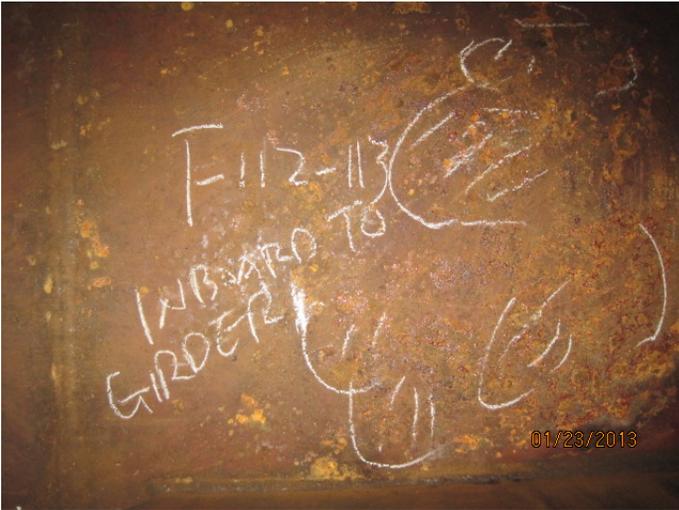
4.63: No.2 D.B.F.O.Tank Port – Deckhead and Structure



4.64: No.2 D.B.F.O.Tank Port - Bottom F99-100

**4.33. No.2 D. B. F. O. Tank Straboard**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 97-123  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  Pitting initiated at F107-108,115-116,119-121 between 3<sup>rd</sup> and 4<sup>th</sup> girder from outboard.  Pitting initiated at F102-118 between 2<sup>nd</sup> and 3<sup>rd</sup> girder from outboard.  Pitting initiated at F97-120 between center longitudinal bulkhead and 1<sup>st</sup> girder from inboard, quite a few individual pits look deep, further examination by thickness measurement inspector to be carried out in order to confirm whether necessary to have immediate repair.</p> <p>Bottom plating dent slightly at F99-100,105-106 and 108-109 between center longitudinal girder and 1<sup>st</sup> girder from inboard.</p> <p>No obvious defects found in other area, structure was in good condition.</p> <p><b>Internal structure</b>  Bilge brackets buckled at F99,107 and 112; 500-1500mm in length and 40-90mm in depth.  F116 floor buckled 500mm in length and 40mm in depth between 1<sup>st</sup> and 2<sup>nd</sup> girder from outboard.  No immediate repair is needed to the above defects  No obvious defects found to other areas, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.65: No.2 D.B.F.O.Tank Stbd - Bottom Pitting



4.66: No.2 D.B.F.O.Tank Stbd - Bottom Dent

**4.34. No.3 D. B. F. O. Tank Port**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	N/A
<p><b>Limit of Inspection</b>  Frame 61-93  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  Pitting initiated at F61-65 between center line and 1<sup>st</sup> girder</p> <p><b>Internal structure</b>  In space between center line to 1<sup>st</sup> girder from center line, floors buckled slightly mid-height, approx depth 40mm.</p> <p><b>Other structure</b>  None noted</p>			



4.67: No.3 D.B.F.O.Tank Port - Side Shell



4.68: No.3 D.B.F.O.Tank Port - Aft Bhd and Bottom Plate

**4.35. No.3 D. B. F. O. Tank Starboard**

General condition of structure		UNSATISFACTORY	
General condition of cathodic protection		N/A	
General condition of coatings		GOOD (Primer only)	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Insection</b>  Frame 61-93  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Slight pitting initiated at a few spots  Bottom pitting at F61-65 extreme inboard was marked/to be repaired by welding  Bottom plate dent at F61-71, no immediate repair is needed.</p> <p><b>Internal structure</b>  Bottom floor and bottom angle bar bent at F61-71, between 1<sup>st</sup> and 2<sup>nd</sup> girder from Inboard. Floor bent at approx 38mm in depth and 300x150mm in area, no immediate repair is needed.</p> <p><b>Other structure</b>  None noted</p>			



4.69: No.3 D.B.F.O.Tank Starboard - Side Shell



4.70: No.3 D.B.F.O.Tank Stbd - Bottom and Suction Pipe

**4.36. No.4 D. B. Bilge F. O. Tank Port**

General condition of structure		SATISFACTORY	
General condition of cathodic protection		SATISFACTORY	
General condition of coatings		FAIR,SEE DETAIL BELOW	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Frame39-55  Ship side space is too narrow to enter for inspection  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Very shallow pitting initiated at 1-5%  Scar pitting developed along bottom plate longitudinal welding butt seam, especially at scallop cut.  Marks were made for TM/repair to be done.</p> <p><b>Internal structure</b>  Good condition</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Bottom plate primer almost gone</p>			



4.71: No.4 D.B. Bilge Tank Port – Structure and Fwd Bhd



4.72: No.4 D.B. Bilge Tank Port - Bottom Plate

**4.37. No.4 D. B. Bilge F. O. Tank Starboard**

General condition of structure		SATISFACTORY	
General condition of cathodic protection		GOOD	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Visual inspection of tank located between frames 39-61. outboard bay was not inspected due to poor accessibility</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Pitting initiated corrosion located at bottom plate between F40-46, depth average 2.0-4.0mm, welding seam eroded at F44-45 inboard bay</p> <p><b>Internal structure</b>  Good condition.</p> <p><b>Other structure</b>  Good condition</p>			



4.73: No. 4 D.B. F.O Tank Stbd – Port View



4.74: No. 4 D.B. F.O Tank Stbd - Bottom Pitting

**4.38. Upper Flume D. O. Tank**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		N/A	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 127-138  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.75: Upper Flume Tank - Port Shell



4.76: Upper Flume Tank - Bottom

**4.39. Feed Water Tank Port**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		good	
Type of coatings:	EPOXY	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 27-30  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.77: Feed Water Tank Port - Bottom



4.78: Feed Water Tank Port - Aft Bhd

**4.40. Feed Water Tank Starboard**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		good	
Type of coatings:	EPOXY	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 27-30  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  Aft transverse bulkhead, first four vertical angle bar stiffener from inboard bent at middle height approx 600mm in height and 20mm in depth, no immediate repair is needed.  No obvious defects found to other areas, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.79: Feed Water Tank Stbd - Bottom



4.80: Feed Water Tank Stbd - Aft Bhd

**4.41. Fresh Water Tank Port**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		good	
Type of coatings:	Epoxy	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 13-27  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.81: Fresh Water Tank Port - Side Shell



4.82: Fresh Water Tank Port – Deckhead and Fwd Bhd

**4.42. Fresh Water Tank Starboard**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		good	
Type of coatings:		Extent	FULL
<p><b>Limit of Inspection</b>  Frame 13-27  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.83: Fresh Water Tank Starboard - Longitudinal Bhd



4.84: Fresh Water Tank Starboard - Bottom

**4.43. Jacket Water Tank**

No report available.



4.85: Jacket Water Tank Port - Structure and Bhd



4.86: Jacket Water Tank Port - Shell Plate

**4.44. Aft Void Space Port**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		SEE DETAILS BELOW	
Type of coatings:	EPOXY	Extent	FULL
<p><b>Limit of Inspection</b> Frame30-39</p> <p><b>Deckhead</b> Good condition</p> <p><b>Transverse Bulkheads</b> Good condition</p> <p><b>Deck or Space bottom</b> Bottom plate dented slightly at F34-37, between side longitudinal bulkhead and girder.</p> <p><b>Internal structure</b> Good condition</p> <p><b>Other structure</b> None noted</p> <p><b>Coating details</b> Bottom plating coating locally broken down 5-20%.</p>			



4.87: Aft Void Space Port - Tank Top



4.88: Aft Void Space Port - Bottom Plate

**4.45. Aft Void Space Starboard**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		FAIR, SEE DETAILS BELOW	
Type of coatings:	EPOXY	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 31-39  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Good condition</p> <p><b>Internal structure</b>  Good condition</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Between longitudinal bulkhead and girder, F35-37 overhead coating gone  F31-39 bottom plate coating gone  F31-33 floor coating broken down at approx 150mm from bottom</p>			



4.89: Aft Void Space Stbd - Side Bhd and Fwd Bhd



4.90: Aft Void Space Stbd - Bottom and Side Bhd

**4.46. Chain Lockers (P&S)**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		See details below	
Type of coatings:	EPOXY	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 183-191  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Upper area coating found good and lower part coating found poor</p>			



4.91: Port Chain Locker - Fwd Wall



4.92: Port Chain Locker - Aft Wall



4.93: Stbd Chain Locker - Middle Wall



4.94: Stbd Chain Locker - Bottom Plating

**4.47. Cofferdam Fr.0-14**

General condition of structure		GOOD see limit of inspection below	
General condition of cathodic protection		N/A	
General condition of coatings		FAIR see details below	
Type of coatings:	EPOXY	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 0-14  Both side areas covered with insulation - not inspected  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Both sides area covered with insulation material - not inspected  Space bottom coating partly broken down  Floor coating poor within height 50mm to bottom</p>			



4.95: Cofferdam F0-14 - Bottom Plate



4.96: Cofferdam F0-14 - Deckhead

**4.48. Cofferdam Under Water Tanks Port**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		good	
Type of coatings:	Epoxy	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 18-30  Inboard aft end two frame spaces not seen as pipe occupied access way  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Tank top coating 20% gone at F27-30 and 15% gone at F19-20  Typically coating along welds found 20% broken</p>			



4.97: Coferdam F18-30 Port - Ship Side & Bottom



4.98: Cofferdam F18-30 Port - Overhead and Longitudinal Bhd

**4.49. Cofferdam Under Water Tanks Starboard**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		good	
Type of coatings:	EPOXY	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 18-30  Inboard aft end two frame spaces not seen as pipe occupied access way  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Fwd outboard corner tank space bottom coat gone locally  Coating broken down at welding seams</p>			



4.99: Cofferdam F18-30 Stbd - Side Shell



4.100: Cofferdam F18-30 Stbd - Fwd Bottom and Longitudinal Bhd

**4.50. Fwd D. B. Void Space Port Side**

General condition of structure		<i>GOOD</i>	
General condition of cathodic protection		<i>N/A</i>	
General condition of coatings		<i>GOOD</i>	
Type of coatings:	EPOXY	Extent	<i>FULL</i>
<p><b>Limit of Inspection</b>  Frame 162-165  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deck or Space bottom</b>  Good condition</p> <p><b>Internal structure</b>  F163 floor buckling at opening approx. 10mm in depth</p> <p><b>Other structure</b>  None noted</p>			



4.101: Fwd D.B. Void Space Port Side - Structure & Longitudinal Bhd



4.102: Fwd D.B. Void Space Port Side - Bottom & Aft Bhd

**4.51. Fwd DP Thruster Cofferdam**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		GOOD	
Type of coatings:	EPOXY	Extent	FULL
<p><b>Limit of Inspection</b>  Full Visual inspection of tank located between Frames 139-146.  Cleanliness was satisfactory.</p> <p><b>Deckhead</b>  Found in good condition</p> <p><b>Transverse Bulkheads</b>  Found in good condition</p> <p><b>Deck or Space bottom</b>  Found in good condition</p> <p><b>Internal structure</b>  Found in fair condition.</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  Coating broken down locally less than 5%.</p>			



4.103: Fwd DP Thruster Cofferdam - Top



4.104: Fwd DP Thruster Cofferdam - Bottom Mild Corrosion

**4.52. No.2 Void Space**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		GOOD	
Type of coatings:	N/A	Extent	FULL
<p><b>Limit of Inspection</b>  Visual inspection of tank located between frames 162-165. Cleanliness was satisfactory</p> <p><b>Deckhead</b>  Good condition</p> <p><b>Transverse Bulkheads</b>  Good condition</p> <p><b>Deeck or Space bottom</b>  Good condition</p> <p><b>Internal structure</b>  Good condition</p> <p><b>Other structure</b>  Good condition.</p>			



4.105: No.2 Void Space – Port View



4.106: No.2 Void Space - Bottom

**4.53. No.5 Void Space**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		GOOD	
Type of coatings:	EPOXY	Extent	FULL
<p><b>Limit of Inspection</b>  Frame 165-176  Cleanliness was satisfactory</p> <p><b>Deckhead</b>  No obvious defects found, structure was in good condition.</p> <p><b>Transverse Bulkheads</b>  No obvious defects found, structure was in good condition.</p> <p><b>Deck or Space bottom</b>  No obvious defects found, structure was in good condition.</p> <p><b>Internal structure</b>  No obvious defects found, structure was in good condition.</p> <p><b>Other structure</b>  None noted</p>			



4.107: No.5 Void Space - Bottom



4.108: No.5 Void Space – Internal Structure

**4.54. Pipe Tunnel**

General condition of structure		GOOD	
General condition of cathodic protection		N/A	
General condition of coatings		POOR, SEE DETAILS BELOW	
Type of coatings:	Intertuf JBA016	Extent	SEE DETAILS BELOW
<p><b>Limit of Inspection</b>  Frame 122-166  No access to the middle of the space. Only ends examined.  Cleanliness was satisfactory.</p> <p><b>Deckhead</b>  Found in good condition</p> <p><b>Transverse Bulkheads</b>  Found in good condition</p> <p><b>Deck or Space bottom</b>  Found in good condition</p> <p><b>Internal structure</b>  Found in good condition</p> <p><b>Other structure</b>  None noted</p> <p><b>Coating details</b>  The first three frame spaces from fwd coating gone</p>			



4.109: Pipe Tunnel - Aft Structure



4.110: Pipe Tunnel - Fwd Bottom

## **App 1. Thickness Measurement Report**

Provided as separate file

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