

**CCGS Leonard J Cowley
Drydocking Refit 2017
October 23 to December 04, 2017**



Table of Contents

Contents

PREAMBLE.....	6
1.1 Intent.....	6
1.2 General Particulars of Leonard J. Cowley	6
1.4 Technical Data Package	6
1.5 Progress Meetings	9
1.6 Parking	9
1.7 Fees and Costs	9
1.8 “As Delivered” Inspections.....	9
1.9 Vessel Security.....	10
1.10 Property of Canada.....	10
1.11 Project Management.....	10
2.0 GENERAL TECHNICAL.....	12
2.1 Physical Operating Conditions for Equipment.....	12
2.2 Protection of Personnel	14
2.3 Workplace Hazardous Materials Information System (WHMIS).....	16
2.4 Protection of Equipment.....	16
2.5 Access to Vessel and Equipment	17
2.6 Assembly of System Equipment and Components	17
2.7 Welding	18
2.8 Coatings and Painting.....	19
2.9 Cleaning	20
3.0 Documentation	21
3.2 Workmanship	22
3.3 Facilities	23
3.4 Removals.....	23
3.5 Exposure and Protection of Equipment.....	23
3.6 Lighting and Ventilation	23

3.7	Electrical Standards.....	23
3.8	Transducers	24
3.9	Fire Detection and Suppression Systems	24
3.10	Air Testing of Structural Tanks	24
3.11	Purchase Orders.....	24
3.12	Tests / Trials and Inspection Records	24
3.13	Certificate Records	25
3.14	List of Acronyms.....	25
4.0	Tests, Dock Trials and Sea Trials.....	26
H - 01	: Production Chart	28
H - 02	: Services	31
H - 03	: Sea Trials	37
H-04	: Fixed foam and Wet Chemical	40
H - 05	: Fixed Smothering Systems	43
H - 06	: HVAC Duct Cleaning.....	47
H-07	: Liferafts and HRU's.....	50
H-08	: Lifeboats and Davits	53
H-09	: Shower Stall Repairs.....	57
H -10	: Lloydes Special Survey Thickness Testing	60
H-11	Sewage Treatment Plant.....	64
H-12	Galley Hood Cleaning.....	70
H-13	: Miranda Davit Annual Inspection.....	74
HD - 01	: Dry-Docking	80
HD - 02	: Underwater Hull Inspections	84
HD - 03	: Cathodic Protection.....	87
HD -04	: SW Cooling Anti-Fouling System	91
HD - 05	: Sacrificial Hull Anodes	97
HD - 06	: Underwater Hull Painting	101
HD-07	: Hull Painting Above Ice Belt.....	105
HD - 08	: Hull Butts and Seams.....	109
HD – 09	:Cooling Water Drains Tanks	111

HD – 10 : Forward Capstan Hydraulic Motor.....	114
HD – 11 : Bilge Keels	118
HD - 12 : Grey water Tank.....	121
HD - 13 : Fresh Water Tank Cleaning	125
HD - 14 : Windlass Port and Stbd	129
HD - 15 : Water Ballast Tank #5.....	133
HD-16 Water Ballast Tanks	149
HD-17 Deck Workshop Ventilation.....	166
HD-18 Forward Machinery Space Ventilation	170
HD-19 Seabay and Sea Chest Coating.....	174
HD-20 Fuel Oil Tanks	180
HD-21 Lube Oil Tanks.....	186
HD-22 Sludge Tank	191
HD-23 Steering Compartment Bilge Painting	195
HD-24 Anchor Chains and Chain Locker	200
HD-25 Bow Thruster Bilge Painting.....	204
HD-26 Hull Repair on Stbd Aft Quarter	208
HD-27 Funnel Structure Repair	218
E-01 Bow Thruster Survey.....	223
E-02 Port and Stbd Clutch Survey/Overhaul	228
E-03 Gearbox Bearing Replacement.....	234
E-04 : Rudder Propeller Shaft and Bearings	238
E-05 : Gearbox Lube Oil Pre-heat.....	246
E-06 Steering Gear	251
L - 01 : Fire Detection Systems.....	257
L - 02 : Meggar Testing.....	261
L - 03: Thermoscan	264
L - 04: Doppler Speed Log Upgrade	267
L-05 Focle Deck Light Replacement	285
L-06 Global Maritime Distress & Safety System Replacement	288
Appendix A	299

Appendix B 11

PREAMBLE

1.1 Intent

These project requirements are supplied to the contractor outlining the objectives, performance, standards and engineering requirements for the drydocking of the CCGS Leonard J. Cowley for the Canadian Coast Guard.

Notwithstanding any errors, omissions, discrepancies, duplication or lack of clarity in these project requirements, it shall be the responsibility of the Contractor to ensure that:

1. The execution of the work specified herein is to the satisfaction of the Inspection Authorities (Chief Engineer and/or his representative) and Regulatory Bodies.
2. The overhaul and installation of all machinery and equipment specified herein shall be as per the manufacturer's applicable instructions, drawings and specifications.
3. All items and equipment supplied are deemed necessary for the safe and satisfactory operation and seaworthiness of the vessel, as required for a vessel of this size and type.
4. Individual work items that the Contractor shall address during the CCGS Leonard J. Cowley's drydocking are outlined in this specification.
5. A complete listing of drawings for the CCGS Leonard J. Cowley is attached in Appendix A.

1.2 General Particulars of Leonard J. Cowley

Length O.A.: 72.0 m

Length B.P.: 67.0 m

Breadth Overall: 14.0 m

Depth Moulded: 4.9 m

Mean Draft, Extreme: 4.3 m

Displacement, Extreme: 2087 tonnes

Displacement, Docking: 1495 tonnes

1.4 Technical Data Package

The Successful Contractor is provided with the following data packages to fully define the scope of work for the CCGS Leonard J. Cowley Drydock refit

Project:

Cowley 2017 Drydock

Page 6

1. Technical Specifications (This Specification Document);
2. Guidance Drawings – Electronic format;
3. CCGS Leonard J Cowley Manuals; as per specification requirement
4. Applicable CCG Standards and Guidelines – Electronic format.
5. DFO 5847 Paint and Hull Coating Standard.
6. Canadian Coast Guard Standard TP 6151E, Welding of Ferrous Material
7. DFO 9415 Welding of Aluminum and Aluminum Alloys.
8. 30-000-000-ES-TE-001 – Colour Coding Standard for Piping System

Supplementary Documentation (not provided by the CCG)

9. ASTM F1321-92 (2004) – Standard Guide for Conducting a Stability Test (Lightweight Survey and Inclining Experiment) to determine the Light Ship Displacement and Centers of Gravity of a Vessel
10. ASTM G82-95 (2003) – Standard Guide for Development and Use of a Galvanic Series for Predicting Galvanic Corrosion Performance
11. CAN/CGSB-1.193-99 – Canadian General Standards Board for High-Build Epoxy Marine Coating
12. CAN/CGSB 1.61-2004 – Canadian General Standards Board for Exterior Marine Alkyd Enamels
13. CAN/CGSB 3-GP-11D – Naval Distillate Fuel, 2002-11-01
14. CAN/CGSB 4.155-M88 – Canadian General Standards Board Flammability of Soft Floor Coverings – Sampling Plans
15. CAN/CGSB 51.53-95 – Poly (vinyl chloride), Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts
16. CAN/ULC-S102-03 – Surface Burning Characteristics of Building Materials and Assemblies
17. CAN/ULC-S109-03 – Flame Tests of Flame-Resistant Fabrics and Films
18. Canada Shipping Act Machinery and Hull regulations pertaining to a Research Vessel having general particulars as specified under Section 1.2
19. CSA C22.1 SB-06 – Canadian Electrical Code Standard Part I Safety Standard for Electrical Installations
20. CSA C22.2 – No. 0-M91 (R2006) – General Requirements – Canadian Electrical Code Part II
21. CSA CAN3-Z299.3-85 (R2002) – Quality Assurance Program Category 3
22. CSA W47.1 03 – Certification of Companies for fusion welding of steel
23. CSA W47.2-M1987 (R2003) – Certification of Companies for fusion welding of aluminum
24. IEC 60092-504 ED 3.0 en: 2001– Electrical Installations in Ships – Part 504: Special Features – Control and Instrumentation
25. CAN/CSA-C22.2 No 60529-05 Degrees of protection provided by enclosures (IP Code)
26. DFO 5737 Fleet Safety Manual.
27. IEC 60533 Second Edition – Electrical and Electronic Installations in Ships – Electromagnetic Compatibility
28. IEEE 45 STD -2002 – Recommended Practice for Electrical Installations Shipboard
29. IEEE STD 315-1975 (Reaffirmed 1993) – Graphic Symbols for Electrical and Electronics Diagrams

30. ISO 4406 – 1999 – Hydraulic fluid power -- Fluids -- Method for coding the level of contamination by solid particles
31. ISO 18413:2002 – Hydraulic fluid power – Cleanliness of parts and components – Inspection document and principles related to containment collection, analysis, and data reporting
32. ISO/TR 10949:2002 – Hydraulic fluid power – Component cleanliness – Guidelines for achieving and controlling cleanliness of components from manufacture to installation
33. ISO/TS 16431:2002 – Hydraulic fluid power – Verification of cleanliness
34. ISO 15748-1:2002 - Ships and marine technology - Potable water supply on ships and marine structures - Part 1: Planning and design
35. ISO 15748-2:2002 - Ships and marine technology - Potable water supply on ships and marine structures - Part 2: Method of calculation
36. ISO 2081 – 1986 – Metallic Coatings – Electroplated Coatings of Zinc on Iron or Steel;
37. Lloyd’s Classification Society Rules for the Classification of Ships
38. MOSH (SOR/87-183) – Marine Occupational Safety and Health Regulations
39. PMBoK 3rd Edition – Project Management Institute guidelines to project management
40. Provincial Department of Labour Industrial Health Regulations respecting removal of Asbestos
41. S.N.A.M.E – Rules/Guidelines for Shop and Installation Trials – latest edition
42. S.N.A.M.E.(3-47)*1989 – Rules/Guidelines for Sea Trials – latest edition
43. SOLAS recommendations
44. TP 11469 E – Guide to Structural Fire Protection
45. TP 127E (2002) – Ship Safety Electrical Standards
46. TP 11469 – Guide to Structural Fire Protection 1993
47. TP 1861E Standards for Navigation Lights, Shapes, Sound Signal Appliances and Radar Reflectors (1991)
48. TP 2072E Deck Cargo Safety Code 1974
49. TP 7301 Stability, Subdivision, and Load Line Standards 1975
50. T.C.M.S. Ship Safety Bulletin 06/1989 Grounding Safety in Dry-dock
51. UL 1309 – Standard for Safety for Marine Shipboard Cable

TP Publications are available at the following web site:

<http://www.tc.gc.ca/marinesafety/tp/menu.htm>

CGSB Standards and publications are available at the following web site:

<http://www.scc.ca>

ULC Standards and publications are available at the following web site:

<http://www.ulc.ca>

Canadian Standards Association Standards are available at the following web site:

<http://www.csa.ca>

International Standards Organization (ISO) is available at the following web site:

<http://www.iso.org>

IEEE Standards and publications are available at the following web site:

<http://www.standards.ieee.org>

British Standards are available at following web site:

<http://www.bsi-global.com>

ANSI Standards are available at the following web site:

<http://www.ansi.org>

ASTM Standards are available at the following web site:

<http://www.astm.org>

ASME Standards are available at the following web site:

<http://www.asme.org>

S.N.A.M.E. Rules/Guidelines are available at the following web site:

<http://www.sname.org>

Project Management Guidelines are available at the following web site

<http://pmi.org>

1.5 Progress Meetings

The Contractor shall provide an adequate Boardroom for Meeting and Meetings shall be held weekly or more frequently as determined by the Contract Authority

1.6 Parking

Parking spaces, as referenced in H-02 Services, shall be allocated within the confines of the shipyard for Government personnel. The spaces shall be clearly marked and the required passes provided to Government personnel.

1.7 Fees and Costs

The Contractor shall include in their bid for the following fees and costs as and when they are incurred during the course of the project:

1. Services;
2. Pilots and tugs;
3. Factory Service Representatives;
4. Tests and Trials of equipment and vessel;
5. Provision of safety services, e.g. gas freeing of tanks, fire protection, air quality monitoring for areas containing asbestos;
6. Certification of lifting devices as required;
7. Type approval of equipment to be installed if required.

1.8 “As Delivered” Inspections

The Contractor shall, with the Technical Authority and the Chief Engineer, carry out an operational inspection of the vessel upon arrival at the yard. All parties shall sign off on the operational assessment of vessel's equipment and systems. This activity shall be carried out before hand-over of the vessel to the Contractor.

Upon completion of all refit work, the contractor shall, with the Technical Authority and the Chief Engineer, carry out an operation inspection of the vessel.

1.9 Vessel Security

There shall be a Visitor Log at each main access to the vessel. The Contractor shall ensure that all its employees and sub-contractor personnel sign-in when entering the vessel, and sign-out when departing. This requirement includes all visitors to the vessel, including inspectors and vendors.

These logs shall be available to the Contractor's Security personnel in the event of any emergency.

1.10 Property of Canada

All materials and equipment removed from the vessel by the Contractor, unless specifically identified within the project requirements for disposal as scrap, shall remain the property of Canada.

All such equipment and materials shall be held and retained in good condition by the Contractor pending instructions from the Chief Engineer.

The Contractor may obtain agreement with the Chief Engineer for the disposal of materials and equipment that will have no market value after removal from the vessel. Any cost associated shall be dealt with thru 1379.

1.11 Project Management

1.11.1 Introduction

Project management refers to system integration and technical control as well as business management of the CCGS Leonard J. Cowley Drydock refit.

1.11.2 Project Action Plan (PAP)

The Contractor shall document the project management for the work in a Project Action Plan and shall update this plan at weekly intervals or more frequently as required by the Contracting Authority.

The PAP shall comprise organization structure charts, a master schedule, support schedules, sub-Contractor schedules and work, Government Furnished Equipment, and Contractor Furnished Equipment delivery dates as a minimum.

The weekly updates to the PAP shall comprise schedule updates, a progress report and review meetings. The components of the PAP and its updates are described in the following sub-sections.

1.11.3 Project Integration Management

The Contractor shall provide an overall project organizational chart identifying all key personnel and sub-Contractors. Further, the Contractor shall identify the contract-related work each sub-Contractor is responsible for.

1.11.4 Change Management Log

The Contractor shall provide a Change Management Log that shall be used for the duration of the project to manage project changes.

The Change Management Log shall track project issues with the following criteria:

- Individual tracking number;
- Date issue was raised;
- Expected resolution date;
- Date issue was resolved;
- Brief note of resolution on issue;
- Individual who raised issue;
- Individual assigned to resolve issue;
- Risk Factor.

If issues require a change in the work they shall be dealt with through the PWGSC 1379 Process.

1.11.5 Risk Management

The Contractor shall identify emergent risks and rank these risks by impact on the work. Mitigation strategies shall be identified for all “High” risks. The “Risk Management Plan” shall be updated at least bi-weekly and provided to the Technical and Contracting Authorities. The “Risk Management Plan” shall be included in the weekly progress meeting Record of Decisions.

1.11.6 Scheduling

The Contractor shall provide a schedule(s) that breaks the work down to the system and component level. The schedule shall include sub-Contractor schedules to the same level. The Contractor shall update the schedule(s) on a weekly basis and the updates shall be provided to the Contract Authority, the Chief Engineer and the Technical Authority.

The schedule(s) shall identify all work in the project. It shall include long lead items, GFE, strip outs, production, assembly, installation, bench testing, system commissioning and tests and trials, as well as all scheduled and required resources.

The schedule(s) shall identify the major milestones, critical path and all interrelationships between tasks. The schedule(s) shall be baseline.

The initial schedule(s) shall be delivered 21 calendar days after contract award.

A milestone schedule shall be supplied with the bidder's tender package.

Microsoft Project 2007 shall be used as the software for all scheduling.

1.11.7 Project Reporting

The Contractor shall provide a weekly Progress Report describing the status of the project Time Line, Cost and Performance as an introduction. Time, Cost and Performance shall then be addressed in detail. The report shall identify significant risks to the program and the actions taken to resolve these risks. The risk analysis shall identify any impact upon delivery and actions taken to recover any slippage that may affect the contract delivery date. The report, either in hard copy or in electronic format, shall be delivered weekly, two (3) working days prior to the progress review meeting to the Contract Manager, the Chief Engineer and the Technical Authority. The progress report shall include sub- Contractor and major component supplier activity.

2.0 GENERAL TECHNICAL

2.1 Physical Operating Conditions for Equipment

All new machinery and/or equipment that are to be supplied and installed shall be designed for operation under the following conditions:

1. Outside air temperature:
 - 40 degree C winter;
 - +35 degree C summer;
2. Water temperature:
 - 0 degree C winter;
 - 30 degree C summer;
3. Wind Velocity of 80 knots;
4. Sea State 6;
5. Ship inclination of up to 35 degrees roll on either side, with a cycle frequency of 10 seconds, and 10 degree pitch with a cycle frequency of 5 seconds and maximum linear acceleration of 1.0g;
6. Permanent list of 22.5 degrees port or starboard, and permanent trim of 10 degree fore and aft.

2.1.1 Equipment below Decks

All equipment shall be capable of its intended operation at the following ambient conditions:

1. 95% relative humidity at temperatures to 50 degree Celsius.

2.1.2 Equipment above Deck

The equipment shall be protected by means of an enclosure and shall be capable of its intended operation in the following conditions:

1. The installation of equipment in weather deck locations shall be such that it is impervious to the effects of sea spray.

2.1.3 Electronic Compartments

Compartments containing electronic equipment shall be provided with ships services to maintain the following conditions:

Manned Compartments:

1. Room temperature: 20°C to 25°C;
2. Relative humidity: 5 to 70%;
3. Noise level: 65 dBA.

Unmanned Compartments:

1. Room Temperature: 20°C to 25°C;
2. Relative humidity: 40 to 70%;
3. Noise level: 80 dBA.

2.1.4 Vibration

All shipboard equipment, racks, cables and other accessories shall be mounted so as to be capable of performing their intended operation under the following conditions:

Shipboard Vibration:

1. Up to 13.2 Hz with displacement amplitude of +/- 1.0mm;
2. 13.2 to 80.0 Hz acceleration amplitude of +/- 0.7g with a maximum acceleration of 0.7g;
3. Natural frequencies at supports for equipment and parts of equipment shall not be within the 0 to 80 Hz range, except where they cannot be kept outside this range by constructional design methods, the vibration shall be damped so that undue amplification is avoided.

2.1.5 Penetrations

2.1.5.1 Prior to the start of work, the Contractor shall obtain information on the classification of the deck heads and bulkheads, which will be penetrated with cables, prepare a sketch of the method of penetration and submit this to the Technical Authority, Chief Engineer, and TCMS for approval.

2.1.5.2 The Contractor shall fill to an as-new condition all redundant penetrations of bulkheads and decks which result from carrying out the work. The structural, watertight and fire resistant integrity of bulkheads and decks is to be maintained.

2.1.5.3 Any penetrations through classified bulkheads or deck heads shall meet TCMS regulations. TP 11469 – Guide to Structural Fire Protection (1993) shall be used for penetrating fire rated bulkheads or deck heads. Additional information is provided in TP 439E – Structural Fire Protection Standards.

2.1.5.4 Where cables are installed in bunches, install with due cognizance to the fire protection requirements of Lloyd's. Where cables pass through watertight or fire zone bulkheads or decks, approved water/fire type cable transits, which can be dismantled for future alterations, shall be used.

2.2 Protection of Personnel

The Contractor shall ensure the removal of all rough edges, points, sharp corners and protrusions created during the conduct of the work.

Smoking is not permitted aboard this vessel.

2.2.1 Lockout and Tagout Procedures

1. The Contractor shall be responsible to protect persons working onboard the vessel while working on or near shipboard systems and equipment from accidental exposure to:

1. electrical current
2. hydraulic pressure
3. pneumatic pressure
4. gas or steam pressure and vacuum
5. high temperatures
6. cryogenic temperatures
7. radio frequency emissions
8. potential reactive chemicals
9. stored mechanical energy
10. equipment actuation

2. The contractor, under the supervision of the Chief Engineer and or the Electrical Officer, shall be responsible for the Lockout and Tag out of equipment and systems listed in the specification.

3. The Contractor shall supply and install all locks and tags and shall complete the Lockout Tag out Log sheet provided by the vessel.

2.2.2 Hot Work

The following precautions shall be taken where hot work is to be conducted:

1. The compartment(s) affected shall be certified gas free by a certified marine chemist or other qualified person. The Contractor shall keep copies of all active and expired hot work certificates in a central location on the vessel for viewing. Certificates shall specify, "Safe for persons" and/or "safe for hot work" as appropriate. The Contractor shall post a copy of all certificates at the entrance to the affected spaces;
2. Protective material shall be used to prevent the spread of sparks, protecting electrical cables and other services;
3. Fire sentries shall be provided in each space and in all adjacent spaces, if welding, grinding and burning is being carried out. Fire sentries shall be provided with an appropriate fire extinguisher and shall be trained in its use. The fire sentry shall maintain a watch in his designated area for at least thirty (30) minutes after any hot work has been completed. Any hot work carried out onboard the vessel during the contract period shall be conducted in accordance with the Contractor's Standard Operating Procedures (SOP's) based upon a review and acceptance of the Contractor's SOP's by the Contract Authority and the Technical Authority. The contractor shall comply with the work requirements as outlined in the Canada Labour Code and applicable provincial regulations.

2.2.3 Confined Space Entry

The Contractor shall keep copies of all active and expired entry permits with certified marine chemist or other qualified person's "Gas Free Certificate" in a central location on the vessel for viewing. Certificates shall specify, "Safe for persons" and/or "safe for hot work".

Any entry into confined spaces during the contract period shall be conducted in accordance with the Contractor's Standard Operating Procedures (SOP's) based upon a review and acceptance of the Contractor's SOP's by the Contract Authority and the Technical Authority.

The contractor shall comply with the work requirements as outlined in the Canada Labour Code and applicable provincial regulations.

2.2.4 Rotating Machinery

Newly installed machinery shall be provided with shielding to prevent contact with rotating elements.

2.2.5 Electrical Equipment

When working on electrically operated equipment, the following precautions shall be taken:

1. Electrical lock-outs shall be used to isolate the equipment and electrical caution tags posted at the main power and distribution panel on those switches supplying equipment under maintenance and verification made at the terminals to ensure power is not present. Any lock-out requirements onboard the vessel during the contract period shall be conducted in accordance with the Contractor's Standard Operating

Procedures (SOP's) based upon a review and acceptance of the Contractor's SOP's by the Contract Authority and the Technical Authority. The contractor shall comply with the work requirements as outlined in the Canada Labour Code and applicable provincial regulations.

2.2.6 Work Aloft

Any work aloft shall be conducted in accordance with the Contractor's Standard Operating Procedures (SOP's) based upon a review and acceptance of the Contractor's SOP's by the Contract Authority and the Technical Authority. The contractor shall comply with the work requirements as outlined in the Canada Labour Code and applicable provincial regulations.

2.2.7 Asbestos

No material containing asbestos shall be used. Any handling of material containing asbestos shall be performed by personnel trained and certified in accordance with Provincial Labour Regulations. The Contractor shall provide the certificates of certified personnel to the Chief Engineer prior to the commencement of any such work.

The Contractor shall be responsible for the safe disposal of any asbestos containing material where such material is disposed of. The Contractor shall provide the Chief Engineer with copies of certificates pertaining to the disposal of the asbestos containing material in accordance with Federal, Provincial and municipal regulations.

2.3 Workplace Hazardous Materials Information System (WHMIS)

The Technical Authority will identify to the Contractor any hazardous materials that are onboard the vessel in accordance with the Workplace Hazardous Materials Information System (WHMIS).

WHMIS Material Safety Data Sheets for identified hazardous materials onboard the vessel will be provided to the Contractor by the Technical Authority.

The Contractor shall be responsible for all Contractor supplied products and materials used aboard the vessel. These materials shall be identified to the Technical Authority and the Chief Engineer. Copies of the MSDS sheets shall be kept in a central location on the vessel for viewing.

2.4 Protection of Equipment

The Contractor shall take measures to ensure that all surfaces and items of material or equipment installed on the vessel, finished surfaces, final color coats and other finished work shall be protected against damage, soiling, and/or contamination.

All electrical and electronic equipment and components shall be protected during the contract against damage by direct or indirect physical contact or by the effects of adverse temperatures or other environmental conditions.

Any damage to surfaces, equipment, furnishings or decor incurred prior to acceptance by Canada shall be returned to “As Delivered” condition by the Contractor at no expense to Canada.

All openings in machinery and/or systems prior to connections being made shall be kept covered by inserts or covers at all times.

The Contractor shall obtain and follow instructions from its sub-Contractors for any special protection required for sub-Contractor furnished equipment during the project work. Such instructions shall be made available to the Technical Authority and the Chief Engineer.

The Contractor shall ensure that the ship's machinery, equipment and systems are protected from all hazards, including but not limited to damage from ongoing work, corrosion, sandblasting (directly or indirectly), paint over spray, hot work, adverse temperature or other environmental conditions and contaminants.

2.5 Access to Vessel and Equipment

2.5.1 Installation and Removal Routes

If the Contractor intends to disturb the physical structure of the vessel to facilitate removal or installations prior approval of the Technical Authority and the Chief Engineer is required.

All interference items, protected, removed or disturbed during the course of overhaul, removal and installation, including lagging and/or insulation, shall be renewed in good order to “As Delivered” condition on completion of work, unless otherwise specified.

2.5.2 Access for Maintenance

The layout of the machinery and equipment shall be designed and constructed to permit ready access for inspection, maintenance and repair without disturbance of other machinery, equipment or structures. Provisions shall be made for the removal of machinery components.

2.6 Assembly of System Equipment and Components

2.6.1 Securing Arrangements of System Equipment and Components

All new and existing systems, equipment and components installed or disturbed as a result of the work, shall be secured to prevent damage caused by the physical operating conditions of the vessel, as per Section 2.1 of this Preamble.

The Contractor shall follow manufacturers’ recommendations for installation arrangements. In the event this information is not available, securing arrangements shall be approved by the regulatory requirements prior to the Contractor commencing the securing activities.

The Contractor shall ensure torque specifications as provided by the manufacturer. Where manufacturer specific torque specifications are not provided, standard SAE nut and bolt torques shall be used.

2.6.2 Cleaning

The Contractor shall ensure that after installation, parts and assembled equipment shall be cleaned of smudges, spatter or excess solder, weld metal and metal chips or any other foreign material. This includes any particles that could loosen or become dislodged during the normal expected life of the equipment. All corrosive material shall be removed. This cleaning shall take place before final assembly of the equipment parts. Any disturbed paint is to be repaired prior to closing machinery.

2.6.3 Tools

The Contractor is to supply all of the tools required to do the work except for certain specialty tools which will be issued to the Contractor and which must be returned in good order to the Chief Engineer. In all other instances, ship's tools are not to be used by the Contractor.

2.6.4 Materials and Substitutions

All materiel is to be Contractor supplied and new and unused unless otherwise specified. All replacement material in the form of jointing, packing, insulation, small hardware, oils, lubricants, cleaning solvents, preservatives, paints, coatings etc, are to be in accordance with the equipment manufacturer's drawings, manuals or instructions. Where no particular item is specified, or where substitution must be made, the Owner's Representative must approve all material offered.

2.7 Welding

2.7.1 General

For fusion welding for steel the Contractor shall be certified in accordance with the Canadian Welding Bureau (CWB), CSA\ACNOR W47.1 1983, Division 2.1.

The Contractor shall supply proof of his accreditation to the Chief Engineer.

All such welding shall be to CSA Standard W59M "Welded Steel Construction (Metal Arc Welding) (Metric Version)".

All aluminum welding shall conform to the requirements of CSA Standard W47.2-M1987 (R1998) "Certification of Companies for Fusion Welding of Aluminum" Division 2.1 and shall be performed by persons currently certified by the Canadian Welding Bureau to CSA Standard W47.2-M1987 (R1988). Proof of certification shall be provided to the Chief Engineer.

The Contractor shall provide copies of all welding certificates at the start of the contract work.

The Contractor shall submit CWB stamped welding specifications and weld procedure data sheets to Lloyd's where required. Weld procedures for joining pipe connections shall be recorded and approved by CWB in accordance with ASME.

All procedures pertaining to hot work as detailed in Section 2.2.2 of this Preamble shall be adhered to.

2.7.2 Removal of Attachments

Temporary cleats and fastenings for servicing structures shall be removed by burning or grinding, and any remaining irregularities shall be ground flush with the surface of the parent plate. Any disturbed paint is to be repaired

2.7.3 Weld Design Requirements

The size, length and details of welds shall be approved by Lloyd's.

2.8 Coatings and Painting

2.8.1 General

Unless otherwise stated in the individual specification item, the primer is to be International Paints Interplate Zinc Silicate NQA262/NQA026 red, or equivalent.

All pipe markings shall be in accordance with CGFM 308-00-03, Color Coding Standard for Piping Systems.

All new and disturbed steel and aluminum work shall be painted in accordance with publication DFO 5847 and to the paint manufacturer's specifications.

All paint shall be for marine application and shall meet CAN/CGSB 1.61-99 for exterior marine alkyd enamels and CAN/CGSB 1.193-99 for marine epoxy paints.

Paint, varnish and other finishes used on interior surfaces shall be listed in TCMS's list of approved products, TP-438.

Each coat of paint shall be of a different shade to indicate proper coverage, and thoroughly dry before application of subsequent coats. At minimum, the first primer coat shall be applied by brush or airless spray.

The final topcoats shall be protected from soiling or damage until the custody of the vessel is returned to Canada. Care shall be taken in the application of paint to ensure that furnishings,

and equipment liable to more serious damage due to excess spray, shall be adequately protected.

The following shall NOT be painted:

1. Screw threads;
2. Grease fittings;
3. Bronze pins;
4. Door screens;
5. Nameplates;
6. Gaskets;
7. Stainless steel or monel metal fittings;
8. Machined surfaces;
9. Instrumentation;
10. Interior gratings;
11. Electrical wires, insulation and fittings;
12. Electrical panels;
13. Rubber seals of watertight doors and hatches;
14. Fire door seals; and, in general, all working parts.

2.8.2 Heavy Metal Based Coatings

Paints containing lead, mercury or copper shall not be used

2.8.3 Blasting Debris

The contractor shall adhere to applicable regulations for containment of blasting debris.

2.9 Cleaning

The Contractor shall maintain the vessel in a clean condition. Debris and garbage shall be removed from the vessel and disposed of at the end of each working day.

Attention shall be given to hazardous materials such as flammable or toxic waste products. These shall be disposed of in accordance with federal, provincial and municipal regulations.

Vessel cleanliness shall extend to the bilge areas which shall be maintained free of oil, water, and debris for the duration of the project.

Work areas are to be totally swept or vacuumed clean to the Chief Engineer's satisfaction at least every third day and dirt removed from the vessel.

3.0 Documentation

All Contractor supplied documentation shall become the property of Canada. This shall include all electronic media. Electronic media shall not be protected to prevent making additional copies for internal use.

3.1.1 Drawings – General

All drawings supplied by the Contractor shall be AutoCAD 2000 DWG format compatible. Electronic drawings shall not be protected so as to be “Read-Only” files. Fonts for text shall be AutoCAD 2000 standard.

Electronic drawings shall be provided to the Technical Authority on CD-ROM media. All disks shall be clearly labeled with the project number, file names and drawing numbers. Disks shall be labeled “As Fitted” drawings for those drawings that have been approved and finalized.

A complete list of symbol (block) names with a description of each symbol shall be provided. One block per drawing shall be provided in electronic format suitable for use with AutoCAD 2000. Drawing sheet sizes, including where possible vendor drawings, shall be ANSI standards with standard border and title block in the layout section.

“As Fitted” prints/plots shall not contain markings or corrections by hand, i.e. marker, pen, pencil.

The Contractor shall provide the Chief Engineer and the Technical Authority with all drawings required by or generated by the sub-Contractors. Schematic drawings of systems shall include all pertinent system information, including sizes, dimensions, labeling, equipment locations, and all information relating to system fittings.

The Contractor shall have in place a complete system of documenting and controlling all drawings and drawing revisions affected by the work. The Contractor shall maintain an up-to-date list of drawings and revisions and shall provide this list to the Chief Engineer and the Technical Authority at the monthly progress meeting. This list shall include a column of all drawings sent to Lloyd’s for approval.

3.1.2 Guidance Drawings

All technical guidance drawings are issued to the Contractor from the Canadian Coast Guard for guidance purposes only. The Contractor is to note that not all guidance drawings supplied are “As Fitted” drawings. The Contractor shall physically verify all affected items and all dimensions necessary for the work.

3.1.3 “As Fitted” Drawings

Upon completion of the work, the Contractor shall transfer all mark-ups from the working drawings to a final revision of all vessel drawings affected by the project work. These drawing shall become the “As Fitted” drawings for the project work.

The Contractor shall update all vessel drawings affected by the work. Prior to completion of the contract, the Contractor shall supply to the Technical Authority the following:

1. Four (4) plotted copies of the latest revision of each of the “As Fitted” drawings;
2. Four (4) electronic copies of the latest revision of each “As Fitted” drawing on individual CD-ROM media in AutoCAD 2000 DWG format. CD-ROM media shall be supplied with detailed file lists for each CD-ROM;
3. All drawings shall become the property of Canada;
4. Plotted drawings shall be on standard ANSI paper sizes. If no AutoCAD drawing files are produced then scanned files (raster format) shall be supplied to the Technical Authority in a TIF format. “As Fitted” drawings shall be delivered within 15 days after completion of the sea trials.

3.1.4 Framed Drawings

The following drawings, modified to “As Fitted” status for the vessel shall be printed, framed and mounted on board the vessel in locations to be designated by the Technical Authority:

1. General Arrangement Drawings, Plan View of all Decks and Profile;
2. Capacity Plan;
3. Single line Electrical;
4. Fire Fighting Systems and Life Saving Equipment.

3.1.5 On-Site Government Office Drawing Updates

As drawings are developed, during the performance of the Work, the Contractor shall provide the On Site Government Office, one (1) hard copy of the latest revision of each drawing. Drawings shall be provided in their native size.

The frequency of drawing updates shall not be less than weekly.

An updated drawing index shall be provided with each batch of updated drawings.

3.2 Workmanship

The contractor shall use fully qualified, certified competent tradesmen. Supervision and shall ensure a uniform high level of workmanship as judged by normally accepted shipbuilding standards to the satisfaction of the Owner’s Representative.

3.3 Facilities

Contractor's bid shall include all the necessary labour and equipment required for the erection of access staging, rigging, lighting, tugs, pilotage, necessary crange and line handling.

During the entire refit the contractor shall maintain in a state of good order all walk-ways, scaffolding, ladders, guardrails and similar appliances which are necessary for the safety of persons working or on business in the areas where work is in progress.

3.4 Removals

Any items of equipment to be removed and subsequently reinstalled in order to carry out the work specified or for access to carry out the work specified shall be jointly inspected for damages prior to removal by both the contractor and owner's representative.

3.5 Exposure and Protection of Equipment

Proper precautions shall be taken to maintain in a proper state of preservation any machinery, equipment, fittings, stores or items of outfit which might become damaged by exposure, movement of materials, sand, grit or shot blasting, airborne particles from sand, grit or shot blasting, welding, grinding, burning, gouging, painting or airborne particles of paint. Any damage shall be the responsibility of the contractor.

Owner supplied equipment shall be received by the contractor and stored in a secure warehouse or storeroom having a controlled environment appropriate to equipment in accordance with the manufacturer's instructions.

3.6 Lighting and Ventilation

Temporary lighting and/or temporary ventilation required to carry out any item of this specification shall be supplied, installed and maintained in safe working condition and removed on completion.

3.7 Electrical Standards

The following specifications and standard form part of this specification and shall apply. In each case, the latest edition as of tender closing date shall govern.

1. TP 127E - Ship Safety Electrical Standards, available from Transport Canada Marine Safety.
2. IEEE Standard 45 - Recommended Practice for Electrical Installation on shipboard., available from Canadian General Standards Board.

If any cable installed within this contract is found to be damaged, shorted or opened as a result of the manner of installation, the entire length of cable shall be replaced and installed at no cost to the owner. Plastic tie wraps may be used in panels or junction boxes only.

3.8 Transducers

All transducers shall be afforded the necessary protection during hull cleaning, blasting, burning, welding and coating operations to ensure that they are not damaged or painted.

3.9 Fire Detection and Suppression Systems

If any specification item will require disturbing, removing or isolating any heat or smoke sensors the contractor shall advise the owner's representative before work commences. The ship's crew will perform any such work.

3.10 Air Testing of Structural Tanks

Where air testing of tanks has been approved and agreed upon by Lloyd's Surveyor and Chief Engineer the Contractor shall be responsible for securing all entry and exit points of the tanks to prevent the escape of test air.

All materials and personal required to provide an air test shall be provided by the Contractor. The Contractor shall be responsible for removing all material used to make the tanks air tight.

3.11 Purchase Orders

The Contractor shall supply two (2) copies of all purchase Orders and Invoices arranged in 3 ring binders.

3.12 Tests / Trials and Inspection Records

The Contractor shall prepare a separate binder for the documentation of all test, trials and Inspection Records. The binder shall be indexed for each test, trial and inspection performed.

The Contractor shall maintain a complete and accurate record of all tests, trials and inspections conducted during the execution of the work. This shall include those tests, trials and inspections performed at sub-Contractors facilities. The records shall include all relevant documentation, test procedures, associated test sheets, including shop test data, and test, trial and inspection data and observation results.

All originals of the test, trial and inspections records shall be signed by Lloyd's, the Contractor and where necessary by the sub-Contractors and/or Field Service Representative (FSR) who witnessed the tests.

Tests and inspections carried out for the specific purpose of satisfying the Lloyd's requirements for the SIRS update of the vessel shall be recorded and signed on documents meeting the requirements of Lloyd's to clearly indicate which piece of equipment or system with associated field number was tested and the results of the tests carried out. All copies of the documentation shall be dated and signed by the attending Lloyd's surveyor and the Contractor.

3.13 Certificate Records

The Contractor shall prepare a separate binder for the documentation of all Certificate Records. The binder shall be indexed for each item or piece of equipment for which Certificate Records are available.

The Contractor shall maintain a complete and accurate record of all certificate records applicable to the work. Certificate records shall be current and for the type of equipment being installed by the Contractor. The Contractor shall ensure that where classification society approval certificates are required, these certificates are provided within the Certificate Records binder. Where manufacturers have supplied certificates for equipment within operational manuals, copies of these certificates shall be indexed within the Certificate Records binder. The Contractor shall also obtain and index all certificates issued by its sub-Contractors.

3.14 List of Acronyms

CA	Contract Authority (PWGSC)
CCG	Canadian Coast Guard
CLC	Canada Labour Code
CSM	Contractor Supplied Material
CSA	Canadian Standards Association
CT	Current Transformer
CWB	Canadian Welding Bureau
DFO	Department of Fisheries and Oceans
MCR	Machinery Control room
FSSM	Fleet Safety & Security Manual (CCG)
FSR	Field Service Representative
GSM	Government Supplied Materials
HC	Health Canada
IEEE	Institute of Electrical and Electronic Engineers
LOA	Length Over All
MSDS	Material Safety Data Sheet
OEM	Original Equipment Manufacturer
OHS	Occupational Health and Safety
PLC	Programmable Logic Controller
PWGSC	Public Works and Government Services Canada
SSMS	Safety & Security Management System

TBS	Treasury Board of Canada Secretariat
TCMS	Transport Canada Marine Safety
TA	Technical Authority – Owner’s Representative (CCG)
VMM	Vessel Maintenance Manager
WHMIS	Workplace Hazardous Material Information System

4.0 Tests, Dock Trials and Sea Trials

The Contractor must demonstrate that the completed work and equipment is in compliance with the performance requirements of this Specification. The Contractor must develop test and trial procedures, and conduct all tests and trials required by this Specification and as may be required by the regulatory bodies in order to permit the issue of all appropriate certificates for the vessel. The Contractor must obtain all necessary certificates for the vessel to ensure that the vessel is fully certified and seaworthy for a vessel of its class prior to the completion of the contract.

The Contractor must prepare a trials schedule showing dates, sequence, procedures, and duration of each trial or set of trials. This agenda, including the proposed trial record sheets for all trials, must be submitted for review and comment to the Technical Authority and the Chief Engineer twenty (20) working days prior to the start of any tests and trials. The Contractor must coordinate the trials agenda with Lloyds to ensure attendance where necessary. The Contractor must ensure a manufacturer’s Field Service Representative (FSR) or written authorization from the manufacturer must be available prior to initial start-up of newly installed or modified equipment. All trials must be witnessed by the Chief Engineer and where necessary, by Lloyds, FSR’s and any sub-Contractors. All tests must be completed on individual components of a system and all defects corrected to the satisfaction of the Chief Engineer, Lloyds and/or the attending FSR. Once defects are corrected, the test and trial must be repeated to the satisfaction of the Chief Engineer and where necessary Lloyds.

Shop testing, dock and sea trials procedures must be to the standards required by Lloyds. Where Lloyds has no requirements for shop test procedures, the Contractor must adhere to the S.N.A.M.E. guidelines as referenced in Section 1.4 of this Specification. The minimum standard for all electrical dock and sea trials must be in accordance with Lloyds, TP127E and IEEE Std 45-2002. All electronic equipment static tests must be completed prior to sea trials with only the operational tests to be carried out at sea.

The Contractor must provide the Technical Authority with a complete list of disturbed services and ship’s systems that require functional and operational tests prior to the completion of each specification requirement. The Contractor must develop specific test procedures to test the operational and functional condition of each of the disturbed services and/or ship’s systems. The Contractor must submit the list of disturbed services and ship’s

systems and the associates specific test procedures for review to the Chief Engineer and the Technical Authority twenty (20) working days prior to the start of these system tests.

Contractor shall reference section 3.12 Tests / Trials and Inspection Records

H - 01 : Production Chart

Spec item #: H-01	SPECIFICATION	TCMSB Field #: N/A
-------------------	----------------------	--------------------

H - 01 : Production Chart

Part 1: SCOPE:

- 1.1** The intent of this specification shall be to develop a production chart using MS Project encompassing all work specifications detailed in this project.
- 1.2** This work shall be carried out in Conjunction with the following:
 - All refit specification items and shall be updated by the contractor prior to all production meetings.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1.

2.2 Standards

2.2.1

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

- 2.4.1** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- .1** The successful contractor shall supply three hard copies to Chief Engineer and forward one electronic copy to the vessel's Senior Vessel Maintenance

Manager william.ping@dfo-mpo.gc.ca and to the PWGSC Contracting Officer that is assigned to this vessel.

- .2 The chart shall show for each specification item, the start date, the manpower loading, the duration, and the completion date. The Contractor shall include on the updates to the production chart any Work Arising from PWGSC 1379 action and indicate how the additional work will impact the completion schedule for the vessel.
- .3 A critical path of work shall be identified, which shows critical tasks that may delay the completion of the refit if they are not completed within the estimated time frame. The critical path may exist due to labor constraints or tasks that cannot be completed concurrently with other tasks.
- .4 If work arises that affects critical path, it shall be immediately brought to the attention of the Chief Engineer, VMM and PWGSC Contracting Officer. Every effort shall be made to prevent completion delay.

3.2 Location

a. N/A

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. Three updated copies of production chart be completed and presented to the Chief Engineer at least 24 hours prior to each progress meeting. An electronic copy of the updated production chart shall be forwarded to the VMM and PWGSC Contracting Officer.

4.2 Testing

N/A

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals
N/A

H-02 Services

Spec item #: H-02	SPECIFICATION	TCMSB Field #: N/A
-------------------	----------------------	--------------------

H - 02 : Services

Part 1: SCOPE:

- 1.1** The following services are to be supplied to the vessel for the full duration of the refit period and disconnected upon leaving. The Contractor is to supply all material to point of onboard connection. The Contractor's quote is to include all craneage/scaffolding required for connection/disconnection of this specification.
- 1.2** Contractor will be responsible for any additional connections required as result of the ship being shifted between berths to dry-dock and back.

Part 2: REFERENCES:

- 2.1 Guidance Drawings/Nameplate Data**
 - 2.1.1.**
- 2.2 Standards**
 - 2.2.1**
- 2.3 Regulations**
 - 2.3.1**
- 2.4 Owner Furnished Equipment**
 - 2.4.2** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.2 General

.1 Berthing:

- i. During refit, while not in dock, vessel to be berthed at Contractor's wharf at a safe and secure berth with adequate water at extreme low tide to ensure that the vessel will not touch bottom.
- ii. Contractor is to include in quote all costs for initial tying up, any movement of the vessel during refit and letting go of lines from

Contractor's wharf on departure of vessel from yard upon completion of refit.

- iii. The Contractor must supply all mooring lines and labor required in berthing, mooring, dock trials and casting off for the vessel. The Contractor may use the vessel's lines to tie up the vessel on arrival but must immediately replace these and remove the vessel's lines to storage. The Contractor must supply all material and labor required to dock and undock the vessel including any vessel movements, provisions of tugs, and line handling personnel.

.2 Gangways:

- i. Labour and services to be supplied to rig and supply on board two gangways complete with safety nets and handrails. Gangways to be placed at opposite ends and sides to allow distinct separate fire escape routes. Gangways to be lighted at night. Access to both gangways is to be constantly maintained in a safe and secure manner clear of all obstacles. While alongside one gangway is required. Gangways are to be maintained safe and structurally suitable for the passage of ship's crew and workmen. The Contractor shall comply with the requirements of the Canada Labour Code and applicable provincial regulations.

.3 Potable Fresh water:

- i. Contractor to supply fresh water for normal operations of the vessel freshwater system during the duration of the refit. Contractor is to provide test results from within the last month indicating that the water meets Provincial drinking water standards before a connection is made to the vessel. Any potable water lines connected directly to the vessel is to be metered for usage. Meter readings to be witnessed by the Chief Engineer at connection and disconnection of freshwater supply to vessel. Contractor to provide in bid price for 32m³ and a unit price per 1m³.
- ii. Contractor to provide a calibration certificate for the meter that provides proof of calibration within the past year.

.4 Fire Main:

- i. Water shall be supplied to the vessel's fire main system at a pressure of 550 kPa (80 psi) and be continuous 24 hours per day. The hose (2.5" diameter) shall be connected to the ship's international shore connection located on the Upper Deck, port side.
- ii. Contractor shall supply a pressure reducing valve with pressure gauge which shall be fitted before the shore connection valve on board the ship.

- iii. For all water lines connected and servicing the vessel, the Contractor must be responsible to take all necessary precautions to ensure that the water lines do not freeze during cold weather. Special attention must be given to the fire main supply line.

.5 Parking:

- i. Three (3) parking spaces near the vessel shall be provided for Government personnel. The spaces shall be clearly marked and the required passes provided to Government personnel.

.6 Electrical Shore Power:

- i. Shore power facilities to be supplied to ship using a 600 V.A.C . 3 phase source which is stepped down to 460 V.A.C. 400 amp service through the vessel's transformer located in the Emergency Generator room . Contractor to supply cables and fittings. The ship connections are located at the shore power connection box, midship on the Upper Deck stbd. side. Contractor to quote for supplying 150,000 KW hours. Contractor to quote KWH unit rate for adjustment purposes.
- ii. Meter readings to be taken from the ship's shore power meter located in the Control Room. Meter readings to be recorded by the Contractor and the ship's Electrical Officer at the time of connection and disconnection.
- iii. If Contractor is supplying power to the ship by means of a diesel generator set on the dock; it's the Contractor's responsibility for any watch keeping or fueling for the generator unit.
- iv. Contractor is advised that the ship requires shore power from the starting date to the completion date of the contract.

.7 Garbage Removal:

- i. A garbage container of (6 m³) minimum capacity shall be used. Contractor to remove garbage from work areas on the ship on a daily basis. Cost of crane and haulage to be included in quotation. Garbage container to be placed in a suitable location agreed upon by the Contractor and the Chief Engineer. Contractor shall provide the "Waste Management System" as required for the shipyard location. Contractor to include in their bid the cost of disposing materials identified in this specification. Disposing of all material as per provincial regulations.

.8 Crane:

- i. Crane and operator usage for vessel's purpose; bids shall include 50 lifts and unit cost per lift. Also quote all inclusive hourly rate for use of crane. Adjustments to total number of lifts will be by (PWGSC) 1379 action.

.9 Vessel Security:

- i. The Contractor must ensure the security of the vessel while the vessel is in the Contractor's care, control and custody. This must include provisions to prevent damage to the vessel due to wind and wave action, tides, flooding, fire, and weather conditions.
- ii. The Contractor meet the above requirement, the Contractor must regularly monitor the mooring lines, and increase the frequency of the monitoring during adverse weather conditions.
- iii. The Contractor must have a call out system in place to respond to any emergency, with personnel qualified to remedy the situation and prevent damage to the vessel.
- iv. The Contractor must ensure that environmental conditions are monitored aboard the vessel throughout the contract period to prevent damage from temperature variations. This must include protection from the freezing of any piping system with fluids within them and the overheating of any spaces in which electronic equipment could be detrimentally affected such as the electronics room, bridge or engine control room.

.10 The contractor is to bid on the removal and disposal of 10,000 liters of dirty oil and oily water mixture. Quote unit cost per each additional 1000 liters. For estimation purposes quote 3,000 liters of oil and 7,000 liters of water. This item is to be adjusted up or down upon proof of invoice. The quantities in this item are for the vessel's requirements and are not to be included with contractor requirements for completion of items in this specification.

.11 The contractor is to include in their bid all the labor, materials, and equipment to erect, as necessary, scaffolding and staging and temporary lighting to facilitate inspection by the Owner's Representative and attending Lloyd's Surveyor for any items in this specification. The scaffolding and staging and temporary lighting shall be removed when the work is complete.

.12 Upon completion of the work, Contractor is to ensure all spaces, compartments and areas of the ship where work was done are left in an "as clean as found condition." The cost of clean up is to be included in each specification item.

- .13 Contractor to supply in bid price for 200 square metetrs (m2) shelter and bid per 100m2 for adjustment purposes.

3.4 Location

- a.

3.5 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.2 Inspection

- 4.1.2. All work shall be completed to the satisfaction of the Chief Engineer.

4.2 Testing
N/A

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.5 Drawings/Reports

5.1.1

5.6 Spares
N/A

5.7 Training
N/A

5.8 Manuals
N/A

Spec item #: H-03	SPECIFICATION	TCMSB Field #: N/A
H - 03 : Sea Trials		

Part 1: SCOPE:

- 1.1** On completion of all specification items, sea trails will be carried out as a functional test of the ship's propulsion and other systems referred to below in section 3.1.

Part 2: REFERENCES:

- 2.1 Guidance Drawings/Nameplate Data**
2.1.1.

- 2.2 Standards**
2.2.1

- 2.3 Regulations**
2.3.1

- 2.4 Owner Furnished Equipment**
2.4.3

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- .1** The Contractor is to have sufficient supervisory staff on board to witness the operation of machinery which he has worked on during this refit. Contractor shall supply an employee or employees who are experienced and have worked on the related systems: Steering Gear Systems, CPP System, Bow Thruster.
- .2** Contractor must supply the services of Rolls Royce FSR to commission Bow Thruster and Steering Gear .Contractor to include in their bid an allowance of \$7000.00 for FSR.

- .3 Contractor to supply Wartsila FSR'S to check OD Box for CPP system that was overhauled. Contractor to include in their bid allowance of \$7000.00 for FSR.
- .4 Contractor to supply Martin Yeatman FSR for the Cathodic protection system that was installed. Contractor to include in their bid an allowance of \$7000.00 for FSR.
- .5 Contractor check exhaust supporting mounts during sea trails for excessive movement and alignment after machinery has warmed up.
- .6 Contractor to carry out Dock trails prior to sea trails for a period of four (4) hours.
- .7 Sea Trials will last a minimum of eight (8) hours.
- .8 Sea Trials will contain ahead and astern movements at various power levels.
- .9 All work shall be to the satisfaction of the Chief Engineer and Lloyd's Surveyor.

3.2 Location

a.

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

100% visual by Chief Engineer. That all relevant work that was carried out in this Dry-Docking by Contractor is functioning as per normal.

4.2 Testing

4.2.1 Function test off all equipment that was overhauled and new installations during this refit period, related to the propulsion and control of the vessel and any other components the vessel must be at sea to test properly.

4.2.1 All test carried out must be approved by Lloyd's Surveyor and Chief Engineer.

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.2 Spares
N/A

5.3 Training
N/A

5.4 Manuals
N/A

H-04 : Fixed foam and Wet Chemical

Spec item #: H-04

SPECIFICATION

LLOYDS #

H-04 : Fixed foam and Wet Chemical

Part 1: SCOPE:

- 1.1 The purpose of this spec is to carry out the annual safety inspection of the Galley Range Guard and the Fixed Fire Fighting Systems in the Helicopter Hangar. Contractor shall perform all required annual maintenance. All work shall be inspected by the attending Lloyd's Surveyor. Contractor shall be responsible for scheduling the Lloyd's Surveyor.
- 1.2 All annual maintenance is to comply with applicable National Fire Protection Association standards.
- 1.3 All work to be performed by authorized manufacturer's qualified technicians.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

GALLEY WET CHEMICAL FIXED FIRE EXTINGUISHING SYSTEM

Name	Model No.	Serial No.	Imperial Gallons	Agent	Pressure PSI @ 70 deg F	Last inspection
Range Guard	RG-4GM	015772	3.3	Karbaloy	175	2016

- 2.1.1. Fire Zone Plan 590-78
- 2.1.2. Fire Fighting Equipment Plan 1590-03
- 2.1.3. Fire Fighting Plan 590-82
- 2.1.4. Helicopter Hanger Manual #35 C/E Cabin

2.2 Standards

2.2.1 SOLAS

2.2.2 Marine Machinery Regulations

2.2.3 National Fire Protection Association standards.

2.3 Regulations

- 2.3.1 Canadian Coast Guard Fleet Safety and Security Manual (DFO/5737)
- 2.3.2 Canadian Coast Guard ISM Lockout/Tagout
- 2.3.3 Canadian Coast Guard ISM Hotwork Procedures
- 2.3.4 Canadian Coast Guard Enclosed Space Entry Procedures

2.4 Owner Furnished Equipment

2.4.1

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1. Contractor shall perform annual maintenance on the Two (2) fixed firefighting equipment (Nordic Foam Flood System and Nordic Twin Agent Skid Unit (AFFF & Purple K) in the Helicopter Hangar. Contractor shall also perform annual maintenance on Galley Wet Chemical fixed equipment

3.1.2. Nordic Foam Flood System

- i. Contractor to take a sample of foam from both Port and Stbd Hanger foam tanks and have foam analysis to see if it's still in good condition..
- ii. Contractor shall inspect all aspects of this system as per manufactures recommendations and prove in good operating condition.
- iii. Any defects shall be dealt with in a PWGSC 1379.

3.1.3. Nordic Twin Agent Skid Unit

- i. Contractor shall inspect all aspects of this system as per manufactures recommendations and prove in good operating condition.
- ii. Contractor shall test pre-mixed AFFF foam solution to determine if in suitable condition.
- iii. Any defects shall be dealt with in a PWGSC 1379.

3.1.4. Galley Wet Chemical System

- i. Contractor shall inspect all aspects of this system as per manufactures recommendations and prove in good operating condition. Any defects shall be dealt with in a PWGSC 1379.

3.1.5. All inspection certificates, shall be provided for all equipment inspected, and be to satisfaction of a Lloyd's Surveyor, Certification shall be on a date as close as practicable to the completion of refit.

3.1.6. All work shall be to the satisfaction of the Chief Engineer.

3.2 Location

3.2.1.

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1.
4.2 Testing

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports
5.1.1

5.2 Spares
N/A

5.3 Training
N/A

5.4 Manuals
N/A

Spec item #: H-05	SPECIFICATION	LLOYDS #
-------------------	---------------	----------

H - 05 : Fixed Smothering Systems
--

Part 1: SCOPE:

- 1.1 Intent of this specification is to carry out the annual safety inspection of the FM-200 Fixed Fire Suppressant System(s) fitted to the vessel and Notifier Fire Alarm System. All systems shall be surveyed by Lloyd's. Contractor shall be responsible for scheduling the Lloyd's surveyor.
- 1.2 The systems shall be thoroughly examined and serviced by an Authorized Kidde distributor manufacturer's qualified technician. Annual maintenance is to comply with applicable National Fire Protection Association standards. Inspection certificates, satisfactory to Lloyd's shall be provided for all systems.
- 1.3 Contractor are to use a certify Kidde FSR to service the vessel's FM200 and CO2 system and certified Notifier FSR to test and certify the interconnection to the Notifier Fire Alarm System.
- 1.4 Prior to starting this specification the Contractor is to provide proof of Certifications.

Part 2: REFERENCES:

2.5 Guidance Drawings/Nameplate Data

- 2.1.1. Fire Zone Plan 590-78
- 2.1.2. Fire Fighting Equipment Plan 1590-03
- 2.1.3. Fire Fighting Plan 590-82

2.6 Standards

- 2.2.1 SOLAS
- 2.2.2 Marine Machinery Regulations

2.7 Regulations

- 2.3.1 Canadian Coast Guard Fleet Safety and Security Manual (DFO/5737)
- 2.3.2 Canadian Coast Guard ISM Lockout/Tagout
- 2.3.3 Canadian Coast Guard ISM Hotwork Procedures
- 2.3.4 Canadian Coast Guard Enclosed Space Entry Procedures

2.8 Owner Furnished Equipment

- 2.4.2 The contractor shall supply labour as stated.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- 3.1.1. Contractor prior to starting any work must notify the Chief Engineer.
- 3.1.2. Contractor, to supply certified Kidde FSR to service the vessel's FM200 and CO2 system
- 3.1.3. The following servicing shall be carried out on all FM-200 Fixed Fire Suppressant Systems.
- 3.1.4. All levers, valves, remote activations, wires, wire junction boxes, pressure operated sirens and pressure operated switches shall be checked. Delay mechanism shall be checked for proper operation.
- 3.1.5. Contractor shall inspect all associated fire dampers to check if they have released during the testing of all systems. Contractor shall reset all fire dampers. Any deficiencies shall be rectified through the PWGSC work arising procedures.
- 3.1.6. Piping shall be disconnected from cylinders and blown through with Nitrogen gas. All multi jet nozzles shall be proven clear.
- 3.1.7. FM-200 cylinders shall be measured using an approved method to determine the existing quantities of FM-200 agent in each cylinder. The weights shall be recorded and the cylinders tagged and dated. Individual pressures shall be recorded for each cylinder.
- 3.1.8. The entire system shall be properly reassembled, inspected and proven serviceable.
- 3.1.9. Remote release stations, fan shut downs as part of system alarm activated, etc., shall be reset and proven operational.
- 3.1.10. Three (3) hard copies of weight and inspection records with inspection certificates shall be prepared by the Contractor for the Chief Engineer. One additional copy shall be forwarded to Lloyd's.
- 3.1.11. Contractor to supply three copies of test reports and three copies of the test Certifies.
- 3.1.12. Contractor supply a certified Notifier FSR to test and certify the Notifier Fire Alarm system.
- 3.1.13. All work carried out in this specification shall be inspected by Lloyd's Surveyor and Chief Engineer.
- 3.1.14. All work shall be carried out to the satisfaction of the Chief Engineer.

3.4 Location

Full weight of cyl & agent incl cap	VESSEL NAME	LOCATION OF HALOCARBON SYSTEM	SYSTEM PURPOSE
181.8	Cowley	Shaft Tunnel	Purifier Room
47.8	Cowley	Tank and Pump Room	Paint Room
175.2	Cowley	Emergency Generator Room	Emergency Generator Room
200.4	Cowley	Harbour Generator Room	Harbor Generator Room
209.8	Cowley	Forward Main Engine Room Port Side	Motor Control Room
615.4	Cowley	Bridge Deck Stbd side Stack	Engine Room Starboard
613.8	Cowley	Bridge Deck Stbd side Stack	Engine Room Port
340	Cowley	Bridge Deck Stbd side Stack	Engine Room Stack Fwd Cylinder
31.0	Cowley	Helicopter Hanger	Av Gas Fueling Dispenser Cabinet
100.3	Cowley	Incinerator Room	Incinerator Room
274.4	Cowley	Bow Thruster Compartment Stbd cyl	Bow Thruster Compartment
240	Cowley	Bow Thruster Compartment Port cyl	Forward Machinery Space
75.8	Cowley	Steering Flat	AV Gas Pump Room
338.4	Cowley	Steering Flat	Steering Gear
187.6	Cowley	Steering Flat	AV Gas Tank Cofferdam

3.5 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.2. To the satisfaction of Lloyd's Surveyor and Chief Engineer.

4.2 Testing

4.2.1.

4.3 Certification

4.3.1 Contractor are to use a certified Kidde FSR to complete the inspection and work.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 Contractor must supply three hard copies and one electronic copy of all reports and certifications of each system.

5.2 Spares N/A

5.3 Training N/A

5.4 Manuals N/A

Spec item #: H-06	SPECIFICATION	LLOYDS #
H - 06 : HVAC Duct Cleaning		

Part 1: SCOPE:

- 1.1** The intent of this specification is to carry out the cleaning of the Air handling units ducting, intake plenums, recirculation plenums, washroom exhaust, louvers and dampers associated with the shipboard accommodation ventilation systems.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Ventilation Arrangement Navigation Bridge Deck	S-111-1
2.1.2. Ventilation Arrangement Bridge & Focsle Deck	S-111-2
2.1.3. Ventilation Arrangement Aft and Upper Deck	S-111-3
2.1.4. Ventilation Arrangement FWS Upper Deck	S-111-4
2.1.5. Ventilation Arrangement Aft Main Deck	S-111-5
2.1.6. Ventilation Arrangement Main Deck FWD	S-111-6
2.1.7. Ventilation Arrangement E/R and Hold Deck	S-111-7
2.1.8. Bow Thruster Ventilation Arrangement Hold Deck	S-111-9

2.2 Standards

- 2.2.1** ACR 2013 Standard for Cleaning and Restoration of HVAC Systems
- 2.2.2** Canadian Coast Guard Fleet Safety and Security Manual (DFO/5737)
- 2.2.3** Canadian Coast Guard ISM Lockout/Tagout
- 2.2.4** Canadian Coast Guard ISM Hotwork Procedures
- 2.2.5** Canadian Coast Guard Enclosed Space Entry Procedures

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

- 2.4.4** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- 3.1.1 Contractor to ensure all 3 AHU's, washroom exhaust fans and air heaters are locked out before commencing of this work. Proper lock out procedure to be followed as per the vessels ISM lockout procedures.
- 3.1.2 Contractor is to thoroughly clean all ventilation ducting for the vessels 3 air handling unit systems and washroom exhaust by a combination of mechanical/pneumatic/vacuum methods in full conformance with applicable industry standards.
- 3.1.3 This shall include the removal and cleaning of the ventilation diffusers throughout the ship and their replacement after completion of the duct cleaning.
- 3.1.4 The contractor is to use vacuum hoses capable of extending through all sections of ducting.
- 3.1.5 Existing openings and access patches in ductwork shall be used, and shall be returned and re-sealed to as found condition using approved fire-rated materials.
- 3.1.6 If additional access openings are required to enable a full and proper job, the contractor will be responsible for closing/re-sealing with approved fire rated materials. Plastic plugs and or flammable sealants are not to be used. Any existing, non-fire rated materials found in used for such applications shall be replaced with proper, approved materials.
- 3.1.7 Contractor shall ensure cleanliness of all work and accommodation spaces affected by the cleaning process is maintained in an as found condition during and upon completion of the duct cleaning.
- 3.6 **Location:**
 - a. Refer to drawings listed in section 2.1
- 3.7 **Interferences**
 - a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

- 4.1.3. All work shall be inspected by Vessel Maintenance Manager or Chief Engineer.
- 4.1.4. All work shall be completed to the satisfaction of the Chief Engineer.

4.2 Testing
N/A

4.3 Certification
N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports
N/A

5.2 Spares
N/A

5.3 Training
N/A

5.4 Manuals
N/A

H-07 : Liferrafts and HRU's

Spec item #: H-07	SPECIFICATION	LLOYDS #
H-07 : Liferrafts and HRU's		

Part 1: SCOPE:

- 1.1 The intent of this item is for the contractor to transport and service the ship's (4) life rafts for annual servicing. Contractor is also to supply qty (4) new Hammar Hydrostatic releases for use with the lifeboats to be serviced

Part 2: REFERENCES:

2.1

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

Liferaft details:

- 25 Person Survitec Zodiac Liferaft, Class A Pack, S/N XDC7FK33F314
- 25 Person Survitec Zodiac Liferaft, Class A Pack, S/N XDC5FJ29B313
- 25 Person Survitec Zodiac Liferaft, Class A Pack, S/N XDC4FF22A212
- 25 Person Survitec Zodiac Liferaft, Class A Pack, S/N XDC4FF21A212

2.2 Standards

2.2.1

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated

Part 3: TECHNICAL DESCRIPTION:

3.1 The Contractor is to remove and transport the ship's (4) liferafts to and from an authorized service centre and is responsible for all cost associated with servicing and transportation.

3.2 After servicing the liferafts complete with certification are to be returned to vessel

3.3 Certification for Liferafts are to be completed so that expiry date will be on or after the first week of November 2017.

3.4 Contractor is to supply and install 4 new Hammar Hydrostatic Releases for the above mentioned liferafts .

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4 All work to be completed to satisfaction of the Chief Engineer.

4.2 Testing

N/A

4.3 Certification

Proof of certification of authorized life raft service facility

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 3 copies of inspection reports detailing replacement parts and work performed

5.1.2 3 copies of certificates for each liferaft.

5.1.3 Contractor shall provide the Chief Engineer with a written report of the contractors work in both electronic and hardcopy formats outlining the details of the inspections and any alterations / repairs to the acceptance of this item.

5.2 Spares

N/A

5.3 Training

N/A

Spec item #: H-08	SPECIFICATION	LLOYDS #
H-08 : Lifeboats and Davits		

Part 1: SCOPE:

- 1.3** The intent of this specification is to carry out the annual inspection and testing of the Port and Stbd lifeboats, davits and winch systems.
- 1.4** Inspection shall include: the boat fiberglass structure, hydrostatic release mechanisms and hooks, davit structure and all associated equipment, davit sheaves, pins and bushings, winches including all internal components and brake assemblies.
- 1.5** An Authorized Palfinger Technician shall perform the annual inspection on the lifeboats and davit winches. Contractor in the work description below refers to the Palfinger Technician.
- 1.6** The contractor shall include in his bid an allowance of \$15,000 total for an FSR for work on both the H-08 Lifeboat and H-13Miranda Daivit specs.
- 1.7** All defects found shall be reported to the Chief Engineer as soon as possible when discovered.
- 1.8** The systems shall be thoroughly examined and serviced by an Authorized Palfinger Technician.
- 1.9** All work carried out in this specification shall be inspected by the Chief Engineer and Lloyd's. The same parties mentioned herein shall witness all tests and trials.

Part 2: REFERENCES:

2.5 Guidance Drawings/Nameplate Data

2.1.1. LIFEBOAT DETAILS

- i. Schat – Harding
- ii. Model :KISS 700 (Dry Cargo)
- iii. Davit Model No. NT / KISS 700
- iv. Davit Winch: BE 4.5

2.6 Standards

2.2.1

2.7 Regulations

2.3.1.

2.8 Owner Furnished Equipment

- 2.4.5** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:**3.3 General**

- .1** Prior to commencement of work the Palfinger shall inform the Chief Engineer so equipment lock outs can be conducted.
- .2** Vessel's crew shall secure Lifeboat(s) to prevent accidental lowering.
- .3** Palfinger shall renew hydrostatic release diaphragm c/w cover retaining screws with a vessel supplied diaphragm
- .4** Palfinger shall inspect the fwd and aft hook assembly, hook tails and hook tail bearings components for wear / damage. Palfinger shall clean and lubricate all components after inspection is completed.
- .5** After inspection of lifeboats the Palfinger shall complete annual maintenance of the lifeboat davit winches.
- .6** Palfinger with the assistance of the ship's crew shall drain oil from winch gear case and remove gear case cover. Palfinger shall prove the gear case vent is free. Palfinger shall inspect the gear case for wear and damage. Palfinger shall measure and record all backlash with respect to gearing of the winch.
- .7** The ships crew shall flush the gear case and refill crank case to the correct operating level with ship supplied oil. Palfinger shall install and secure the gear case cover with correct cover seal.
- .8** Palfinger shall dismantle the winch brake assembly for component wear inspection. This will include dismounting the brake and centrifugal assembly from its shaft. Brake linings and centrifugal brake pads to be inspected for wear and damage. Brake lining retaining screws shall be inspected. Centrifugal brake springs shall be inspected for wear and damage. Wear measurements of the brake linings shall be recorded and compared to manufactures specifications, if measurements are below specifications Palfinger shall renew brake linings.
- .9** Palfinger shall clean all parts including any brake dust from brake housing and de-glaze the brake running surface.
- .10** Palfinger shall re-assemble brake and centrifugal assembly. After re-assembly the brakes shall be adjusted to correct setting.
- .11** Palfinger shall remove two sheave, pin and bushing assembly for inspection to get a general idea of the condition of wear.

- .12 Palfinger shall prove grease fittings, grease channels and holes are clear.
- .13 Palfinger shall include in their bit unit cost per sheave, pin and bushing removal, inspection and re-installation.
- .14 Palfinger shall inspect for damage and wear all davit mounting hardware, davit arms, falls, falls wires, turnbuckles, shackles and foundation
- .15 Palfinger shall inspect for damage to the Fiberglass reinforced laminate (FRP) both inside and out. All hull penetrations and steering mechanisms shall be inspected for wear and correct operation.
- .16 Palfinger shall carry out an inspection of the Port and Stbd lifeboat davit falls and wires including all associated equipment.
- .17 Palfinger shall inspect and check for correct operation the operation of the hand crank, limit switches and davit arm track rollers.
- .18 Palfinger to change out all bolts on barrel drum flanges as recommended by Schatt from last inspection.

3.8 Location

- a. N/A

3.9 Interferences

- 3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.3 Inspection

- 4.1.5. All work to be completed to satisfaction of the Chief Engineer.

4.2 Testing

- 4.2.1. Palfinger with the vessel's crew in attendance shall carry out an operational test on both lifeboats and davits to prove the correct operation of the davit, winch, brakes, sheaves, limit switches and hydrostatic release mechanism. The life boats shall be lowered to prove the hydrostatic interlock operation. Palfinger shall determine if these tests shall be first conducted under load condition or with out the boat.
- 4.2.2. The hooks shall be reset and the lifeboats lifted out of the water to reset the hydrostatic interlock and then re-lowered to the water to prove the correct operation of the hydrostatic interlock.
- 4.2.3. After all tests and trials are proven satisfactory, Palfinger with the vessel's crew shall conduct a launch of each boat for the Lloyd's attending surveyor.

4.2.4. Contractor to megger test electrical motor.

4.3 Certification
N/A

Part 5: DELIVERABLES:

5.9 Drawings/Reports

5.1.1 Palfinger to supply three typed copies of report to Chief Engineer.

5.10 Spares N/A

5.11 Training N/A

5.12 Manuals N/A

Spec item #: H-09	SPECIFICATION	LLOYDS #
H-09 : Shower Stall Repairs		

Part 1: SCOPE:

- 1.4** The intent of this specification is to repair a total of 3 damaged shower stalls. All work shall be inspected by the Chief Engineer including inspection after cleaning and preparation for putting on first coating.

Part 2: REFERENCES:

2.9 Guidance Drawings/Nameplate Data

- 2.1.1.** General Arrangement Drawing.

2.10 Standards

- 2.2.1**

2.11 Regulations

- 2.3.1** Work shall be carried out in accordance with the instructions given in the Preamble of this specification.

2.12 Owner Furnished Equipment

- 2.4.3** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

3.2 General

- 3.1.1.** Contractor prior to starting has to contact the Chief Engineer.
- 3.1.2.** Contractor must supply ventilation from all rooms being worked on to the outside of the vessels. In some cases Contractor might be able to use the cabin's port hole but in other cases he will have to use the vent in the cabin door and use sealed ventilation from cabin door to outside off vessel.
- 3.1.3.** Contractor must ensure that no fumes from the work area spread to the adjoining rooms or hallways.

- 3.1.4. The contractor is responsible for the removal and reinstallation of all shower hardware needed to complete this work.
- 3.1.5. Contractor to repair 3 shower stalls in the following cabins:
- 3.1.6. Contractor to repair 1st Engineers Shower. The damaged base and approximately 8 inches up the bulkheads shall be ground out. The base shall be built up even with the drain, ensuring not to cover it, and the bulkheads shall be made even with the remaining upper portions. The entire shower shall then be given one complete gel coat.
- 3.1.7. Contractor to repair 2nd Officers Shower. The damaged base and approximately 8 inches up the bulkheads shall be ground out. The base shall be built up even with the drain, ensuring not to cover it, and the bulkheads shall be made even with the remaining upper portions. The entire shower shall then be given one complete gel coat.
- 3.1.8. Contractor to repair 2nd Program Officers Shower. The peeling bottom and partial side gel coating shall be buffed off, and the entire shower given one complete gel coat.
- 3.1.9. Contractor shall clean up all dust and debris from work area. The area must be inspection to the satisfaction of the Chief Engineer.

3.6 Location

- 3.2.1. Focle Deck,

3.7 Interferences

- 3.3.1 Contractor is responsible for identifying and dealing with any interference items.

Part 4: PROOF OF PERFORMANCE:

4.2 Inspection

- 4.1.3. All work shall be inspected by the Chief Engineer or his delegate Engineer or Chief Officer.

4.2 Testing N/A

4.3 Certification N/A

Part 5: DELIVERABLES:

5.5 Drawings/Reports

5.1.1 Contractor to supply three typed copies and one electronic copy of report to Chief Engineer.

5.6 Spares N/A

5.7 Training N/A

5.8 Manuals N/A

H -10 : Lloydes Special Survey Thickness Testing

Part 1: SCOPE:

- 1.1 Contractor to supply and support the services of a Lloyd's approved firm to perform Non-destructive testing on vessels hull. Testing shall be done to the satisfaction of Lloyd's Surveyor.

- 1.2 In conjunction with the Lloyd's Special Surveyor a Nace inspector will be checking the condition of coating throughout the vessel: Hull, All tanks and some superstructure..

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- 2.1.1. Hull wind strake, water strake, keel, forepeak, aft peak, longitudinals and frames in mid-ship area.
- 2.1.2. 590-70 General Arrangement
- 2.1.3. 590-04 Profile & Deck
- 2.1.4. 590-01 Shell Expansion
- 2.1.5. 590-18 Stringer Plan
- 2.1.6. 590-27 Bow Structure
- 2.1.7. 590-77 Insulation Plan
- 2.1.8. 590-78 Fire Zone Plan
- 2.1.9. 590-79 Capacity Plan
- 2.1.10. 590-80 Steering Gear Compartment

2.1.11. Related Specifications

- HD Dry-Docking
- HD Sacrificial Hull Anodes
- HD Under Water Hull Painting
- HD Hull Painting Above Ice Belt
- HD Hull Butts And Seams
- HD Freshwater Tank Coating
- HD Water Ballast Tanks
- HD Fuel Oil Tanks

HD Bilge Keels
HD Grey Water Tanks
HD Sludge Tanks
HD Cooling Water Drain Tanks
HD Bow Thruster Bilge Painting
HD Steering Gear Bilge Painting

2.2 Standards

- 2.1.1. Canadian Coast Guard Fleet Safety Manual (DFO 5737)**
- 2.1.2.** Coast Guard ISM Lockout/Tagout
- 2.1.3.** Coast Guard ISM Hotwork procedures
- 2.1.4.** Coast Guard Enclosed Space Working procedures

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

- 2.4.1** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- 3.1.1** Upon completion of hull inspection and cleaning the Contractor shall arrange the services of qualified NDT Technician to perform 600 ultrasonic shots to test the hull thickness as directed by Lloyd's Class Surveyor.
- 3.1.2** Contractor shall quote on 800 shots and unit price per additional shot for adjustment purposes.

- 3.1.3** The Contractor shall provide the services of a man lift and operator for minimum of eight hours, with a hourly rate for adjustment, to be completed to complete the wind and water strakes ultrasonic shots.
- 3.1.4** Areas to be surveyed are: wind and water strakes approximately 72 shots. Keel approximately 52 shots. Forepeak bulkhead approximately 8 shots. Aft peak bulkhead 8 shots. Longitudinals and frames in transducer compartment approximately 40 shots. Longitudinals, frames and hull plating in steering bilge approximately 30 shots. Longitudinals, frames and hull plating in bowthruster bilge approximately 30 shots. All ballast tanks 40 shots. Chain Locker approximately 10 shots. Approximately 20 shots in various other tanks
- 3.1.5** All exposed main deck plating over full length of ship. Approx.20 shots
- 3.1.6** Exposed superstructure deck plating (i.e. Focsle deck, bridge deck and superstructure, Main engine room stack). Approx. 30
- 3.1.7** Contractor to quote tank watch and assistance for total off 100 hours.
- 3.1.8** Contractor shall provide the results of the testing in a service report format with three copies presented to the Chief Engineer
- 3.1.9** Lloyd's Surveyor and Chief Engineer shall witness testing.
- 3.1.10** All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyds surveyor.
- 3.2** **Location:**
 - a.** Ship's Hull
- 3.3** **Interferences**
 - a.** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.6. 100% visual By Chief Engineer, Lloyd's Surveyor.

4.1.7. All work shall be completed to the satisfaction of the Chief Engineer.

4.2 Testing

4.2.1. Ultrasonic testing 800 shots.

4.3 Certification

4.3.1. Lloyd's Certificate company to carry out the ultrasonic testing.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 Two hard copies and one electronic copy of the test reports will be supplied to Chief Engineer.

5.2 Spares
N/A

5.3 Training
N/A

5.4 Manuals
N/A

Spec item #: HD-11	SPECIFICATION	LLOYDS #
H-11 Sewage Treatment Plant		

Part 1: SCOPE:

1.1 The intent of this specification shall be to pump out the main sewage treatment tank including all associated internal and external piping and touch up the tank's internal coatings. Install owner supplied air diffusers in the main treatment tank. Inspect, clean and prove operational all tank operating and alarm probes.

1.3 During the cleaning & inspection of the main treatment tank the Contractor shall supply 3 portable toilets for the crew's facilities. The Chief Officer will detail as to where he wants them positioned. Contractor shall be responsible for transporting the units to and from the vessel for use and disposal. Contractor shall also be responsible for the removal of the portable toilets when the sewage system is put back in operation.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1 COMPONENT/SYSTEM

HAMWORTHY SUPERTRIDENT SEWAGE TREATMENT UNIT

Model Size ST2A-CR.

SERIAL # 98761-01

2.1.2 DRAWINGS AND MANUALS

2.1.2.1 Hamworthy Installation , Operation and Maintenance Manual, Chief Engineers cabin. Manual #18

2.1.2.2 Grey Water System

2.1.2.3 Vacuum Sewage System Dwg. 97037-26

2.1.3. TANK CAPACITIES

Main treatment tank approx. 2200 Litres

2.2 Standards

2.2.1 Canadian Coast Guard Fleet Safety and Security Manual (DFO/5737)

2.2.2 Canadian Coast Guard ISM Lockout/Tagout

2.2.3 Canadian Coast Guard ISM Hotwork Procedures

2.2.4 Canadian Coast Guard Enclosed Space Entry Procedures

2.2.2 IACS No. 47 – Shipbuilding and Repair Quality Standards

2.2.3 TP127E – Ships Electrical Standards

2.2.3 IEEE 45:2002 – Recommended Practice for Electrical Installation on Ship's

2.2.5 Society for Protective Coatings (SSPC) Standards

2.2.5.1 SP1 – Solvent Cleaning

2.2.5.2 SP3 – Power Tool Cleaning

2.3 Regulations

2.3.1 Canada Shipping Act 2001

2.3.1.1 Hull Construction Regulations

2.3.1.2 Marine Machinery Regulations

2.3.1.3 Vessel Pollution and Dangerous Chemical Regulations

2.3.2 MARPOL Annex IV – Regulations for the Prevention of Pollution by Sewage from Ships

2.4 Owner Furnished Equipment

2.4.1 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

3.1 Sewage Treatment Plant Cleaning

3.1.1. Prior to starting the work in this spec the contractor shall verify with the Senior Engineer that all plant operational switches and probes are working. The Senior Engineer shall isolate the tank and all electrical supplies for the system(s).

3.1.2. The contractor shall open up and pump out the Main Sewage plant Aeration compartment, Settling, and Contact sections and dispose of the contents as per provincial environmental regulations.

3.1.3. Contractor shall remove all manhole covers on the main treatment tank to gain access to all tank internals. Contractor shall clean tank internals and dispose of the contents as per provincial environmental regulations. All tank internal and external air piping including all circulation piping will be removed and proven clear and re-installed. All air lift tubes to be removed and proven clear.

3.1.4. The contractor shall bid on the replacement of four manhole studs and quote a unit price per stud replacement.

3.1.5. Contractor shall bid on supplying and coating tank internals with Intershield 300. Contractor to bid on 10 square feet and to supply bid price per square foot coverage.

3.1.6. Contractor shall replace the 12 air diffuser using stainless steel nuts and washers as per makers' specifications. Diffusers and fasteners are vessel supply. Air diffuser elements are made from a porous ceramic material and must be handled with care to avoid breakages.

3.1.7. Contractor shall prove clear the vent lines from the main treatment tank and the grey water tank to the exit point at the funnel top. The horizontal PVC section located in the transducer compartment shall be disconnected and removed for cleaning. The contractor is responsible for re-installation of these pipes.

3.1.8. Contractor shall clean and prove that all level switches and alarms are working as per instruction manual specifications. After work is completed and tank is filled with fresh water Contractor shall prove all probes and operational switches are working.

3.1.9. Contractor shall contact the Chief Engineer prior to closing up the individual tanks for a final inspection.

3.1.10. Contractor shall close up all tanks with new gaskets on all manholes and inspection covers.

3.1.11. Contractor shall clean and lubricate with never seize all studs, nuts, bolts, screws and fasteners in carrying out the work in this specification.

3.1.12. Contractor shall fill all tank sections with clean fresh water and check for leaks.

3.1.13. All work in this specification shall be satisfactory to the attending Chief Engineer.

Grey Water Tank Cleaning

3.4 Location:

- a. Transducer Compartment

3.5 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.2 Inspection

4.1.8. All work shall be inspected by Chief Engineer.

4.1.9. All work shall be completed to the satisfaction of the Chief Engineer.

4.2 Testing

The contractor shall complete a function test with the Chief Engineer in attendance ensuring there are no leaks or defects.

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.5 Drawings/Reports

5.1.1 Contractor to supply Chief Engineer with two copies of the report of all work carried out.

5.6 Spares
N/A

5.7 Training
N/A

5.8 Manuals
N/A

H-12 : Galley Hood Cleaning

Spec item #: H-12	SPECIFICATION	LLOYDS #
-------------------	---------------	----------

H-12 Galley Hood Cleaning

Part 1: SCOPE:

- 1.1** The intent of this specification is to carry out the annual cleaning of the Galley range hood exhaust trunking to the exit point at the exterior deck ventilator mushroom as well as the clothes dryer vents from laundry room to exit on Foc'sle deck in front of wheelhouse.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1.	Ventilation Arrangement Bridge & Focsle Deck	S-111-2
2.1.2.	Ventilation Arrangement Aft and Upper Deck	S-111-3
2.1.3.	Ventilation Arrangement FWS Upper Deck	S-111-4
2.1.4.	Ventilation Arrangement Aft Main Deck	S-111-5
2.1.5.	Ventilation Arrangement Main Deck FWD	S-111-6

2.2 Standards

- 2.2.1** ACR 2013 Standard for Cleaning and Restoration of HVAC Systems
- 2.2.2** Canadian Coast Guard Fleet Safety and Security Manual (DFO/5737)
- 2.2.3** Canadian Coast Guard ISM Lockout/Tagout
- 2.2.4** Canadian Coast Guard ISM Hotwork Procedures
- 2.2.5** Canadian Coast Guard ISM Working Aloft Procedure

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

- 2.4.2** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.1 Galley Range Hood Cleaning

- 3.1.11** This work is to be schedule around working hours of the vessels Galley. Advance notice must be given and a time agreed upon with the Chief Engineer.
- 3.1.12** Contractor to carry out the lock out procedure with the ship's Senior Engineer for isolation of the Galley range, stove, deep fryer and range hood ventilation exhaust fan.
- 3.1.13** All Galley exhaust ductwork, including range hood itself and exhaust fan, shall be completely degreased by suitable means. Any removed sludge/residues shall be properly disposed of by the Contractor.
- 3.1.14** The contractor shall remove the exterior deck ventilation diffuser top for internal inspection and cleaning of the ventilator piping / duct work. The Contractor shall note that the exhaust fan and motor assembly are housed in the exterior deck ventilator top.
- 3.1.15** Contractor supplied electrician shall dis-connect the motor wiring at the junction box prior to removing the vent top and shall re-connect upon completion of work. Contractor shall fit the ventilator top c/w a new gasket upon completion of the cleaning. Contractor shall supply and fit new stainless steel securing bolts, nuts and lock washers.
- 3.1.16** The contractor shall thoroughly clean ventilation ducting from the range hood up through to the exit point on deck.
- 3.1.4** The contractor shall ensure that condition of the Galley is left in a clean condition upon completion of the work in this specification.

3.2 Laundry Dryer Exhaust Cleaning

- 3.2.1.** The contractor shall thoroughly clean by a combination of mechanical/pneumatic/vacuum methods both clothes dryer vents leading from laundry room to their exit on Foc'sle deck in front of wheelhouse.
- 3.2.2.** These ducts exist through mushroom vents on a raised platform on the Foc'sle deck. These vent covers will need to be removed to gain suitable access to portions the duct work. This platform is at height of approximately 9 feet and has no railings so working ISM working aloft regulations shall be followed.

3.3 Location:

a.

3.4 Interferences

- 3.2.2.** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

- 4.1.1.** All work shall be inspected by PWGSC Technical Inspector and Chief Engineer.
- 4.1.2.** All work shall be completed to the satisfaction of the Chief Engineer.

4.2 Testing

N/A

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1

5.2 Spares N/A

5.3 Training N/A

5.4 Manuals N/A

Spec item #: H-13	SPECIFICATION	LLOYDS #
H-13 : Miranda Davit Annual Inspection		

Part 1: SCOPE:

The intent of this specification is to carry out the annual inspection of the vessels two Miranda davits which includes the winch gear box internal components and brake assemblies, davit sheaves, pins and bushings and the cradle roller wheels, pins and bushings. Inspection involves gauging component wear measurements and to make adjustments as required.

- 1.1 An Authorized Palfinger Technician shall perform the annual inspection on the davits and winches. Contractor in the work description below refers to the Palfinger Technician.
- 1.2 See spec H-08 Lifeboats and Davits for FSR Allowance to cover both Lifeboat and Miranda Davits.
- 1.3 All components and wear measurements shall be inspected by the Chief Engineer and the attending Lloyd's surveyor.
- 1.4 Contractor shall arrange the scheduling of the Lloyd's surveyor for all inspections and trials and notify the Chief Engineer prior to them being conducted.
- 1.5 Contractor shall record all wear measurements and clearances taken and provide the Chief Engineer with three type written copies of the measurements.
- 1.6 All work carried out in this specification shall be to the satisfaction of the Chief Engineer and Lloyd's.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1 Miranda MRT 3900 Davit & BHY 5300 Winch

Serial No. (Port) CE014-3737-B ARM- B1
(Stbd) CE014-3737-A- ARM-A

2.1.2 BHY 5300 Winch

Serial No. (Port) 145700
(Stbd) 145701

2.1.3. Drawing and Manuals

Binder No. 55 Chief Engineer's cabin contains the following:

2.2 Standards

2.2.1

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

- 2.4.1** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

Prior to commencement of the work the Contractor shall inform the Chief Engineer so he can carry out the ISM lock out procedure on all associated equipment.

Ship's crew shall be responsible for the removal and re-installation of the davit wire ropes.

- 3.1.1.** The contractor shall carry out all work in this specification as per the manufacturers overhaul instructional manual working within the limits and tolerances specified.
- 3.1.2.** The contractor shall drain oil from the winch gear case and remove the gear case cover. The contractor shall inform the Chief Engineer if there is any water content showing in the used oil. Contractor shall inspect the gear case for wear and damage. Contractor shall measure and record all backlash on all internal gears
- 3.1.3.** The contractor shall prove that the gear case vent is free and clear and functioning properly to prevent internal pressure. The contractor shall flush the gear case with new oil until all residue water and dirt is removed. Contractor shall fit the gear case oil drain plug with pipe sealant and fill the gear case to the correct operating level with ship supplied oil. Contractor shall replace the gear case cover with a new gasket. Oil shall be vessel supply.
- 3.1.4.** The contractor shall dismantle the winch brake assemblies to gauge wear and check for signs of heat. This will include dismounting the manual hand brake and centrifugal brake assembly from its shaft. Brake linings and centrifugal brake pads to be inspected for wear and damage. Brake lining retaining screws shall be inspected. Centrifugal brake springs shall be inspected for wear and damage. Wear measurements of the brake linings

shall be recorded and compared to manufactures specifications, if measurements are below specifications Contractor shall renew brake linings.

- 3.1.5.** The contractor shall clean all parts including any brake dust from brake housing. The contractor shall de-glaze the running contact surfaces of the centrifugal brake drum housing and the hand brake inner cone clutch by machining them true. Contractor shall check with the manufacturer to obtain the minimum rotor thickness tolerance.
- 3.1.6.** The contractor shall re-assemble the brake assemblies using lock-tite on the all brake lining securing screws. After re-assembly the breaks shall be adjusted to correct setting. Davit shall be lowered under load to test operation of the brakes.
- 3.1.7.** The contractor shall prove to the Chief Engineer that all grease fittings and hoses are clear on all davit and cradle components.
- 3.1.8.** The contractor shall inspect all securing and lifting lugs that are welded to the davit structure and boat cradle assembly. The contractor shall inspect lug holes for wear and ovality. The contractor shall inspect lugs for cracks and signs of corrosion in welds where they are welded to the davit frame and cradle.
- 3.1.9.** To determine serviceability the Contractor shall gauge the as fitted sheave pins and bushings for wear and compare measurements to the original readings. Contractor shall carry out a N.D.T. on all sheave pins to check for cracks and other defects.
 - 3.11.1** The contractor shall gauge wear on all as fitted sheave brass wear washers for comparison to the original readings.
 - 3.11.2** The contractor shall prove that all sheave assembly grease channels and holes are clear.
 - 3.11.3** The contractor shall include in their bid a unit price to fabricate / machine one sheave pin, and one bushing, material shall be owner supply. Price shall also include unit cost to fit and ream the new sheave bushing to provide the correct pin to bushing running clearance. The material is owner supplied.
 - 3.11.4** Prior to re-installation of sheave assemblies that were removed for inspection the Contractor shall provide the Chief Engineer with two type written copies of the following measurements:

3.11.4(a) All Pin diameters taken uniformly along the axis in the horizontal and vertical planes.

3.11.4(b) All sheave bushing inside diameters uniformly along the axis in the horizontal; and vertical planes

3.11.4(c) All three sheave support bracket pin bore

3.11.4(d) All wear washer thicknesses at four equidistant points.

3.11.5 The contractor shall re-install the three sheave assemblies on the davit and lock up the securing arrangement with Lock-tite with the bolts tightened as per the standard torque chart for the type and grade of bolt used. The contractor shall grease all three sheaves and prove freedom of movement in their housing brackets.

3.1.1. Upon re-assembly of all davit and cradle components the contractor shall torque all bolts, screws and fasteners as per the standard torque chart for the type and grade of fastener used. All fasteners shall be cleaned and coated with anti seize compound before installation.

3.1.1. The contractor shall carry out a final inspection of the davit and cradle components with the Chief Engineer in attendance and the Contractor shall make any adjustments required to provide correct operation of all including the hand crank, brake assemblies, limit switches and davit arm track rollers.

3.2 Location

3.2.1. N/A

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. All work to be completed to satisfaction of the Chief Engineer.

4.2 Testing

4.2.1 Contractor shall notify the Chief Engineer when they are ready for a functional test of the davit, winch and brake units.

- 4.2.2** Ship's crew shall test the davit operation with the Contractor's representative in attendance. The cradle shall be allowed to free fall without a Fast Rescue Craft (FRC) to test winch and brake unit is functioning correctly.
- 4.2.3** After all parties agree the davit functions correctly the davit shall be tested under full load condition.
- 4.2.4** Contractor shall be responsible for all adjustments and the repair of all defects that are a direct result of the work carried out within this specification.
- 4.2.5** The contractor shall megger test electrical motor.

4.3 Certification

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1

5.2 Spares N/A

5.3 Training N/A

Manuals N

Spec item #: HD-01	SPECIFICATION	LLOYDS #
HD - 01 : Dry-Docking		

Part 1: SCOPE:

- 1.1** The intent of this specification shall be to remove the vessel from the water for inspection and maintenance of the underwater section of the hull and associated equipment.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Docking Plan # 590-96 Rev.2 will be supplied by Owner.

2.1.2. Vessel Particulars:

Length O.A.	72.0 m
Length B.P.	67.0 m
Breadth Overall	14.0 m
Depth Moulded	4.9 m
Mean Draft, Extreme	4.3 m
Displacement, Extreme	2087 tonnes
Displacement, Docking	1495 tonnes

2.2 Standards

2.2.1 The contractor shall use a certified docking master or other qualified person approved by owner's representative and PWGSC when docking and undocking the vessel. The Contractor shall quote separately the cost to dock and undock the vessel. The Contractor shall indicate the amount of lay-days required to carry out the specified work and quote the cost per lay-day.

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- .1 Crew will be on board when putting vessel on and off dock, and during the duration on vessels time on the dock.
- .2 Contractor to prepare blocks and necessary shoring to maintain true alignment of the vessel's hull and machinery throughout the drydocking period. The bow overhang must be supported by a minimum of three shores, which are not to be removed until just before ship is undocked. Contractor to dock and undock vessel and allow sufficient laydays to perform both the work described in this specification as well as a margin of time to cover work arisings. Contractor is to quote unit cost per layday.
- .3 The vessel is to be docked so that all docking plugs, transducers, anodes and sea inlet grids are clear and accessible. A minimum clearance of 4' is to be available below the keel. If any hull fittings are covered, the Contractor is responsible for all labour and materials required for making alternative arrangements to drain tanks and/or move blocks to gain access to areas of specified work.
- .4 The Contractor shall be responsible for the safe transfer of the ship from its pre-docking berth or location onto its docking blocks. During docking, radio contact is to be maintained between the vessel's Commanding Officer and the Contractor's Docking Officer. The Contractor is to include in his bid, tug and/or pilotage services as required.
- .5 Within two hours of docking, the underwater hull is to be cleaned by high pressure fresh water washing 2000 PSI minimum to remove all marine growth and allow preliminary inspection.
- .6 Prior to commencing hydroblasting, all hull mounted equipment and openings are to be fully protected
- .7 The following information is to be recorded on Ship Condition Reports.
- .8 Prior to docking, all tanks on vessel to be sounded and contents recorded. Copy to be signed by the ship's Captain, the Chief Engineer and Contractor's Docking Master.

- .9** Prior to docking and after docking, the Contractor is to take a set of “Hot” crankshaft deflections on each main engine as detailed in the manufacturer’s indtruction manual.. These deflection readings shall be taken in the pressence of the Chief Engineer or his delegate. A copy of the deflections is to be given to the Chief Engineer prior to docking and after docking.
- .10** On docking, all tanks emptied to be listed, and copies held by Contractor and Chief Engineer.
- .11** At undocking, all tanks to be refilled to obtain same draft and trim as at docking, and condition agreed by the Docking Master, the ship's Captain and the Chief Engineer.
- .12** Contractor shall remove the aft shaft seal rope guard for sterntube seal inspection and weld it back on as per Lloyd’s classification rules after completion of all work in this specification.
- .13** Contractor shall remove the main port and stbd seachest grids and the forward seachest grid port side. After all work / inspections are completed as outlined in spec item “Cathodic protection” the Contractor shall install all grids and lock up the screws as per Lloyd’s classification rules. Contractor to bid on replacing 24 stainless steel bolt for sea grid’s and quote per one it will adjusted up or down by PWGSC 1379 action.
- .14** The Contractor is not to remove or transfer any tank contents without first discussing same with the Chief Engineer.
- .15** Two gangways which provide safe access to the vessel are to be provided, throughout the dry-docking period. Gangways are to have sufficient lighting and rigged with safety nets.
- .16** For any Hydrostatic testing of tanks the testing shall be carried out uniformly so that excess local strain shall not ensue, not more than one tank at a time shall be filled without symetrical compensation on the other side of the ship. Additional shoring for testing deep tanks shall be fitted when required.
- .17** After the vessel is docked the four permanent hull anodes are to be covered with soft soap. There are two anodes either side of the hull just aft of midships below the the waterline.
- .18** All sea valves shall be shut prior to undocking, and checked for watertightness during the undocking period by the Contractor.

3.2 Location

3.2.1

3.3 Interferences

- 3.3.1** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

All work shall be completed to the satisfaction of the Chief Engineer.

Testing

N/A

4.2 Certification

- 4.2.1 Copy of Docking Master Certification or qualified person.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

Three hard copies of refit reports of all items carried out in this refit specification will be supplied to Chief Engineer.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals

N/A

HD-02 Underwater Hull Inspections

Spec item #: HD-02	SPECIFICATION	LLOYDS #
HD - 02 : Underwater Hull Inspections		

Part 1: SCOPE:

- 1.1** The intent of this specification shall be to carry out the inspection(s) as outlined in the description of work. All staging, materials, and equipment to carry out the work in this specification shall be Contractor supplied.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1.

2.2 Standards

2.2.1

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- .1 Contractor shall check and record the main propeller shaft axial and radial run out, with a dial gauge, and check the tail shaft wear down. Chief Engineer has the wear down gauge.
- .2 Contractor shall take and record the rudder jumping collar clearance.
- .3 Contractor shall take and record the clearance between rudder stock and the upper thordon bush, also the lower pintle clearance and jumping collar clearance.
- .4 Contractor shall remove the drain plugs from the rudder, kort nozzle and skeg and replace plugs and secure them after completion of the work in this specification.
- .5 Contractor shall conduct non-destructive testing (magnetic particle inspection) to detect the presence of cracks on the tail shaft hub flange radius
- .6 Chief Engineer or his delegate to witness all measurements taken.
- .7 Two hard copies of all readings to be given to the Chief Engineer.

3.2 Location

- a. N/A

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

Chief Engineer or his delegate to witness all measurements taken.

4.2 Testing

Contractor shall conduct non-destructive testing (magnetic particle inspection) to detect the presence of cracks on the tail shaft hub flange radius.

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 Two hard copies of all readings to be given to the Chief Engineer.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

HD-03 Cathodic Protection

Spec item #: HD-03	SPECIFICATION	TCMSB Field #: N/A
--------------------	----------------------	--------------------

HD - 03 : Cathodic Protection

Part 1: SCOPE:

Cathodic Protection, Hull Impressed Current System.

- 1.1** The intent of this spec is to provide: a) the necessary procurements and work to update, repair as necessary, test and reactivate the impressed current hull corrosion protection (ICCP) system, and b) to remove spent sacrificial anodes and supply and fit new ones in their place.
- 1.2** All work shall be to the satisfaction of the Chief Engineer and Lloyd's Class.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Drawing and manuals:

- i. 590-96 Docking Plan ,
- ii. Anode MPE Cathodic C 12300 as modified
- iii. Reference electrode MPE Cathodic C 12350
- iv. Cowley ICCP 2014
- v. The installation drawings for ICCP anodes and reference electrodes, ship's electrical drawings and the instruction manual for Cathelco power/control unit will be available on board.

2.1.2. Equipment data: The ICCP system consists of a "Cathelco" thyristor controlled power/control panel, 460/3/60 input, 150 A output at 24VDC , dwg. No. C1614, four anodes, and two reference electrodes. The panel is located in the main machinery space. Shaft grounding brush gear is fitted about fr.27 on the intermediate propeller shaft, the gear consists of grounding brushes and a potential brush connected to a millivolt meter at the control panel. The anodes and reference electrodes are to be renewed, see sec. 3.1.2

2.2 Standards

2.2.1 Transport Canada TP127

2.3 Regulations

2.3.1 Lloyd's Rules

Local Provincial regulations

Transport Canada TP127

2.4 Contractor Furnished Equipment

To supply all material and labour as detailed the technical specification.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- .1** Contractor shall engage the services of M. Yeatman, Andover Management Inc. 7 Canal St., Dartmouth, NS B2Y 2W1, cell 902 488 4119, andover@eastlink.ca to supervise the work, test on completion, and report to CCG Contractor shall contact the Chief Engineer prior to commencement of work to carry out the lockout procedure to isolate all power supplies to the system. Contractor to include in their bid an allowance of \$5,000.00 for Martin Yeatman to be adjusted on proof of invoice by PWGSC 1379 action.
- .2** Prior to entry into any tank or confined space, tank or space is to be certified "Safe for Workers" or "Safe for Hot Work" as required by Transport Canada Marine Safety TP3177E. Certificates to be given to Chief Engineer and copies posted by the tank manhole and gangway.
- .3** Pre-job safety assessments shall be completed as per Canadian Coast Guard fleet safety manual or as per provincial government regulations.
- .4** FSR will do resistance and potential tests before and after refloating the vessel.
- .5** During undocking of the vessel the contractor with Chief Engineer in attendance shall check for leaks and the Contractor shall make repairs prior to vessel floating off the keel blocks.
- .6** After refloating the vessel, power will be restored to the ICCP panel, and the FSR shall do a full system test assisted by the contractor.
- .7** New zinc sacrificial anodes (8 in number EFL Z-26 or equal, see docking plan) shall be supplied and fitted in the seachests and thruster tunnel, and on the rudder after removing the spent ones. One anode EFL Z-12 or equal shall be fitted in each structural cell of the SW cross bay (double bottom frs. 42-44, 14 in number). Anodes shall meet MILSPEC A18001

3.2 Location

- a. ICCP Anode locations:**
 - i. Frame 31 ½ Port
 - ii. Frame 31 ½ Stbd
 - iii. Frame 39 ½ Port
 - iv. Frame 39 ½ stbd
- b. ICCP reference electrode Locations;**
 - i. Frame 19 ½ Port
 - ii. Frame 76 ½ stbd

3.3 Interferences

- a.** Contractor is responsible for the identification of interference items, their temporary removal, and storage and refitting to vessel.
- b.** Contractor shall ensure safe access including gas free certification where necessary.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.3. Contractor shall assist CCG and its representatives to inspect the work after completion In particular the hull anodes (ICCP and sacrificial) and reference electrodes shall be clean and free of overspray before the vessel is refloated. See section HD-06 Underwater Hull Painting for hull paint and dielectric shields.

4.1.4. All work shall be completed to the satisfaction of the Chief Engineer, FSR Inspector.

4.2 Testing

4.2.2. The FSR will carry out a full system check on the ICCP system after the vessel has been refloated. One shipyard electrician should be available to assist. It is preferable that the vessel be on own power for this test.

4.3 Certification

4.3.1 Copy of Manufacture data sheets to be supplied to Chief Engineer.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

The Contractor shall provide the Chief Engineer with three type written copies and one electronic copy. Of all Contractor + FSR work reports, readings and the drawings of the new anodes and reference electrodes.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals

N/A

HD-04 SW Cooling Anti-Fouling System		
Spec item #: HD-04	SPECIFICATION	TCMSB Field #: N/A
HD -04 : SW Cooling Anti-Fouling System		

Part 1: SCOPE:

Anti-fouling Protection Intakes and Sea Water Circulating System

- 1.1 The intent of this spec is to remove the existing wasted 16 anodes in all 3 sea chests and the main sea bay. New anodes to be installed and resistance readings shall be taken and recorded on all the new anodes prior to connection and again after all anodes are connected to the system electrically. Sea bays and sea chests are to be cleaned and then examined by the attending Lloyd's Class Surveyor. All sea water piping suction tailpieces in the sea chests and main sea bay shall be cleaned internally which build up with scale deposits restricting flow. There are also four sacrificial anodes to be removed and replaced with new in the main sea bay which are welded to the tank floors.
- 1.2 All work shall be to the satisfaction of the Chief Engineer and Lloyd's Class Surveyor.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Drawing, instruction book, tech. Order:

- i. Drawing 590-96 Docking Plan
- ii. Cathelco System / Sea boxes and Sea Bay Electrolytic Protection”
Drawing # ECMS-05-04-01 and 02
- iii. The drawing, installation and parts manual are on board the vessel and will be made available to the Contractor.
- iv. Drawing Cowley A/F 2014
- v. Anode Installation
- vi. The system controller is fed from panel L10 Breaker 21/23, 115 V.A.C.
1 Phase

- 2.1.2. **Equipment data:** The A/F system consists of a modular power/control panel of Cathelco Ltd. UK manufacture, located in the main machinery space, 120/1/60 input, 8 dual control modules. Each of 16 controls is adjustable from 0 to 2 amps DC. The panel was fitted in 2003. There are 16 expendable anodes, 6 copper, 6 aluminum, and 4 iron, located in the seachests and the cross bay.

2.2 Standards

2.2.1

2.3 Regulations

2.3.3.1 Transport Canada TP127,

2.3.4.1 Lloyds Rules,

2.3.5.1 Local safety regulations applicable to the shipyard

2.4 Owner Furnished Equipment

Contractor will install owner supplied 16 anodes for this specification item. All other materials required to complete this spec shall be Contractor supply including the 4 x Z-26 sacrificial anodes (MILSPEC A18001)

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- .1 Contractor shall engage the services of M. Yeatman, Andover Management Inc. 7 Canal St., Dartmouth, NS B2Y 2W1, cell 902 488 4119, andover@eastlink.ca to supervise the work, test on completion, and report to CCG. Contractor to include in their bid an allowance of \$5,000.00 for Martin Yeatman to be adjusted on proof of invoice by PWGSC 1379 action.
- .2 Contractor shall contact the Chief Engineer prior to commencement of work to carry out the lockout procedure to isolate all power supplies to the system.
- .3 **Hull external Sea Chest grids** (3 in total : Port & Stbd midships, and Fwd Port) Each Sea chest grid has 10 x M20 x 90mm long counter sunk stainless steel screws, nuts are welded to the back of 100 x 65 x 12.50mm flat bar lugs. Length of screws is not denoted on the drawing. The screws are locked by spot weld. Contractor bid replacing 5 with new and bid per 1 for adjustment purposes by PWGSC 1379 action.
- .4 Contractor shall remove all manhole covers and sea chest grids to gain access to the anodes.
- .5 Prior to entry, tank is to be certified "Safe for Workers" or "Safe for Hot Work" as required by Transport Canada Marine Safety TP3177E. Certificates to be given to Chief Engineer and copies posted by the tank manhole and gangway.
- .6 Pre-job safety assessments shall be completed as per Canadian Coast Guard fleet safety manual or as per provincial government regulations.
- .7 The contractor shall remove any loose scale deposits in the sea bay and sea chests and dispose of as per provincial regulations. The contractor shall not scrape any scale from the sea bay internals, the scale acts as a protective coating

- .8 After all internal cleaning is completed the Contractor shall arrange to have the main sea bay and all three sea chests inspected internally by the Lloyd's surveyor.
- .9 Contractor shall remove all of the 16 A/F system anodes regardless of their degree of consumption, and clean the safety caps and the plating in way of their installation. (All removed old anodes to be give to the Chief Engineer). Badly corroded or damaged safety caps shall be replaced with new ones. regulations.
- .10 The contractor shall install the new marine growth (M.G.),trap corrosion(T.C.) and cast iron anodes as per the FSR's instructions and location drawing. The four cast iron anodes are referenced on the drawing EMCS-05-04-01 as follows: 13-TC8 / 14-TC9 / 15-TC10 / 16-TC14. Contractor shall use all new gaskets and fittings. Resistance values shall be taken and recorded on all of the new anodes prior to and after installation. The anode safety caps shall be fitted with new seals.
- .11 Before fitting the anodes, contractor shall make suitable fittings and pressure test the eight (8) safety caps with conduit extensions through the double bottom, P and S at the main sea chests. Cost of possible repairs to be negotiated before proceeding. All anodes shall then be installed according to the drawings.
- .12 The anodes shall be installed with 90-100 lbs. ft torque, and the cables reconnected. The safety caps in the main sea chests P & S shall be filled with Vaseline and the covers fitted with new 'O' rings. The other safety cap covers or conduit glands shall be left off until the trial float-off of the vessel, and inspected for leaks. When proven tight, the caps shall be filled with Vaseline and the covers replaced with new "O" rings as necessary.
- .13 Before connecting the cables at the panel, FSR shall check the resistance and potential.
- .14 Contractor shall also install a total of four z-26 sacrificial anodes, one in each structural cell of the main sea bay. Contractor shall supply the z-26 anodes. These are welded to the tank floors. (double bottom frs. 42-44)
- .15 After refloating the vessel, power will be restored to the panel, and the FSR shall reconnect the anode and ref. electrode cables and do a full system test assisted by the contractor.
- .16 Contractor shall clean internal piping of all sea suction tail pieces within the main sea bay. There are a total of 12 suction tail pieces as per the table below:

Number	Description	Diameter (mm)
CW-11	Port S/S Generator	65
CW-13	Air Compressors	38
CW-14	Port Main Engine	150

HD-04 SW Cooling Anti-Fouling System

CW-15	Refrigeration	38
CW-16	Stbd. Main Engine	150
CW-17	Stbd generator	65
CW-18	Harbour Generator	65
B-16	Main Fire pump	100
B-17	General Service pump	100
B-36	Bilge Pump	100
No #	Reverse Osmosis Pump	38
No #	Emergency Fire pump fwd sea chest	100

- .17** Contractor shall replace and secure all manhole covers with new gaskets and the manhole cover studs shall be wire brushed cleaned and coated with an anti-seize compound.
- .18** Contractor shall install and secure the 3 sea chest grids, the screws on the sea chest grids shall to be torqued up and spot welded. The welds shall be ground flush to hull's profile. After installation the grids shall be primed and coated as per the detail outlined in the Underwater Hull Painting spec.
- .19** During undocking of the vessel the contractor with Chief Engineer in attendance shall check for leaks and the Contractor shall make repairs prior to vessel floating off the keel blocks.

3.2 Location

a. Cathodic Anode Location(s):

Forward emergency fire pump sea chest	Fr.80-82	(4 anodes)
Main Sea Bay	Fr.42-44	(4 anodes)
Port & Stbd sea chests	Fr.42-44	(4 anodes per chest)

Total of 16 Anodes

b. Sacrificial Zinc Anodes

Main Sea Bay	Fr. 42-44	(4x Z-26 Zinc)
--------------	-----------	----------------

3.3 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, and storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

- 4.1.5. Contractor shall assist CCG and its representatives to inspect the work after completion.
- 4.1.6. All work shall be completed to the satisfaction of the Lloyd's Surveyor, Chief Engineer and Field Service Represented (FSR).

4.2 Testing

- 4.2.1. The FSR will carry out a full system check on the system after the vessel has been refloated. One shipyard electrician should be available to assist.

4.3 Certification

- 4.3.1 Copy of Manufacture data sheets to be supplied to Chief Engineer.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

The Contractor shall provide the Chief Engineer with three hard copies and one electronic copy of all Contractor + FSR work reports, drawings and readings.

5.2 Spares

No spares required

5.3 Training

No training required

5.4 Manuals

N/A

Spec item #: HD-05	SPECIFICATION	TCMSB Field #: N/A
HD - 05 : Sacrificial Hull Anodes		

Part 1: SCOPE:

1.1 The intent of this specification is to renew the two anodes one each attached port and stbd midships just under the bilge keels and the four outside Bowthruster tunnel two on each side. Anodes are welded to the hull.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- Refer to docking plan 590-96 for anode placement / location details.

2.2 Standards

2.2.1 The following Coast Guard Standards and/or Technical Bulletins must be followed while executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.

2.2.1.1 Canadian Coast Guard Fleet Safety Manual (DFO 5737)

2.2.1.2 Coast Guard ISM Lockout/Tagout

2.2.1.2 Coast Guard

ISM Hotwork

procedures

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

2.4.1 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated Total of eight , 22 POUND Z-26 from Eastern Foundries Ltd or equal.

Part 3: TECHNICAL DESCRIPTION:

3.1General

- Contractor shall remove wasted hull anodes located outside Bow Thruster

tunnel, midships under bilge keels Port & Stbd side of vessel, and on each side of the rudder. Grind old weld residue flush where brackets have been cut off, install new anodes outside tunnel and touch up Hull coating.

- All materials shall be Contractor supply. Contractor shall dispose of wasted anodes as per the provincial environmental regulations.
- Contractor shall schedule this work prior to the work in the Hull painting spec to ensure the bare metal is primed and coated along with the rest of the Hull.
- All work shall be to the satisfaction of the Chief Engineer .

3.2 Location

- Four anodes outside Bowthruster tunnel two anodes on each side and two attached port and stbd midships just under the bilge keels one on each side and two on the rudder.

3.3 Interferences

N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

- 4.1.1 100% visual by Chief Engineer .

4.2 Testing

N/A

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.2 Spares

N/A

5.3 Training

N/A

5.4Manuals

N/A

Spec item #: HD-06	SPECIFICATION	TCMSB Field #: N/A
HD - 06 : Underwater Hull Painting		

Part 1: SCOPE:

- 1.1 The intent of this spec is to affect repairs to the Inerta hull coating, touch up and re-coat the entire underwater hull which is 6" above the waterline down to and including the Keel. Contractor to include rudder and Kort nozzle. Also to paint draft marks and plimsoll marks.
- 1.2 This work shall be carried out in Conjunction with the following:
HD-8 Hull Above Ice Belt Painting.

Part 2: REFERENCES:

Guidance Drawings/Nameplate Data

Total underwater area is 1188square meters.

Standards

- 2.2.1 Follow Manufacture's product data sheets.

Regulations

- 2.3.1 Meet the satisfaction of an NACE Inspector.

Owner Furnished Equipment

- 2.4.1 It is noted that Canadian Coast Guard will provide the service of an independent NACE Inspector.
- 2.5.1 The contractor shall supply all: materials, equipment, including staging, rigging, scaffolding, enclosures, heating, painting equipment and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

General

- 3.1.1 Contractor shall repair 140 square meters of the underwater hull coating (SA 2 1/2 on 140 square meters) and sweep blast 100% on 1188square meters.
- 3.1.2 Contractor shall provide unit cost for grit blasting per square meter.

- 3.1.3** Contractor shall provide unit cost for complete coating per square meter.
- 3.1.4** All anodes shall be affixed prior to painting. Hull sacrificial anodes shall be protected from paint and grit blasting , the protection shall be removed prior to undocking.
- 3.1.5** The affected areas are to be grit blasted to SA 21/2, edges feathered; this is to roughen up the Inerta for the new coating system to adhere. All traces of grit used for blasting are to be removed by contractor.
- 3.1.6** Contractor is responsible and liable for ensuring the hull is clear and clean prior to, during and immediately after coating application.
- 3.1.7** Grit for blasting shall not enter any part of the ship. All access points shall be suitably covered by contractor. This includes the main engines and main generators exhaust outlets located at the top off stack.
- 3.1.8** Contractor shall plug all deck scuppers and discharges as well as take any precautions necessary to prevent any liquids from contaminating areas being prepared for or being coated.
- 3.1.9** Contractor to ensure surfaces and equipment other than those specified in this specification are not coated and inlets or discharges on the shell will not be blocked by the coating including the transducers.
- 3.1.10** Contractor to provide protection for deck machinery and any other equipment shall be protected from grit blasting and painting. This will include the fall for lifeboats and FRC davits.
- 3.1.11** Sea bays and grid shall be protected during the grit blasting and coating process and orifices shall be proven original diameter prior to undocking.
- 3.1.12** Equipment used to apply the coating shall meet the specifications of the coating manufacturer.
- 3.1.13** No substitutes shall be permitted for any paint. Only dry film thickness (DFT) used for assessment.
- 3.1.14** Coating sequence as follows: 1. Spot prime 1st coat Intershield ENA 300 Aluminum 6 mils DFT. 2. 2nd coat Intershield ENA 300 Bronze 6mils DFT. 3rd coat Intergard 377 Black 6 mils DFT.
- 3.1.15** Top coat one complete coat of Intergard 377 black 6-8 mils DFT, abrasion resistant low temperature curing epoxy.
- 3.1.16** Contractor shall paint Draft marks and Plimsill marks white with one coat of Intergard 264 epoxy.

Location

- 3.1.17** Entire under water hull area.

Interferences

- 3.2.1.** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

All work shall be completed to the satisfaction of the Chief Engineer,
NACE Inspector.

Testing

4.2.2.

Certification

4.3.1 Copy of Manufacture data sheets to be supplied to Chief Engineer.

Part 5: DELIVERABLES:

Drawings/Reports

5.1.1 Three hard copies of refit reports of all items carried out in this refit
specification will be supplied to Chief Engineer.

5.1 Training
N/A

5.2 Manuals

HD-07 : Hull Painting Above Ice Belt

Spec item #: HD-07	SPECIFICATION	LLOYDS #
HD-07 : Hull Painting Above Ice Belt		

Part 1: SCOPE:

- 1.1 The intent of this spec is to grit blast and paint the vessel's hull from waterline to the upper bulwarks (Coast Guard Colours).
- 1.2 This work shall be carried out in Conjunction with the following:
All specification items HD-6 Hull underwater painting.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- 2.1.1 Total area above ice belt is 800square meters.

2.2 Standards

- 2.2.1 Follow Manufacture's product data sheets.

2.3 Regulations

- 2.3.1 Meet the satisfaction of an NACE inspector.

2.4 Owner Furnished Equipment

The contractor shall supply all: materials, equipment, including staging, rigging, scaffolding, enclosures, heating, painting equipment and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- .1 The damage affected areas are to be grit blasted SA-2 1/2 on 120square meters and to be sweep blast profile number SS SA1 or SSPC-SP7 100%(sweep on 800 square meters). Areas of the undamaged adjacent coating are to be feathered to provide a suitable surface for the new coating system to adhere.

- .2 The waterline is clearly marked physically on hull which is detailed on the ship's drawings, for clarification the Chief Officer shall identify the waterline.
- .3 Contractor shall provide suitable storage facilities close to work site for necessary materials and equipment they are to be maintained at the recommended temperature of the coating manufacture to ensure ease of preparation and application.
- .4 The mixing and spraying equipment shall be kept heated and protected as necessary, while in use to ensure that the coating is maintained and the recommended temperature.
- .5 Contractor to provide unit cost for grit blasting per square meter.
- .6 Contractor shall provide unit cost for complete coating per square meter.
- .7 All anodes shall be affixed prior to painting. Hull sacrificial anodes shall be protected from paint and grit blasting, the protection shall be removed prior to undocking.
- .8 All traces of grit used for blasting are to be removed by contractor.
- .9 Contractor is responsible and liable for ensuring the hull is clear and clean prior to, during and immediately after coating application.
- .10 Grit for blasting shall not enter any part of the ship. All access points shall be suitably covered by contractor. This includes the main engines and main generators exhaust outlets located at the top off stack.
- .11 Contractor shall plug all deck scuppers and discharges as well as take any precautions necessary to prevent any liquids from contaminating areas being prepared for or being coated.
- .12 Contractor to ensure surfaces and equipment other than those specified in this specification are not coated and inlets or discharges on the shell will not be blocked by the coating including the transducers.
- .13 Contractor shall also take measures to ensure that no damage, unnecessary cleaning, or any repairs result from either the hull preparations or the coating application.
- .14 Contractor to provide protection for deck machinery and any other equipment shall be protected from grit blasting and painting. This will include the falls for lifeboats and FRC davits.
- .15 Sea bays and grid shall be protected during the grit blasting and coating process and orifices shall be proven original diameter prior to undocking.
- .16 Equipment used to apply the coating shall meet the specifications of the coating manufacturer.
- .17 No substitutes shall be permitted for any paint. Only dry film thickness (DFT) used for assessment.
- .18 Coating sequence as follows: There shall be 4 coats of paint as follows; (2 primer coats and 2 finish coats)The areas which have been cleared to bare metal are then to be coated with Interprime CPA 099 Prime RED to 3 mils DFT (Dry film thickness).
- .19 Under areas which are to finished CCG Red and CPA 097 Prime white to 3 mils DFT. Under areas which are then to be finished white to prevent shadows in the finish coat.

- .20 Finish coat to be as follows: (1.) Rail to ice belt LAA Intersheen CCG Red, 1.6-2 mils DFT, (2.) Stripes Intersheen Black LAY-999, 1.6-2 mils DFT, (3.) Intersheen white LAY-000, 1.6-2 mils DFT. Paint is Coast Guard White.
- .21 Thickness determination of the new coating is to be verified and recorded at three positions on each repair area. Measuring points to be as indicated by the Owner's representative.

3.2 Location

- a. Hull from waterline to the upper bulwarks.

3.3 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

All work shall be completed to the satisfaction of the Chief Engineer and NACE Inspector

4.2 Testing

4.2.2.

4.3 Certification

4.3.1 Copy of Manufacture data sheets to be supplied to Chief Engineer.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

Three hard copies of refit reports of all items carried out in this refit specification will be supplied to Chief Engineer.

5.2 Spares
N/A

5.3 Training
N/A

5.4 Manuals
N/A

Part 1: SCOPE:

- 1.1 Note this item has to be done prior to HD-5 and HD-6.
- 1.2 Hull plate welding butts and seams to repair.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- 2.1.1. 590-70 General Arrangement
- 2.1.2. 590-04 Profile & Deck
- 2.1.3. 590-01 Shell Expansion
- 2.1.4. 590-18 Stringer Plan
- 2.1.5.

2.2 Standards

2.2.1

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- .1 Hull plate welding butts and seams to be repaired will be determined at the time of hull survey by the Lloyd's and Coast Guard representatives and the Chief Engineer.
- .2 Seams and butts selected for repair are to be marked, cleaned to sound metal by air arc or grinding and brought up to original level by approved welding techniques and materials. Welders must be certified by Canadian Welding Bureau (CWB). All work is to be to the satisfaction of Lloyd's and Chief Engineer. Contractor is to use rods suitable for use with Grade EH-36 steel.

.3 Contractor is to quote on 305 meters of gouging and 1220 bead meters of weld. The contractor is to quote per bead meter for adjustment purposes.

.4 Any butts and seams falling in way of fuel tanks that require gas freeing and certification will be covered by 1379 action. Butts and seams falling in way of ballast/void tanks that are painted will require paint work to be touched up in way of damage and will be covered by 1379 action

3.2 Location

a. Hull of ship.

3.3 Interferences

3.3.1 Fuel and Ballast Tanks

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

100% visual to be carried out by Chief Engineer, Lloyd's Surveyor .

4.2 Testing

100% Magnetic Particle Inspection (MPI)

4.3 Certification

Welding in accordance with CSA W47.1 & W59

Welder's to CWB W47.1 Certified.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

Spec item #: HD-09	SPECIFICATION	LLOYDS #
HD – 09 :Cooling Water Drains Tanks		

Part 1: SCOPE:

- 1.1 The intent of this specification is to open up Port and Stbd Main Engine Jacket Water Drains Tanks for Lloyd's 5 year survey inspection and air pressure tested. Contractor shall arrange scheduling of the Lloyd's Surveyor's for inspection and testing.
- 1.2 Also the contractor shall clean the tank and prove operational all of the level float switches. All work shall be inspected by the Chief Engineer including inspection after cleaning, and before the tank is closed up and to witness operational tests.
- 1.3 Ship repair facilities and / or contractors are to have in place Confined Space Entry Programs that meet the provincial requirements.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- 2.1.1. Capacity 1.3 cubic meters each.
- 2.1.2. Drawing #590 Revision 2 (for the location of the docking plugs).
- 2.1.3. Surface area is approximately 8 m² each.

2.2 Standards

- 2.1.1. **Canadian Coast Guard Fleet Safety Manual (DFO 5737)**
- 2.1.2. Coast Guard ISM Lockout/Tagout
- 2.1.3. Coast Guard ISM Hotwork procedures
- 2.1.4. Coast Guard Enclosed Space Working procedures

2.3 Regulations

- 2.3.1 Entry into confined spaces shall be carried out in accordance Provincial Regulations.

2.4 Owner Furnished Equipment

- 2.4.3 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- 3.1.17 Contractor shall notify Chief Engineer prior to starting work.

- 3.1.18** The main engine cooling water drains tanks shall be isolated from the inlets. Upon completion of all work in this spec the Contractor shall remove all blanks / by-passes that were fitted to isolate the tank.
- 3.1.19** The contractor shall pump down the main engine cooling water drains tanks to there lowest level, the manhole cover removed, tank gas freed “safe for personal” certificate to be given to chief engineer, and posted by manhole for tank to be entered and on the vessel’s gangway. Any remaining water and debris shall be disposed of in accordance with the provincial environmental regulations.
- 3.1.20** All internal surfaces of the tank shall be cleaned by the Contractor and wiped down using lint free wiper rags.
- 3.1.21** The tanks shall be inspected by Lloyd’s and the Chief Engineer. The contractor shall be responsible for scheduling the inspectors for inspections.
- 3.1.22** Suction pipe from discharge pump shall be removed and proven clear and re-installed.
- 3.1.23** Sounding pipe shall be proven clear.
- 3.1.24** All float and level switches shall be cleaned.
- 3.1.25** After all work is completed the contractor shall replace manhole covers using new contractor supplied 1/4" neoprene gaskets gasket. Manhole securing studs and nuts shall be cleaned up and coated with anti seize compound.
- 3.1.26** Contractor shall conduct an air pressure test on the tank as per Lloyd’s rules and requirements. The Lloyd’s surveyors and the Chief Engineer witnessing all testing.
- 3.1.27** After all testing is completed the sounding pipes, suction pipes and vents (vent caps) shall be proven clear. The high level alarm shall be proven operational by the contractor.

3.6 Location:

- a.** Frames No. 41 -42 off vessel’s center line.
- b.** Port and Starboard inner main engine cooling double bottom tanks.

3.7 Interferences

- a.** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

- 4.1.7.** Tanks shall be inspected by a Lloyd’s Surveyor and the Chief Engineer.
- 4.1.8.** All work shall be completed to the satisfaction of the Chief Engineer.

4.2 Testing

- 4.2.1. Tank has to be air tested for Lloyd's five year survey it has to be witness by a Lloyd's Surveyor and Chief Engineer.
- 4.2.2. Contractor has to prove alarms and probe working after air testing is carried out.
- 4.2.3. Contractor to prove clear sounding pipes, suction pipes and vents.

4.3 Certification
N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

- 5.1.1 Contractor to supply two typed and one electronic copies of report to Chief Engineer.

5.2 Spares
N/A

5.3 Training
N/A

5.4 Manuals
N/A

Spec item #: HD-10	SPECIFICATION	LLOYDS #
HD – 10 : Forward Capstan Hydraulic Motor		

Part: 1 SCOPE:

1.1 The intent of this specification shall be to refurbish the Forward Capstan as listed in this specification to repair current leaking head seals.

Part: 2 REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1 Reference drawings General arrangement Focsle, Upper, Main deck and Hold 590-70 sheet 1 of 2 and 2 of 2.

2.1.2 Manual #62 located in Chief Engineers Cabin.

2.2 Standards

2.2.1 All standard fluid power practices to be used as a standard in this refit. All hydraulic work shall be done by a certified hydraulic shop. All customer supplied oil to be filtered into our systems through a filter cart with 3 micron filters.

2.3 Regulations

2.3.1 Contractor responsible for all standard lockout procedures as per Provincial regulations.

2.3.2 Contractor responsible for all standard lockout procedures as per Provincial regulations.

2.4 Owner Furnished Equipment

2.4.1 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part: 3 TECHNICAL DESCRIPTION

3.1 Forward Capstan

- 3.1.1.1** The contractor is to ensure the forward starboard hydraulic unit is locked out, and is to be verified by chief engineer or delegate.
- 3.1.1.2** Drain gear oil from forward capstan head gearbox, oil sample of this gear oil to be sent for sampling and results presented to CCG Chief Engineer.
- 3.1.1.3** The contractor shall disconnect the hydraulic motor from the Hydraulic circuit, capping all lines to ensure no contamination of the hydraulic circuit.
- 3.1.1.4** Remove Capstan head hydraulic motor (Calzoni MR 1800 N5) from gear box. Motor to be transported to contractor shop.
- 3.1.1.5** Motor to be disassembled for inspections 100% visual by CCG Chief Engineer.
- 3.1.1.6** Motor to be assembled with contractor supplied seal kit. Motor to be tested on contractor test bench as per manufactures specifications and test report provided. Contractor must also provide oil sample certificated of test bench oil with a minimum of NAS Class 6.
- 3.1.1.7** Contractor to transport the hydraulic motor back to vessel to its location on the vessel. Contractor to install hydraulic motor and fill up gearbox with new contractor supplied oil.
- 3.1.1.8** Contractor to run up and test Capstan operation to be witness by Chief Engineer. Any leaks shall be corrected by the contractor.

3.2 Location

- 3.2.1** Forepeak Store Room

3.3 Interferences

- 3.3.1** N/A

Part: 4 PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1 Chief Engineer to witness an inspection of opened machinery

4.2 Testing of Forward Capstan

4.2.1 All test to be witness by CCG Chief Engineer.

4.2.2 Winches to be ran up for 5 minutes in each direction to ensure oil to each component.

4.2.3 Oil level to be topped up in hydraulic tank.

4.2.4 Bollard pull is required for capstan winch to simulate the capstan working under loaded conditions.

4.3 Certification

4.3.1 All standard fluid power practices to be used as a standard in this refit. All hydraulic work shall be done by a certified hydraulic shop.

Part: 5 DELIVERABLES:

5.1 Drawings/Reports

5.1.1 The successful contractor shall supply two hard copies and one electronic copy of refit report including test reports, oil sample reports, to Chief Engineer.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals

N/A

HD-11 Bilge Keels

Spec item #: HD-11	SPECIFICATION	LLOYDS #
--------------------	---------------	----------

HD – 11 : Bilge Keels

Part 1: SCOPE:

- 1.1 The intent of this specification shall be to carry out a hydrostatic test on the Port & Stbd bilge keels.
- 1.2 Contractor shall note that if welding repairs are required on the bilge keels that fuel oil tanks depending on area of damage would have to be gas free prior to commencement of any hot work.
- 1.3 Bidders shall include a price for 19 meters of gouging and welding plus unit cost per meter.
- 1.4 Contractor shall include fault finding and marking in its bid.

Part 2: REFERENCES:

- 2.1 **Guidance Drawings/Nameplate Data**
 - 2.1.1. Drawing # 87536-1 Rev 1.
- 2.2 **Standards**
 - 2.2.1
- 2.3 **Regulations**
 - 2.3.1
- 2.4 **Owner Furnished Equipment**

The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- .1 Contractor shall remove the drain plugs from both Bilge Keels. Contractor shall perform a hydrostatic test on each to a head of 2.45 meters for 30 minutes. Chief Engineer shall be notified to witness testing.

- .2 Contractor shall replace plugs with thread sealant and secure them as per approved method to Lloyd's classification rules after completion of the work in this specification.
- .3 Contractor to bid on gas freeing two fuel oil tanks and quote per one fuel oil tank to be gas freed to be adjusted by PWGSC 1379.
- .4 The Chief Engineer shall witness testing.

3.2 Location

- a. Port and Stbd external bilge keels (Frame No.'s 26-68).

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

100% visual By Chief Engineer, Lloyd's Surveyor .

4.2 Testing

100% Magnetic Particle Inspection (MPI)

4.3 Certification

Welding in accordance with CSA W47.1 & W59

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1

5.2 Spares

N/A

5.3 Training
N/A

5.4 Manuals N/A

HD - 12 : Grey water Tank

Spec item #: HD-12	SPECIFICATION	LLOYDS #
--------------------	---------------	----------

HD - 12 : Grey water Tank

Part 1: SCOPE:

- 1.1** The intent of this specification is to open up tank for annual cleaning and inspection. Contractor shall clean and touch up tank coating where affected. Prove operation of all level and operating switches. All work shall be inspected by the Chief Engineer including inspection after cleaning, painting and before tank is closed up and to witness operational tests.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- 2.1.1.** Capacity 1.6 cubic meters.
- 2.1.2.** Surface area Approximately 11.15 square meters.

2.2 Standards

- 2.2.1** Canadian Coast Guard Fleet Safety and Security Manual (DFO/5737)
- 2.2.2** Canadian Coast Guard ISM Lockout/Tagout
- 2.2.3** Canadian Coast Guard ISM Hotwork Procedures
- 2.2.4** Canadian Coast Guard ISM Enclosed Space Entry Procedures
- 2.2.5** IACS No. 47 – Shipbuilding and Repair Quality Standards
- 2.2.6** Society for Protective Coatings (SSPC) Standards

2.3 Regulations

- 2.3.1** Lloyd's Classification.
 - 2.3.2** Canada Shipping Act 2001 – Marine Machinery Regulations
- Owner Furnished Equipment**

The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- .1 The contractor shall with the aid of the Senior Engineer shall ensure the grey water discharge pump is locked out.
- .2 Tank level transducer shall be removed from the tank and a blank fitted to the flange plate of the tank while work and testing are being carried out. Upon completion the blank shall be removed and the transducer reinstalled using new gaskets. This work shall be completed by the Contractor.
- .3 The gray water tank shall be isolated from the inlets and by-pass arrangements installed to the overboard pipe. The Senior Engineer or Chief Engineer shall verify all inlets have been dealt with. The contractor shall make provision for the removal of waste while tank is undergoing cleaning and inspection. The contractor shall bid on the removal of 5 cubic meters of grey water and give a cost per cubic meter price and the final price shall be adjusted up or down based on the invoice for removal
- .4 The gray water tank shall be pumped down to its lowest level, the manhole cover removed, tank gas freed “safe for personal” certificate to be given to Chief Engineer, and posted by manhole for tank to be entered and on the vessel’s gangway. Any remaining water and debris shall be disposed of in accordance with the provincial environmental regulations.
- .5 Contractor shall remove the docking plug to drain water accumulation. Docking plug removed shall be tagged immediately after removal, stored in a suitable container to prevent damage to the threads and given to the Chief Engineer. The Chief Engineer or his delegate shall be present when docking plug are removed and re-installed.
- .6 Contractor shall supply and fit docking plug opening with a wooden plug to prevent ingress of dirt during operations such as sandblasting, painting, etc. which could cause contamination of tank to occur.
- .7 After all tank work is completed the docking plug shall be installed using new sealing thread and white lead. Tap to be run over threads in hole. Docking plug threads shall be cleaned on a lathe if required. Contractor to quote on thread cleaning docking plug in lathe.
- .8 Contractor shall clean all internal surfaces of the tank.

- .9** The tanks shall be inspected by the Chief Engineer or his delegate Engineer.
- .10** The Contractor shall bid on supplying and repairing coating for 50sq ft. of tank internals with International Intershield ENA 300. Any scaling or damaged internal tank paint surfaces shall be repaired by power tooling to SSPC-SP11 standard (bare metal with profile) and given two coats. The first coat shall be Intershield ENA 300 bronze @ 6 Mils DFT. The second coat shall be Intershield ENA 300 Aluminum grey @ 6 Mils DFT s. The contractor shall quote a unit square foot price and the cost shall be adjusted up or down by 1379 action base on the actual units (square feet) required for repair. Coating applied to the tanks internal surfaces shall follow the recommended procedure as set out in the paints manufacture's literature.
- .11** Suction pipe from discharge pump shall be removed and proven clear and re-installed.
- .12** Sounding pipe shall be proven clear.
- .13** All float and level switches shall be cleaned.
- .14** After all work is completed Contractor shall replace manhole cover using new approved gasket. Manhole securing studs and nuts shall be cleaned up and coated with anti-seize compound.
- .15** The tank shall be filled with fresh water and the high level alarm, pump cut in / out float switches shall be proven operational.
- .16** . Upon completion of all work in this specification the Contractor shall remove all blanks / by-passes that were fitted to isolate the tank.

3.2 Location

- a.** Shaft tunnel Frames No. 20 – 21.

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

Tanks shall be inspected by the Chief Engineer or his delegate Engineer.

4.2 Testing
N/A

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 Contractor to supply two typed copies of report to Chief Engineer.

5.2 Spares N/A

5.3 Training N/A

5.4 Manuals N/A

HD -13 Fresh Water Tank Cleaning

Spec item #: HD-13	SPECIFICATION	LLOYDS #
HD - 13 : Fresh Water Tank Cleaning		

Part 1: SCOPE:

- 1.1 The intent of this specification is to complete a cleaning and inspection of the vessels domestic fresh water tank..

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- 2.1.1. Capacity Plan 590-79
- 2.1.2. Capacity 32.5 Cubic Meters

2.2 Standards

- 2.2.1 Canadian Coast Guard Fleet Safety and Security Manual (DFO/5737)
7.A.12 Potable Water Quality
- 2.2.2 Canadian Coast Guard ISM Lockout/Tagout
- 2.2.3 Canadian Coast Guard ISM Enclosed Space Entry Procedures
- 2.2.4 Canadian Coast Guard ISM Hotwork Procedures

2.3 Regulations

- 2.3.1 Lloyd's Classification.
- 2.3.2 Canada Shipping Act 2001

2.4 Owner Furnished Equipment

- 2.4.4 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- 3.1.1. Contractor shall connect up a separate fresh water supply of 3.5 bar pressure to ship's domestic freshwater system, before the fresh water tank is taken out of service and left in place until the fresh water tank is ready to go back in service.

3.1.2. Contractor is to sound and record the amount of water in the tank before starting work. Contractor shall pump out contents of the tank and dispose of any residue water remaining. The contractor is to remove the remaining water from the tank and shall bid on the removal of 1m³ of water and provide unit cost per m³ for the removal of additional water.

3.1.3. Contractor shall remove manhole cover and gas free tank, “safe for personnel”. Certificate to be given to Chief Engineer, and copies posted by manhole for the tank to be entered and a copy posted by the ships gang way.

3.1.4. The tank is to be hydro blasted and chemically cleaned with a chemical capable of removing rust discoloration. The chemical used is to be approved by the Provincial Health Services for its intended application. Proof of such approval is to be furnished to the Chief Engineer before work begins. All debris is to be removed from tank and the tank is to be wiped down and dried out. After cleaning, the tank is to be inspected by Nace Inspector and by the Chief Engineer or his delegate Engineer.

3.1.5. The contractor shall quote on cleaning 100 m² and provide unit cost for cleaning per m².

3.1.8. Contractor shall prove the tank sounding pipe / tank inlet and outlet piping and pump suction strainer are free and clear prior to closing up the tank.

3.1.9. Contractor shall supply / install a steel elbow adaptor c/w bolt type 150 # flange / gasket sized to bolt to 1.5 inch sounding pipe isolation valve located lower end of tank stbd side in the forward machinery space. Contractor shall remove the existing short section of sounding pipe already flanged to the isolation valve for removal to fit install the adaptor. This adaptor will allow the Contractor(s) supplied pump / hoses / fittings to be connected for the purpose of pumping out the fresh water tank when flushing / chlorinating the tank. Upon completion of all work in this spec and prior to commissioning the domestic fresh water system the Contractor shall remove adaptor and re-pipe sounding pipe as per original.

3.1.10. Upon completion of inspection and work in this spec the contractor shall remove the vent cap from the vent pipe and replace manhole cover (s) using a new gaskets & anti seize compound on all studs. The Contractor shall include the cost to replace three manhole studs and provide a unit cost per replacement of additional manhole studs.

3.1.11. The contractor shall fill and flush the tank once after cleaning. It shall then be refilled with fresh water then super chlorinate (disinfect) the tank as per procedure set out in the Fleet Safety Manual 7.A.12 Potable Water Quality, Section 3.5 Disinfection. All taps throughout the vessel shall be turned on to supply super chlorinated water to all piping. The super chlorinated water shall stand for a minimum of four hours. Super chlorination is achieved by adding unscented bleach @ 5% sodium hypochlorite at a volume of 1 litre / cubic meter of water in the tank. The contractor shall dispose of the super chlorinated water in the tank as per provincial regulations. The contractor shall then re-fill and flush the tank again to ensure the removal of super chlorinated water.

3.1.12. Contractor shall re-fill the tank with fresh water for a final time and chlorinate to a standard level of 0.2 – 0.5 mg/litre which is achieved by dosing the tank with unscented bleach at a rate of 2 litres / 100 cubic meters. Contractor shall first take sample of shore water supply and

send to an independent laboratory for testing, the testing parameters (28) shall follow the testing parameters set out in the Fleet Safety Manual 7.A.12 Potable Water Quality.

3.1.13. Contractor shall bid on 4 fills and 3 flushes. The Contractor shall include the cost for the disposal of any chlorinated and neutralized water.

3.1.14. After completion of work, three samples of fresh water shall be taken from the tank, furthest point from tank and the Galley, these three samples shall be sent to an independent laboratory for testing, the testing parameters (28) shall follow the testing parameters set out in the Fleet Safety Manual 7.A.12 Potable Quality. The contractor shall test for VOC levels in the testing procedures and shall include the cost of the VOC testing in the bid price. The Contractor must test for total hydrocarbons. An inspection certificate shall be sent to the Chief Engineer or Chief Officer.

3.1.15 Contractor to provide a unit cost per square meter for coating repair. Coating is Royle Coating Easy Prep

3.8 Location:

- a. Frame, 71-75

3.9 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. Inspection of tank shall be carried out by Lloyd's Surveyor, Nace Inspector , Chief Engineer and or Chief Officer before any work is started.

4.1.2. An inspection of tank before closing shall be done by Lloyd's Surveyor the Chief Engineer and or Chief Officer.

4.1.3. All work shall be completed to the satisfaction of the Chief Engineer.

4.3 Testing

4.2.1. After completion of work, three samples of fresh water shall be taken from the tank, furthest point from tank and the Galley, these three samples shall be sent to an independent laboratory for testing, the testing parameters (28) shall follow the testing parameters set out in the Fleet Safety Manual 7.A.12 Potable Quality.

4.3 Certification
N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 The contractor shall provide 2 written Copies and one electronic of any documents or test to the Chief Engineer.

5.2 Spares
N/A

5.3 Training
N/A

5.4 Manuals
N/A

HD -14 Windlass Port and Stbd

Spec item #: HD-14	SPECIFICATION	LLOYDS #
HD - 14 : Windlass Port and Stbd		

Part 1: SCOPE:

- 1.1 The intent of this specification shall be to carry a scheduled 5 year surveyor on both the Port and Stbd Anchor Windlass as required by Lloyd's.
- 1.2 The purpose of this spec is to completely dismantle the windlass including the gear case shafting, bearings, bush/gear wheel and bearing assemblies, sliding clutch assembly and bull wheel shafting and the outboard pedestal for inspection and renewal of wear components.
- 1.3 This spec will also cover the inspection of the anchor chain fairlead roller and the chain stopper assemblies.
- 1.4 This spec will also cover the renewal of the windlass brake pads and machining of the running surface as well as inspection of pins, bushings on the brake band pivots and linkages.
- 1.5 Brake lining, roller bearings, bushings are vessel supply.
- 1.6 Contractor supply all parts, tools, equipment and rigging to carry out this specification.
- 1.7 All work in this specification shall be carried out as per manufacture's overhaul manual including the shaft bearing clearances
- 1.8 Contractor shall take note that the windlass has components that are shimmed to provide correct alignment.
- 1.9 Contractor shall ensure correct alignment of all components on re-assembly of the windlass.

Part 2: REFERENCES:

2.5 Guidance Drawings/Nameplate Data

- 2.1.1. Manufacture by Burrard Iron Works Limited
 - i. Model number H6
 - ii. Port Windlass Serial number 840707
 - iii. Stbd windlass Serial Number 840708
- 2.1.2. Parts and overhaul manual #62 in Chief Engineers Cabin
- 2.1.3. Sectional arrangement drawing #840603
- 2.1.4. Anchor chain fairlead roller details dwg #590-Sk19
- 2.1.5. Related Specifications:
 - i. ANCHOR CHAINS AND CHAIN LOCKERS

2.6 Standards

2.2.1

2.7 Regulations

2.3.1

2.8 Owner Furnished Equipment

- 2.4.5** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.2 General

- 3.1.28** Contractor will carry out this specification when both chains and anchors have been lower to the Dry-dock floor. As required by Specification HD-17 ANCHOR CHAINS AND CHAIN LOCKERS.
- 3.1.29** Contractor shall be responsible for contacting the Lloyd's Surveyor and Chief Engineer when items are ready for the inspections
- 3.1.30** Contractor shall lock out power to anchor handling windlasses.
- 3.1.31** Contractor shall drain oil from the gear case and dispose of it as per Provincial Environment regulations. The gear case shall be wipe out with lint free rags on completion of all the work in this spec the Contractor shall top up the gear case to the correct working level with vessel supplied.
- 3.1.32** Contractor shall carry out all the necessary removals of the associated windlass equipment including outboard bearings, pedestals, shafting, clutches, wildcat assemblies and hydraulic drive motors to gain access for the removal of the main shafts/clusters shaft and drive pinion shafts together with the gearing.
- 3.1.33** Contractor shall clean up the bearing housings and polish any scores on the shafting.
- 3.1.34** Contractor shall take and record measurement on all shafting bearing bushes.
- 3.1.35** Contractor shall conduct N.D.T. (LPI) testing on all gear wheel teeth and check gear wheel bushings or wear.
- 3.1.36** Contractor shall inspect the sliding clutch components for wear.
- 3.1.37** Contractor shall renew all grease fitting on both windlasses/chain stopper and anchor chain fairlead rollers. Contractor to prove all grease passages are free. Contractor to grease all fittings with 130-AA Lubriplate or equivalent.

- 3.1.38** Contractor shall remove the shaft pin on the anchor chain fairlead rollers and inspect the pin and bushing for wear. On the completion of inspection, Contractor shall re-assemble the fairlead rollers.

- 3.1.39** Contractor shall clean all grease and rust from all parts removed prior to re-assembly. Contractor to apply one coat of International Interprime 198 grey primer to all painted surfaces that were disturbed by work carried out in this specification.

- 3.1.40** Contractor shall remove the brake assembly and remove all brakes linings and dispose of as per Provincial Environment regulations.

- 3.1.41** Contractor shall true up running surface of the brake drum by machining. Contractor shall verify with manufacture the minimum allowable thickness prior to machining. The brake drum is part of the wildcat assembly.

- 3.1.42** Contractor shall install owner supply brake linings c/w machine screws, washers and nuts, Contractor shall re-install the brake assemblies on each windlass unit and make any adjustments required to give maximum braking ability to the unit.

- 3.1.43** Contractor shall check the wear on all pins and bushings on the brake band assembly pivots and linkages and ensure freedom of movement.

- 3.1.44** Contractor shall re-build the windlass and associated equipment in its entirety as per the manufacturer's instructions adhering to all their required clearances and ensuring correct alignment. Contractor shall record the backlash on all gearing.

- 3.1.45** Contractor shall box up the windlass with new gaskets on inspection covers.

- 3.1.46** On completion of all work in this specification the Contractor shall test the windlasses to the satisfaction of the Chief Engineer and Lloyd's Surveyor.

3.10 Location:

- a. Fwd Bow on Focle Deck**

3.11 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.**

Part 4: PROOF OF PERFORMANCE:

4.3 Inspection

4.1.9. 100% visual By Chief Engineer and Lloyd's Surveyor.

4.1.10. All work shall be completed to the satisfaction of the Chief Engineer.

4.2 Testing

4.2.1. Contractor to carry out a function test to the satisfaction of the Chief Engineer and the attending Lloyd's Surveyor

4.3 Certification

4.3.1. This specification is to be carried out in order to obtain Lloyd's Survey credit.

Part 5: DELIVERABLES:

5.9 Drawings/Reports

5.1.1 The Contractor shall supply the Chief Engineer with two typed copies and one electronic of the Contractors overhaul / work report which shall include all wear measurements, clearances and operational tolerances. Contractor shall also include a list of all new parts fitted including their corresponding position / part numbers and quantities.

5.10 Spares
N/A

5.11 Training
N/A

5.12 Manuals
N/A

HD -15 Water Ballast Tank #5

Spec item #: HD-15	SPECIFICATION	LLOYDS #
--------------------	---------------	----------

HD - 15 : Water Ballast Tank #5

Part 1: SCOPE:

- 1.3** The intent of this specification item is to describe the work required for the contractor to open up the #5 water ballast tank for removal of existing coatings by Grit blasting to bare metal and re coating and for inspection and hydrostatic testing as required by Lloyd's. All inspections and testing shall be witnessed by the Chief Engineer and the attending Lloyd's Register inspector.
- 1.4** Coast Guard will arrange for a NACE inspector to view the tank condition, grit blasting meets standard referred to in this specification and inspect the coatings to make sure they are applied as per manufacture's product data sheets.

Part 2: REFERENCES:

2.9 Guidance Drawings/Nameplate Data

- 2.1.1.** Drawing Capacity Plan 590-79
2.1.2. Docking Plan # 590-96 Rev. 2
2.1.3. #590-40-01, 590-40-03, Vents and sounding pipes
2.1.4. #590-54 Manhole and level transmitter locations.

Tank No. & Name	Loaction	Capacity Cubic meters	Surface Area M ² (Including framing)
No. 5 Water Ballast port	Fr. B-Aft	48.8	180

2.10 Standards

2.2.1

2.11 Regulations

2.3.1

2.12 Owner Furnished Equipment

- 2.4.6** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

3.3 General

- .1** The tank listed above shall be opened for cleaning, grit blasting, coating, and survey by a Lloyd's Surveyor and the Chief Engineer. The Owner will provide the services of a NACE inspector to witness all aspects of painting.

- .2** The tank shall be pumped down to their lowest levels by the ships crew leaving approximately 2 cubic meters total residue to be disposed of by the Contractor in accordance with Provincial Environmental Regulations. Contractor shall quote unit cost per 1m3 for adjustment up or down by 1379 action. Contractor shall remove all manhole covers, as detailed on Drawing #590-54 for Manhole and level transmitter locations.

- .3** Prior to entry, tank is to be certified "Safe for Workers" or "Safe for Hot Work" as required by Transport Canada Marine Safety TP3177E. The certificates shall be given to the Chief Engineer and copies posted by the tank manhole and gangway.

- .4** The above listed tank shall be inspected by a Lloyd's Surveyor, Chief Engineer and NACE inspector prior to grit blasting.

- .5** Contractor prior to grit blasting shall plug all outlets (pump suction/discharge, level transducer) sounding, vents.

- .6** Contractor must prior to grit blasting make sure any equipment that maybe damaged by grit blast is protected from direct blast or debris.

- .7** Contractor to bid on grit blasting to bare metal as per SSPC SP-10/NACE 2 Near White_Abrasive Blast clean with an angular Surface Profile of 50-75 microns (2-3 mils) 180 square meters (total area of the above tank) and quote per one square meter to be adjusted up or down by PWGSC 1379 action.

- .8** Contractor to clean all debris from grit blasting in preparing for coatings.

- .9** Contractor shall removed all debris from grit blasting put ashore and properly disposed of it in accordance with its provincial enviromental regulations.

- .10** All ventilation requirements to assist in drying out of tanks prior to painting and to assist paint curing shall be Contractor supply.

.11 Coating Specification for Application :

- i. **Surface Preparation:** Steel surface shall be prepared to meet a minimum of SSPC SP-10/NACE 2 Near White Abrasive Blast clean with an angular Surface Profile of 50-75 microns (2-3 mils).
- ii. **Coating System:** 2 (two) coats: One primer coat Intershield ENA 300 – Bronze and one Top coat Intershield ENA 300 – Aluminium or approved equal product. Apply each coat (6 mils) dry film thickness (dft) directly on to the prepared steel surface. Total DFT 12 mils. Note two stripe coats have to be put on as specified in this specification prior to each full coat being applied.
 1. 1st coat: Colour Bronze, followed by a stripe coat.
 2. 2nd coat: Colour Aluminum, followed by a stripe coat.

General Information, Product Information, and Description of Work to be carried out in Ballast Tanks follows:

1.0 Description

1.1 Work Included

- 1.1.1** The work under this Section shall include the supply of all labour, supervision, materials, equipment, and transportation necessary for the supply, fabrication, surface preparation, and delivery to site required for the Work, as specified herein, and as directed by the Chief Engineer, complete in every respect.
- 1.1.2** The Work shall include, but not be limited to, the following:
 - (1) High pressure water cleaning at 242bar the Tank Surfaces. Collect the high pressure wash residue and remove from Site.
 - (2) Dehumidification of the interior of the Ballast Tanks to control the environment and ensure a non-stop work schedule.
 - (3) Surface preparation of areas to be painted. Collect all blasting residue and remove from Site.
 - (4) Painting of the Ballast Tank Surfaces with the specified coating system.

(5) Testing and Inspection of the applied coating.

1.2 Codes, Standards, and, Related Documents.

- (1) SSPC PA 1 Specification for Shop, Field, and Maintenance Painting.
- (2) SSPC PA 2 Specification for Measurement of Dry Coating Thickness.
- (3) SSPC SP-1 Specification for Solvent Cleaning.
- (4) SSPC SP-2 Hand Tool Cleaning.
- (5) SSPC SP-6 Commercial Abrasive Blast Cleaning.
- (6) SSPC VIS-1 Visual Standard for Abrasive Blast Cleaned Steel.
- (7) Steel Structures Painting Manual Volume 1, Good Painting Practice.
- (8) Steel Structures Painting Manual Volume 2, Systems and Specifications, 2005 Edition.
- (9) Pictorial Surface Preparation Standards for Painted Steel Surfaces.
- (10) SSPC SP-12/NACE No. 5. Surface Preparation and Cleaning of metal by Water Jetting prior to Abrasive Blast Cleaning of Metal surfaces to meet SSPC SP-6, Commercial Blast Cleaning (Pipe Tunnel) and SSPC SP-10, Near White Metal Blast Cleaning (Ballast Tanks).
- (11) ASTM D 4285, Indicating Oil and Water in Compressed Air.
- (12) International Standards ISO 8502-3, Part 3, Assessment of Dust on Steel Surfaces prepared for Painting (Pressure Sensitive Tape Method).
- (13) ASTM D 5162-01 Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates, Method B.
- (14) ASTM D 4417, Determining Surface Profile of Blast Cleaned Steel using Replica Tape, Method C.
- (15) NACE RPO 287-95, NACE Standard Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces.

1.2.1 Paint Manufacturer's Technical Bulletins:

- (a) Product Data and Safety Data Sheets.
- (b) Repair procedures for correcting damage to coated surfaces.

1.2.2 Guidelines for Application and Removal of Protective Coatings- Canadian Coast Guard Environment Operations Branch.

1.3 Quality Assurance

1.3.1 Only skilled painters shall be used in performing work to produce the highest quality product. In the acceptance or rejection of applied finishes, no allowances will be made for lack of skill on the part of the painters. Contractor shall submit names and work experience of skilled painters to the Chief Engineer for review prior to commencement of coating system application.

1.3.2 The Contractor shall require strict quality control over surface preparation and application of coatings to ensure compliance with the specifications and applicable requirements of the paint manufacturer.

1.3.3 The following tests and checks shall be carried out before, during, and after the painting process. A Coating Application Log of these tests shall be maintained and submitted to the Chief Engineer upon completion of the Project.

- (a) Surface preparation including anchor profile and abrasive used.
- (b) Wet and Dry film thicknesses.
- (c) Surface temperature, ambient temperature, room temperature, relative humidity, dew point and coating temperature.
- (d) Continuity of Paint to be checked using low voltage detector (Sponge Test) as specified by the Chief Engineer.
- (e) Adhesion tests as specified by the Chief Engineer.
- (f) Coating Batch Numbers.

1.4 Product Delivery, Storage, and Handling

1.4.1 Delivery

1.4.1.1 Materials shall be delivered to the Contractor's shop or construction site in their original containers unopened and bearing original labels. Labels shall contain at least the following information: name of material, CGSB number if applicable, manufacturer's name and stock number, content constituents, preparation instructions, thinning instructions and application instructions.

1.4.2 Storage

1.4.2.1 Only approved materials shall be stored at the job site, and these shall be stored only in suitable and designated areas restricted to the storage of paint materials and related equipment. Provide and maintain dry temperature control and weather proof storage. Store materials and equipment in a well ventilated area with temperature range 7°C to 30°C. Store temperature sensitive products above minimum temperature as recommended by manufacturer. Remove only, quantities required for same day use. **Provide a minimum of one 9 kg type ABC dry chemical fire extinguisher adjacent to storage area.**

1.4.2.2 The Contractor shall use all means necessary to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste.

1.4.2.3 Materials unsuitable for use or rejected by the Chief Engineer shall be immediately removed from the site.

1.4.3 Handling

1.4.3.1 All necessary precautionary measures shall be taken to prevent fire hazards and spontaneous combustion for materials stored on the Construction Site.

1.4.4 Protection

1.4.4.1 The Contractor shall use all means necessary to protect paint materials before, during and after application and shall protect surfaces not to be painted from paint and damage. In the event of damage, the Contractor shall immediately notify the Chief Engineer and then make all repairs and replacements necessary to the Chief Engineer's approval and at no cost to the Owner.

1.4.4.2 The Contractor shall provide sufficient drop cloths, shields and protective equipment or materials to prevent spray or droppings from fouling surfaces not intended to be refinished.

2.0 PRODUCTS

2.1 Materials

2.1.1 General

2.1.1.1 All paint materials shall be the product of a single manufacturer.

2.1.1.2 Alteration of paint formulation will not be permitted without approval of the Chief Engineer.

2.1.1.3 The use of accelerators will not be permitted.

2.1.2 Compatibility

2.1.2.1 All paint materials and equipment shall be compatible in use. All tools and equipment shall be compatible with the paint to be applied.

2.1.2.2 Thinners, when used, shall be only those thinners recommended for that purpose by the paint manufacturer.

2.2 Application Equipment

2.2.1 The Contractor shall use application equipment as recommended by the painting material manufacturer and compatible with the material being applied.

2.2.2 The Contractor shall ensure equipment used is capable of producing the required finish and appearance.

2.3 Protective Coating systems

2.3.1 The paint shall be a Primer coat Intershield ENA 300 – Bronze and Top coat Intershield ENA 300 – Aluminium as manufactured by International Paints Canada, or approved equal, applied to a dry film thickness of:

- (1) Total dry film thickness applied in two (2) full coats and (2) striped coats. (12mils) on flat and combined with striped coats (16 mils) on curved surfaces.

- (2) Two Stripe coats it shall be applied to all corners, crevices, rivets, bolts, welds, and other edges using the specified coating prior to application of each full coat on the interior structure. First coating is to be Colour bronze and second stripe coat to be Aluminium. Such striping shall extend a minimum of 2.2 cm from the edge. The stripe coat shall set to touch before the full coat is applied. **Note: stripe coating is most effective on edges that are rounded by grinding.**

2.4 Shop and Field Touch-Up Painting

- 2.4.1** At the completion of the painting and as part of acceptance of the Work by the Chief Engineer, the Contractor shall, in the presence of the Chief Engineer, inspect the painting system for damage.
- 2.4.2** Damaged areas shall be clearly noted by the Chief Engineer and when requested by the Chief Engineer the Contractor shall repair the previously agreed upon damaged areas at no cost to the owner.
- 2.4.3** Procedure to determine applied coating discontinuity using ASTM D 5162-01, ASTM D4787, Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates. This procedure is carried out at the request of the Chief Engineer.

2.5 Mixing

- 2.5.1** Painting materials shall be mixed and prepared in strict accordance with the manufacturer's recommendation.
- 2.5.2** Materials shall be stirred prior to and during application to produce a uniform mixture.
- 2.5.3** Materials shall be thinned, when required, in strict accordance with manufacturer's recommendations.

3.0 EXECUTION

3.1 Surface Preparation

3.1.1 Ballast Tanks

- 3.1.1.1** All surfaces to be coated shall be abrasive blast cleaned to a commercial blast finish according to Steel Structures Painting Council (1) specification SSPC-SP 10/NACE 2, near white metal abrasive blast. Steel shall be cleaned with a minimum surface profile of 50-75 microns (2-3 mils) to obtain the required adhesion of the Intershield ENA 300 paint to the steel. The SSPC surface preparation, as specified, must be in evidence immediately before application of coating.
- 3.1.2** Determine level of cleanliness using International Standard ISO 8502-3, Part 3. **Note: acceptable level for dust quantity and dust particle size shall not exceed rating 2.**
- 3.1.3** Determine surface profile of blast cleaned steel using Replica Tape (ASTM D 4417) Method C. **Note: This Replica Tape provides an anchor profile and shall be affixed to final report. A NACE Certified Coating Inspector shall witness and record the Test Results.**
- 3.1.4** All sharp edges shall be ground prior to sand blasting to form a rounded contour of minimum edge radius of 2 mm. This 2 mm rounding may be achieved by minimum 2 or 3 strokes of a grinding disc as recommended by coating manufacturer.
- 3.1.5** The acceptable chloride ion level shall be less than 2ppm. Coating shall not be applied until this level is achieved.
- 3.1.6** Weld joints which do not have a smooth ripple finish, shall be ground to a rounded contour.

3.2 Other Surface Preparations

- 3.2.1** Any major surface defects, particularly surface laminations or scales, and welding defects, as holes and very sharp transitions between layers detrimental to the protective coating shall be removed by suitable dressing and/or with repair welding as required. Where such defects have been revealed during blast cleaning and the dressing has been performed, the dressed area shall be reblasted to the specified standard. All welds shall be inspected and if necessary, repaired prior to final blast cleaning.

3.2.2 Steel surfaces shall not be blasted nor coated when:

- (a) surface temperature is less than 3°C above the dew point,
- (b) when relative humidity is greater than 80% or,
- (c) when there is a possibility that the blasted surface will be subjected to wetting or flash rusting before the primer can be applied.

3.2.2.1 Surfaces shall be blown, wiped or vacuumed free of blasting abrasive and residue before the surface is coated. Particular care and effort shall be employed to remove residue from pockets, corners, bolt heads and other such irregular surfaces.

3.2.2.2 It is mandatory that no more surface be blasted than can be coated by the end of the same work shift.

3.2.3 A 200mm (8 inch) wide strip of uncoated, blasted surface shall be left between the coated and unblasted surfaces. When blasting is continued, the 200mm (8 inch) strip of previously blasted surface shall be reblast cleaned in a direction away from the coated surface.

3.2.4 Compressed air used for blasting shall be free of detrimental amounts of condensed water or oil. Adequate separators and traps shall be provided.
Blast cleaning shall be done in such a manner that no damage is done to partially or entirely completed portions. In any case, execution shall commence at the top of the structures and progress towards the bottom.

3.2.5 If any rusting, including flash rusting or rust bloom occurs, the Contractor shall reblast the affected surfaces prior to coating.

3.2.6 All sharp edges, welds, high spots and edges shall be strip coated prior to application of any paint.

3.2.7 Any areas contaminated by oil or grease shall be washed with coating manufacturer's recommended solvent to SSPC-SP 1, Solvent Cleaning to remove all residues. The Contractor shall ensure that the solvent has evaporated or is removed prior to application of the touch-up primer.

3.2.8 All dirt, soil and extraneous matter shall be removed by water washing using stiff bristle brushes if necessary and allowed to dry.
All surfaces damaged after painting or designated to be "touched-up" shall be prepared by spot abrasive blast.

3.2.9 All edges of areas to receive touch-up shall be feathered so as to produce a sound edge and to provide a roughened surface to act as a

mechanical key. Contact Coating Manufacturer for additional instructions for this procedure.

- 3.2.10** Any contamination which has taken place since the surface was prepared shall be removed and any dust settlement removed by blowing down with oil-free, dry air.

Coatings shall not be applied to damp surfaces or to surfaces below -7°C or above 43°C. Consult coating manufacturer.

- 3.2.11** Inhibitive washing to prevent rusting is prohibited unless approved by coating manufacturer.

- 3.2.12** All surfaces damaged after painting or designated to be 'touched up' shall be prepared by spot abrasive cleaning prior to coating application.

- 3.2.13** All edges of areas to receive a 'touch-up' shall be feathered so as to produce a sound edge and to provide a sound edge and to provide a roughened surface to act as a mechanical key.

3.3 Chloride ion Testing

- 3.3.1** Carry out chloride ion testing of prepared surfaces as listed.

- 3.3.2** **On completion** of pre-surface preparation by SSPC-SP 1 to ensure the chloride ion are not imbedded into the substrate when cleaning Ballast Tanks to near white metal (SSPC-SP10) as specified. If chloride ion level, as specified is not attained, a rewash of the affected area shall be carried out using a soluble salt remover, such as Chlor-Rid Liquid Salt Remover at a dilution ratio of 1:100, sprayed on the affected area at a minimum of 20 mps (3000 psi).

- 3.3.3** **On completion** of substrate preparation by SSPC-SP 10 (Ballast Tank) prior to coating application:

- 3.3.4** NACE Inspector shall witness and record these tests.

- 3.3.5** The acceptable chloride ion level shall be less than 2µg/cm². Coating shall not be applied until this level is achieved.

3.4 WORKMANSHIP

3.4.1 General

3.4.1.1 All coatings shall be applied in accordance with the paint manufacturer's published application instructions. Such instructions are deemed a part of this technical specification.

3.4.2 Inspection

3.4.2.1 All cleaned and prepared surfaces shall be inspected by NACE Certified Coating Inspector prior to the application of coating.

3.4.3 Application

3.4.3.1 All equipment shall be maintained in good working condition and shall be comparable to that described in the printed instructions of the coating manufacturer. All equipment shall be thoroughly cleaned before use.

3.4.3.2 All air lines shall be equipped with water traps to positively remove condensed moisture.

3.4.3.3 Materials shall be thinned, when required, in strict accordance with manufacturer's recommendations.

3.4.3.4 Paint film is to be of specified thickness, free of voids, pinholes, runs, sags or other signs of improper application techniques or undesirable shop conditions. Wet film thickness shall be applied so as to produce the required dry film thickness in one coat.

3.4.3.5 Minimum drying time as stated in the printed instructions of the coating manufacturer shall be carefully observed.

3.4.3.6 The coating shall not be force dried under conditions which will cause checking, wrinkling, blistering, formation of pores, mudcracking or detrimentally affect its condition or appearance. Newly coated surfaces shall be protected to the fullest practical extent from detrimental forces until the coating has cured.

3.4.3.7 Errors or deficiencies resulting from poor workmanship will not be tolerated and, subject to the Chief Engineer's decision, shall be removed and redone.

3.4.3.8 Above all, application of coatings shall be as required to produce a high quality system with respect to appearance and integrity.

3.4.3.9 The coating manufacturer and the Chief Engineer shall be consulted concerning items not covered herein.

3.4.3.10 Newly coated surfaces will be inspected when the coating has thoroughly dried. The coated surfaces will be examined with respect to uniformity, continuity and soundness and may be rejected if any of the following defects are apparent and if the Engineer, in his judgement, believes the coating performance and life may be impaired by these conditions:

- (1) Runs, sags, holidays or shadowing caused by inefficient application methods.
- (2) Evidence of poor coverage at plate edges, lap joints, crevices, pockets, corners and re-entrant angles.

3.4.3.11 Coated surfaces rejected by the Chief Engineer shall be made good by the Contractor. Small affected areas may be touched up. Large affected areas, or where insufficient dry film thickness has been attained, shall involve the application of another complete coat at the Contractor's expense. Runs, sags or coating damaged in handling shall be removed by scraper prior to further application of coatings.

3.4.3.12 Special care shall be taken so that difficult areas to paint such as edges, crevices, structural members or other intricate areas shall receive the specified amount of coating.

3.4.3.13 Coatings shall not be applied closer than 20mm to a non-blasted area. Any subsequent blasting operation shall not result in sand particles embedded in the coating film.

3.5 **INSPECTION**

3.5.1 The Chief Engineer may inspect all aspects of the work, or designate a NACE Certified Coating Inspector, in addition to testing required to be performed by the Contractor, it shall be clearly understood that it is the prime responsibility of the Contractor to provide all labour, materials and equipment to properly execute the Work, to confer with the manufacturer of the products used, and to keep the Chief Engineer informed of any problems or difficulties arising out of the Work.

- 3.5.2** All painting shall be inspected for such items as proper mixing, thinning, wet and dry film thickness, lifting, overspray, mud-cracking, sagging, runs, skips, sharp edge coverage, pinholing, bubbling, curing or any other common deficiency or problem area that would be detrimental to the life expectancy or quality of the system.
- 3.5.3** Procedure to determine applied coating discontinuity using ASTM D5162-01, Standard Practice For Discontinuity (Holiday) Testing of Non Conductive Protective Coating on Metallic Substrates Test Method A – Low Voltage Testers. This procedure shall be carried out on 100% of the coated surface.
- 3.5.4** Testing by the Chief Engineer and repair by the Contractor, necessitated by destructive testing, of coatings which meet the requirements of this Specification will be at the expense of the Owner. The cost of testing and repair of coatings which do not meet the Specification will be at the expense of the Contractor.

4.0 ENVIRONMENTAL AND SAFETY REQUIREMENTS

4.1 General

- 4.1.1** The Contractor is completely responsible for the environmental safety of the coating work. Precautions shall be taken to protect humans, and the environment from cleaning operations, sandblasting, solvents and chemical contamination.

4.2 Final Clean-Up

- 4.2.1** General Requirements, during application of the coating systems the Contractor shall prevent spillage of coating materials and, in the event of such spillage, shall immediately advise the Chief Engineer, remove all spilled material and the waste or other equipment used to clean up spills, and return the surfaces to their original undamaged condition to the approval of the Chief Engineer at no additional cost to the Owner.
- 4.2.2** Upon completion of the application work, the Contractor shall visually inspect all surfaces and remove all coatings and traces of coatings from surfaces not scheduled to be coated.

- .12** All Tanks shall be inspected by Chief Engineer before closing up. Tanks shall be closed up in good order, using new jointing and anti-seize compound on manhole cover studs and nuts (Contractor supply). The contractor shall bid on replacing one manhole stud per tank and provide unit cost per stud replacement.
- .13** Upon completion of inspection and close up, the vent cap shall be removed from each individual tank vent and the tank is to be hydro-statically tested with the Lloyd's Hull surveyor and Chief Engineer in attendance to witness test.
- .14** Upon completion of testing, all vent caps shall be installed in good order, bolts used for connection shall be cleaned and coated with anti-seize compound. Contractor to inspect vent head screens for damage or blockage, any defects to be reported to the Chief Engineer immediately for corrective action.
- .15** Contractor shall fill all the tanks with fresh water and perform a hydrostatic test on the tanks.
- .16** Contractor to supply all materials and equipment to carry out work on the tanks. The contractor is responsible for notifying the Lloyd's Surveyor and the Chief Engineer when tank is ready for inspection and testing.
- .17** Chief Engineer and Lloyd's Surveyor shall witness testing.
- .18** All work to be to the satisfaction of Chief Engineer and the Lloyd's Surveyor.

3.2 Location

a.

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. 100% visual By Chief Engineer, Lloyd's Surveyor.

4.1.2. Upon completion of all repairs and testing, the Contractor and the Chief Engineer shall conduct a final inspection and ensure all tanks, covers, vents and piping connections have been returned to operating conditions and the attending the Lloyd's Surveyor has completed all inspections.

4.2 Testing

4.2.1. Hydrostatic testing all tanks to satisfaction of Chief Engineer and Lloyd's.

4.2.2. The contractor shall supply all necessary materials, fittings blanks and labor for respective tests. All blanks installed in order to perform a pressure test are to be recorded on a list according to location on the tank and shall be accounted for by the contractor and the Chief Engineer or his delegate upon their removal.

4.3 Certification

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 The Contractor shall provide to the Chief Engineer and NACE inspector, before the coating is applied, the following information sheets regarding the coating used: working procedures sheets, product data sheets, and the Material Safety Data Sheets.

5.1.2 Contractor supply Chief Engineer three copies written and one electronic copy of a report of all work carried out.

5.2 Spares
N/A

5.3 Training
N/A

5.4 Manuals N/A

HD -16 Water Ballast Tanks

Spec item #: HD-16	SPECIFICATION	LLOYDS #
HD-16 Water Ballast Tanks		

Part 1: SCOPE:

- 1.5 The intent of this specification item is to describe the work required for the contractor to open up the seven listed water ballast tanks for cleaning and coating repairs and for inspection and hydrostatic testing. All inspections and testing shall be witnessed by the Chief Engineer and the attending Lloyd's Register inspector.
- 1.6 Coast Guard will arrange for a NACE inspector to view the tank condition, and ensure surface prep meets standard referred to in this specification and inspect the coatings to make sure they are applied as per manufacture's product data sheets.

Part 2: REFERENCES:

2.13 Guidance Drawings/Nameplate Data

- 2.1.1. Drawing Capacity Plan 590-79
2.1.2. Docking Plan # 590-96 Rev. 2
2.1.3. #590-40-01, 590-40-03, Vents and sounding pipes
2.1.4. #590-54 Manhole and level transmitter locations.

Tank No. & Name	Loaction	Capacity Cubic meters	Area (Sq. Meters)	Add 20% For Floors / Framing
No. 1 Water Ballast port	Fr. 71-81	35.8	130	156
No. 1 Water Ballast stbd	Fr. 71-81	39.1	130	156
No. 2 Water Ballast port	Fr. 66-71	58.7	142	170
No. 2 Water Ballast stbd	Fr. 66-71	58.7	142	170
No. 4 Water Ballast port	Fr. 18-28	37.2	86	103
No. 4 Water Ballast stbd	Fr. 18-28	47	86	103
Forepeak Tank	Fr. 91-100		96	115.2

2.14 Standards

2.2.1

2.15 Regulations

2.3.1

2.16 Owner Furnished Equipment

2.4.7 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

3.4 General

- .1** The tanks listed above shall be opened for cleaning, coating repair, and survey by a Lloyd's Surveyor and the Chief Engineer. The Owner will provide the services of a NACE inspector to witness all aspects of painting.
- .2** The tanks shall be pumped down to their lowest levels by the ships crew leaving approximately 2 cubic meters total residue to be disposed of by the Contractor in accordance with Provincial Environmental Regulations. Contractor shall quote unit cost per 1m3 for adjustment up or down by 1379 action. Contractor shall remove all manhole covers, as detailed on Drawing #590-54 for Manhole and level transmitter locations.
- .3** Prior to entry, tank is to be certified "Safe for Workers" or "Safe for Hot Work" as required by Transport Canada Marine Safety TP3177E. The certificates shall be given to the Chief Engineer and copies posted by the tank manhole and gangway.
- .4** The contractor shall clean all internal area of the ballast tanks with high pressure wash (5000 psi minimum)
- .5** The contractor shall remove all mud, loose scale and sediment from the tanks.
- .6** All of the above listed tanks shall be inspected by a Lloyd's Surveyor, Chief Engineer and NACE inspector prior to coating repairs.
- .7** Any damaged tanks coating to be cleaned down to bare metal by (1) Power tooling to meet SSPC SP-11 with a suitable profile or (2) of SSPC SP-10/NACE 2 Near White Abrasive Blast clean with an angular Surface Profile of 50-75 microns (2-3 mils) with edges feathered out. All debris shall be removed ashore by Contractor and properly disposed of in accordance with environmental regulations.
- .8** Prior to Power tooling or Abrasive Blast cleaning the damaged areas of tank coatings has to be identified in agreement with Chief Engineer.

- .9 Contractor to quote on repairs / coating of 100 m2 of tank surface area and rate per square meter. On two types of surface preparation (1) Power tooling to meet SSPC SP-11 with a suitable profile, (2) or SSPC SP-10/NACE 2 Near White Abrasive Blast clean with an angular Surface Profile of 50-75 microns (2-3 mils). Adjustments will be made by PWGSC 1379 action.
- .10 The method of surface preparations will be made by the Chief Engineer or Nace Inspector after the inspection of the tanks.
- .11 Contractor to clean all debris from surface preparation when preparing for coatings. All debris from shall be put ashore and properly disposed of it in accordance with its provincial environmental regulations.
- .12 All ventilation requirements to assist in drying out of tanks prior to painting and to assist paint curing shall be Contractor supply.
- .13 **Coating Specification for Application :**
 - i. **Surface Preparation:** Steel surface shall be prepared to meet a minimum of (1) Power tooling to meet SSPC SP-10/Nace2 with a suitable profile. or (2) of SSPC SP-11 Near White Abrasive Blast clean with an angular Surface Profile of 50-75 microns (2-3 mils).
 - ii. **Coating System:** 2 (two) coats: One primer coat Intershield ENA 300 – Bronze and one Top coat Intershield ENA 300 – Aluminium or approved equal product. Apply each coat (5-6 mils) dry film thickness (dft) directly on to the prepared steel surface. Note two stripe coats have to be put on as specified in this specification prior to each full coat being applied.
 - 1. 1st coat: Colour Bronze, followed by a stripe coat.
 - 2. 2nd coat: Colour Aluminum, followed by a stripe coat.

General Information, Product Information, and Description of Work to be carried out in Ballast Tanks follows:

1.0 Description

1.1 Work Included

- 1.1.1 The work under this Section shall include the supply of all labour, supervision, materials, equipment, and transportation necessary for the

supply, fabrication, surface preparation, and delivery to site required for the Work, as specified herein, and as directed by the Chief Engineer, complete in every respect.

1.1.2 The Work shall include, but not be limited to, the following:

- (6) High pressure water cleaning at 242bar the Tank Surfaces. Collect the high pressure wash residue and remove from Site.
- (7) Dehumidification of the interior of the Ballast Tanks to control the environment and ensure a non-stop work schedule.
- (8) Surface preparation of areas to be painted. Collect all blasting residue and remove from Site.
- (9) Painting of the Ballast Tank Surfaces with the specified coating system.
- (10) Testing and Inspection of the applied coating.

1.2 Codes, Standards, and, Related Documents.

- (16) SSPC PA 1 Specification for Shop, Field, and Maintenance Painting.
- (17) SSPC PA 2 Specification for Measurement of Dry Coating Thickness.
- (18) SSPC SP-1 Specification for Solvent Cleaning.
- (19) SSPC SP-2 Hand Tool Cleaning.
- (20) SSPC SP-6 Commercial Abrasive Blast Cleaning.
- (21) SSPC VIS-1 Visual Standard for Abrasive Blast Cleaned Steel.
- (22) Steel Structures Painting Manual Volume 1, Good Painting Practice.
- (23) Steel Structures Painting Manual Volume 2, Systems and Specifications, 2005 Edition.
- (24) Pictorial Surface Preparation Standards for Painted Steel Surfaces.
- (25) SSPC SP-12/NACE No. 5. Surface Preparation and Cleaning of metal by Water Jetting prior to Abrasive Blast Cleaning of Metal surfaces to meet SSPC SP-6, Commercial Blast Cleaning (Pipe Tunnel) and SSPC SP-10, Near White Metal Blast Cleaning (Ballast Tanks).
- (26) ASTM D 4285, Indicating Oil and Water in Compressed Air.

- (27) International Standards ISO 8502-3, Part 3, Assessment of Dust on Steel Surfaces prepared for Painting (Pressure Sensitive Tape Method).
- (28) ASTM D 5162-01 Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates, Method B.
- (29) ASTM D 4417, Determining Surface Profile of Blast Cleaned Steel using Replica Tape, Method C.
- (30) NACE RPO 287-95, NACE Standard Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces.

1.2.1 Paint Manufacturer's Technical Bulletins:

- (a) Product Data and Safety Data Sheets.
- (b) Repair procedures for correcting damage to coated surfaces.

1.2.2 Guidelines for Application and Removal of Protective Coatings-
Canadian Coast Guard Environment Operations Branch.

1.3 **Quality Assurance**

1.3.1 Only skilled painters shall be used in performing work to produce the highest quality product. In the acceptance or rejection of applied finishes, no allowances will be made for lack of skill on the part of the painters. Contractor shall submit names and work experience of skilled painters to the Chief Engineer for review prior to commencement of coating system application.

1.3.2 The Contractor shall require strict quality control over surface preparation and application of coatings to ensure compliance with the specifications and applicable requirements of the paint manufacturer.

1.3.3 The following tests and checks shall be carried out before, during, and after the painting process. A Coating Application Log of these tests shall be maintained and submitted to the Chief Engineer upon completion of the Project.

- (g) Surface preparation including anchor profile and abrasive used.
- (h) Wet and Dry film thicknesses.
- (i) Surface temperature, ambient temperature, room temperature, relative humidity, dew point and coating temperature.

- (j) Continuity of Paint to be checked using low voltage detector (Sponge Test) as specified by the Chief Engineer.
- (k) Adhesion tests as specified by the Chief Engineer.
- (l) Coating Batch Numbers.

1.4 Product Delivery, Storage, and Handling

1.4.1 Delivery

- 1.4.1.1** Materials shall be delivered to the Contractor's shop or construction site in their original containers unopened and bearing original labels. Labels shall contain at least the following information: name of material, CGSB number if applicable, manufacturer's name and stock number, content constituents, preparation instructions, thinning instructions and application instructions.

1.4.2 Storage

- 1.4.2.1** Only approved materials shall be stored at the job site, and these shall be stored only in suitable and designated areas restricted to the storage of paint materials and related equipment. Provide and maintain dry temperature control and weather proof storage. Store materials and equipment in a well ventilated area with temperature range 7°C to 30°C. Store temperature sensitive products above minimum temperature as recommended by manufacturer. Remove only, quantities required for same day use. **Provide a minimum of one 9 kg type ABC dry chemical fire extinguisher adjacent to storage area.**

- 1.4.2.2** The Contractor shall use all means necessary to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste.

- 1.4.2.3** Materials unsuitable for use or rejected by the Chief Engineer shall be immediately removed from the site.

1.4.3 Handling

1.4.3.1 All necessary precautionary measures shall be taken to prevent fire hazards and spontaneous combustion for materials stored on the Construction Site.

1.4.4 Protection

1.4.4.1 The Contractor shall use all means necessary to protect paint materials before, during and after application and shall protect surfaces not to be painted from paint and damage. In the event of damage, the Contractor shall immediately notify the Chief Engineer and then make all repairs and replacements necessary to the Chief Engineer's approval and at no cost to the Owner.

1.4.4.2 The Contractor shall provide sufficient drop cloths, shields and protective equipment or materials to prevent spray or droppings from fouling surfaces not intended to be refinished.

2.0 PRODUCTS

2.1 Materials

2.1.1 General

2.1.1.1 All paint materials shall be the product of a single manufacturer.

2.1.1.2 Alteration of paint formulation will not be permitted without approval of the Chief Engineer.

2.1.1.3 The use of accelerators will not be permitted.

2.1.2 Compatibility

2.1.2.1 All paint materials and equipment shall be compatible in use. All tools and equipment shall be compatible with the paint to be applied.

2.1.2.2 Thinners, when used, shall be only those thinners recommended for that purpose by the paint manufacturer.

2.2 Application Equipment

2.2.1 The Contractor shall use application equipment as recommended by the painting material manufacturer and compatible with the material being applied.

- 2.2.2 The Contractor shall ensure equipment used is capable of producing the required finish and appearance.

2.3 Protective Coating systems

- 2.3.1 The paint shall be a Primer coat Intershield ENA 300 – Bronze and Top coat Intershield ENA 300 – Aluminium as manufactured by International Paints Canada, or approved equal, applied to a dry film thickness of:
- (3) Total dry film thickness applied in two (2) full coats and (2) striped coats. (12mils) on flat and combined with striped coats (16 mils) on curved surfaces.
 - (4) Two Stripe coats it shall be applied to all corners, crevices, rivets, bolts, welds, and other edges using the specified coating prior to application of each full coat on the interior structure. First coating is to be Colour bronze and second stripe coat to be Aluminium Such striping shall extend a minimum of 2.2 cm from the edge. The stripe coat shall set to touch before the full coat is applied. **Note: stripe coating is most effective on edges that are rounded by grinding.**

2.4 Shop and Field Touch-Up Painting

- 2.4.1 At the completion of the painting and as part of acceptance of the Work by the Chief Engineer, the Contractor shall, in the presence of the Chief Engineer, inspect the painting system for damage.
- 2.4.2 Damaged areas shall be clearly noted by the Chief Engineer and when requested by the Chief Engineer the Contractor shall repair the previously agreed upon damaged areas at no cost to the owner.
- 2.4.3 Procedure to determine applied coating discontinuity using ASTM D 5162-01, ASTM D4787, Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates. This procedure is carried out at the request of the Chief Engineer.

2.5 Mixing

- 2.5.1 Painting materials shall be mixed and prepared in strict accordance with the manufacturer's recommendation.
- 2.5.2 Materials shall be stirred prior to and during application to produce a uniform mixture.
- 2.5.3 Materials shall be thinned, when required, in strict accordance with manufacturer's recommendations.

3.0 EXECUTION

3.1 Surface Preparation

3.1.1 Ballast Tanks

- 3.1.1.1 All surfaces to be coated shall be abrasive blast cleaned to a commercial blast finish according to Steel Structures Painting Council (1) specification SSPC-SP 10/NACE 2, near white metal abrasive blast. Steel shall be cleaned with a minimum surface profile of 50-75 microns (2-3 mils) to obtain the required adhesion of the Intershield ENA 300 paint to the steel. The SSPC surface preparation, as specified, must be in evidence immediately before application of coating.
- 3.1.2 Determine level of cleanliness using International Standard ISO 8502-3, Part 3. **Note: acceptable level for dust quantity and dust particle size shall not exceed rating 2.**
- 3.1.3 Determine surface profile of blast cleaned steel using Replica Tape (ASTM D 4417) Method C. **Note: This Replica Tape provides an anchor profile and shall be affixed to final report. A NACE Certified Coating Inspector shall witness and record the Test Results.**
- 3.1.4 All sharp edges shall be ground prior to sand blasting to form a rounded contour of minimum edge radius of 2 mm. This 2 mm rounding may be achieved by minimum 2 or 3 strokes of a grinding disc as recommended by coating manufacturer.

- 3.1.5** The acceptable chloride ion level shall be less than 2ppm. Coating shall not be applied until this level is achieved.
- 3.1.6** Weld joints which do not have a smooth ripple finish, shall be ground to a rounded contour.

3.2 Other Surface Preparations

- 3.2.1** Any major surface defects, particularly surface laminations or scales, and welding defects, as holes and very sharp transitions between layers detrimental to the protective coating shall be removed by suitable dressing and/or with repair welding as required. Where such defects have been revealed during blast cleaning and the dressing has been performed, the dressed area shall be reblasted to the specified standard. All welds shall be inspected and if necessary, repaired prior to final blast cleaning.
- 3.2.2** Steel surfaces shall not be blasted nor coated when:
- (d) surface temperature is less than 3°C above the dew point,
 - (e) when relative humidity is greater than 80% or,
 - (f) when there is a possibility that the blasted surface will be subjected to wetting or flash rusting before the primer can be applied.
- 3.2.2.1** Surfaces shall be blown, wiped or vacuumed free of blasting abrasive and residue before the surface is coated. Particular care and effort shall be employed to remove residue from pockets, corners, bolt heads and other such irregular surfaces.
- 3.2.2.2** It is mandatory that no more surface be blasted than can be coated by the end of the same work shift.
- 3.2.3** A 200mm (8 inch) wide strip of uncoated, blasted surface shall be left between the coated and unblasted surfaces. When blasting is continued, the 200mm (8 inch) strip of previously blasted surface shall be reblast cleaned in a direction away from the coated surface.
- 3.2.4** Compressed air used for blasting shall be free of detrimental amounts of condensed water or oil. Adequate separators and traps shall be provided.
Blast cleaning shall be done in such a manner that no damage is done to partially or entirely completed portions. In any case, execution shall commence at the top of the structures and progress towards the bottom.

- 3.2.5 If any rusting, including flash rusting or rust bloom occurs, the Contractor shall reblast the affected surfaces prior to coating.
- 3.2.6 All sharp edges, welds, high spots and edges shall be strip coated prior to application of any paint.
- 3.2.7 Any areas contaminated by oil or grease shall be washed with coating manufacturer's recommended solvent to SSPC-SP 1, Solvent Cleaning to remove all residues. The Contractor shall ensure that the solvent has evaporated or is removed prior to application of the touch-up primer.
- 3.2.8 All dirt, soil and extraneous matter shall be removed by water washing using stiff bristle brushes if necessary and allowed to dry.
All surfaces damaged after painting or designated to be "touched-up" shall be prepared by spot abrasive blast.
- 3.2.9 All edges of areas to receive touch-up shall be feathered so as to produce a sound edge and to provide a roughened surface to act as a mechanical key. Contact Coating Manufacturer for additional instructions for this procedure.
- 3.2.10 Any contamination which has taken place since the surface was prepared shall be removed and any dust settlement removed by blowing down with oil-free, dry air.
Coatings shall not be applied to damp surfaces or to surfaces below -7°C or above 43°C. Consult coating manufacturer.
- 3.2.11 Inhibitive washing to prevent rusting is prohibited unless approved by coating manufacturer.
- 3.2.12 All surfaces damaged after painting or designated to be 'touched up' shall be prepared by spot abrasive cleaning prior to coating application.
- 3.2.13 All edges of areas to receive a 'touch-up' shall be feathered so as to produce a sound edge and to provide a roughened surface to act as a mechanical key.

3.3 **Chloride ion Testing**

- 3.3.1 Carry out chloride ion testing of prepared surfaces as listed.
- 3.3.2 **On completion** of pre-surface preparation by SSPC-SP 1 to ensure the chloride ion are not imbedded into the substrate when cleaning Ballast Tanks to near white metal (SSPC-SP10) as specified. If chloride ion level, as specified is not attained, a rewash of the affected area shall be

carried out using a soluble salt remover, such as Chlor-Rid Liquid Salt Remover at a dilution ratio of 1:100, sprayed on the affected area at a minimum of 20 mps (3000 psi).

3.3.3 On completion of substrate preparation by SSPC-SP 10 (Ballast Tank) prior to coating application:

3.3.4 NACE Inspector shall witness and record these tests.

3.3.5 The acceptable chloride ion level shall be less than $2\mu\text{g}/\text{cm}^2$. Coating shall not be applied until this level is achieved.

3.4 WORKMANSHIP

3.4.1 General

3.4.1.1 All coatings shall be applied in accordance with the paint manufacturer's published application instructions. Such instructions are deemed a part of this technical specification.

3.4.2 Inspection

3.4.2.1 All cleaned and prepared surfaces shall be inspected by NACE Certified Coating Inspector prior to the application of coating.

3.4.3 Application

3.4.3.1 All equipment shall be maintained in good working condition and shall be comparable to that described in the printed instructions of the coating manufacturer. All equipment shall be thoroughly cleaned before use.

3.4.3.2 All air lines shall be equipped with water traps to positively remove condensed moisture.

3.4.3.3 Materials shall be thinned, when required, in strict accordance with manufacturer's recommendations.

3.4.3.4 Paint film is to be of specified thickness, free of voids, pinholes, runs, sags or other signs of improper application techniques or undesirable shop conditions. Wet film thickness shall be applied so as to produce the required dry film thickness in one coat.

3.4.3.5 Minimum drying time as stated in the printed instructions of the coating manufacturer shall be carefully observed.

3.4.3.6 The coating shall not be force dried under conditions which will cause checking, wrinkling, blistering, formation of pores, mudcracking or detrimentally affect its condition or appearance. Newly coated surfaces shall be protected to the fullest practical extent from detrimental forces until the coating has cured.

3.4.3.7 Errors or deficiencies resulting from poor workmanship will not be tolerated and, subject to the Chief Engineer's decision, shall be removed and redone.

3.4.3.8 Above all, application of coatings shall be as required to produce a high quality system with respect to appearance and integrity.

3.4.3.9 The coating manufacturer and the Chief Engineer shall be consulted concerning items not covered herein.

3.4.3.10 Newly coated surfaces will be inspected when the coating has thoroughly dried. The coated surfaces will be examined with respect to uniformity, continuity and soundness and may be rejected if any of the following defects are apparent and if the Engineer, in his judgement, believes the coating performance and life may be impaired by these conditions:

- (1) Runs, sags, holidays or shadowing caused by inefficient application methods.
- (2) Evidence of poor coverage at plate edges, lap joints, crevices, pockets, corners and re-entrant angles.

3.4.3.11 Coated surfaces rejected by the Chief Engineer shall be made good by the Contractor. Small affected areas may be touched up. Large affected areas, or where insufficient dry film thickness has been attained, shall involve the application of another complete coat at the Contractor's expense. Runs, sags or coating damaged in handling shall be removed by scraper prior to further application of coatings.

3.4.3.12 Special care shall be taken so that difficult areas to paint such as edges, crevices, structural members or other intricate areas shall receive the specified amount of coating.

3.4.3.13 Coatings shall not be applied closer than 20mm to a non-blasted area. Any subsequent blasting operation shall not result in sand particles embedded in the coating film.

3.5 INSPECTION

3.5.1 The Chief Engineer may inspect all aspects of the work, or designate a NACE Certified Coating Inspector, in addition to testing required to be performed by the Contractor, it shall be clearly understood that it is the prime responsibility of the Contractor to provide all labour, materials and equipment to properly execute the Work, to confer with the manufacturer of the products used, and to keep the Chief Engineer informed of any problems or difficulties arising out of the Work.

3.5.2 All painting shall be inspected for such items as proper mixing, thinning, wet and dry film thickness, lifting, overspray, mud-cracking, sagging, runs, skips, sharp edge coverage, pinholing, bubbling, curing or any other common deficiency or problem area that would be detrimental to the life expectancy or quality of the system.

3.5.3 Procedure to determine applied coating discontinuity using ASTM D5162-01, Standard Practice For Discontinuity (Holiday) Testing of Non Conductive Protective Coating on Metallic Substrates Test Method A – Low Voltage Testers. This procedure shall be carried out on 100% of the coated surface.

3.5.4 Testing by the Chief Engineer and repair by the Contractor, necessitated by destructive testing, of coatings which meet the requirements of this Specification will be at the expense of the Owner. The cost of testing and repair of coatings which do not meet the Specification will be at the expense of the Contractor.

4.0 ENVIRONMENTAL AND SAFETY REQUIREMENTS

4.1 General

4.1.1 The Contractor is completely responsible for the environmental safety of the coating work. Precautions shall be taken to protect humans, and the environment from cleaning operations, sandblasting, solvents and chemical contamination.

4.2 Final Clean-Up

- 4.2.1** General Requirements, during application of the coating systems the Contractor shall prevent spillage of coating materials and, in the event of such spillage, shall immediately advise the Chief Engineer, remove all spilled material and the waste or other equipment used to clean up spills, and return the surfaces to their original undamaged condition to the approval of the Chief Engineer at no additional cost to the Owner.
- 4.2.2** Upon completion of the application work, the Contractor shall visually inspect all surfaces and remove all coatings and traces of coatings from surfaces not scheduled to be coated.

- .14** All Tanks shall be inspected by Chief Engineer before closing up. Tanks shall be closed up in good order, using new jointing and anti-seize compound on manhole cover studs and nuts (Contractor supply). The contractor shall bid on replacing one manhole stud per tank and provide unit cost per stud replacement.
- .15** Upon completion of inspection and close up, the vent cap shall be removed from each individual tank vent and the tank is to be hydro-statically tested with the Lloyd's Hull surveyor and Chief Engineer in attendance to witness test.
- .16** Upon completion of testing, all vent caps shall be installed in good order, bolts used for connection shall be cleaned and coated with anti-seize compound. Contractor to inspect vent head screens for damage or blockage, any defects to be reported to the Chief Engineer immediately for corrective action.
- .17** Contractor shall fill all the tanks with fresh water and perform a hydrostatic test on the tanks.
- .18** Contractor to supply all materials and equipment to carry out work on the tanks. The contractor is responsible for notifying the Lloyd's Surveyor and the Chief Engineer when tank is ready for inspection and testing.

.19 Chief Engineer and Lloyd's Surveyor shall witness testing.

.20 All work to be to the satisfaction of Chief Engineer and the Lloyd's Surveyor.

3.4 Location

a.

3.5 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.2 Inspection

4.1.3. 100% visual By Chief Engineer, Lloyd's Surveyor.

4.1.4. Upon completion of all repairs and testing, the Contractor and the Chief Engineer shall conduct a final inspection and ensure all tanks, covers, vents and piping connections have been returned to operating conditions and the attending the Lloyd's Surveyor has completed all inspections.

4.2 Testing

4.2.1. Hydrostatic testing all tanks to satisfaction of Chief Engineer and Lloyd's.

4.2.2. The contractor shall supply all necessary materials, fittings blanks and labor for respective tests. All blanks installed in order to perform a pressure test are to be recorded on a list according to location on the tank and shall be accounted for by the contractor and the Chief Engineer or his delegate upon their removal.

4.3 Certification

Part 5: DELIVERABLES:

5.5 Drawings/Reports

5.5.1 The Contractor shall provide to the Chief Engineer and NACE inspector, before the coating is applied, the following information sheets regarding the coating used: working procedures sheets, product data sheets, and the Material Safety Data Sheets.

5.5.2 Contractor supply Chief Engineer three copies written and one electronic copy of a report of all work carried out.

5.6 Spares
N/A

5.7 Training
N/A

5.8 Manuals N/A

HD-17 Deck Workshop Ventilation

Spec item #: HD-17	SPECIFICATION	LLOYDS #
--------------------	---------------	----------

HD-17 Deck Workshop Ventilation

Part 1: SCOPE:

- 1.2** The intent of this specification is to install a forced draft ventilation system in the Bosun's workshop.

Part 2: REFERENCES:

2.5 Guidance Drawings/Nameplate Data

2.1.1. MSI Drawing – Forward Machinery Space Modifications

2.6 Standards

2.2.1 SOLAS

2.2.2 Marine Machinery Regulations

2.2.3 National Fire Protection Association standards.

2.2.4 ACR 2013 Standard for Cleaning and Restoration of HVAC Systems

2.7 Regulations

2.3.1 Canadian Coast Guard Fleet Safety and Security Manual (DFO/5737)

2.3.2 Canadian Coast Guard ISM Lockout/Tagout

2.3.3 Canadian Coast Guard ISM Hotwork Procedures

2.3.4 Canadian Coast Guard Enclosed Space Entry Procedures

2.8 Owner Furnished Equipment

2.4.8 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:**3.2 General**

- 3.1.47** The Contractor is to install new 8 inch spiral galvanized steel ductwork in the Bosun's workshop as identified in MSI drawing 2907-02-01. Contractor shall note the measurements for ducting lengths in the drawing are not exact and piping shall be cut and fitted in place.
- 3.1.48** The existing heat detector and mount located in the deckhead shall be cut from its location and welded in a location further inboard to allow clearance for the new ductwork.
- 3.1.49** This ductwork shall be suitably supported to the deck stiffeners above.
- 3.1.50** The contractor shall install a coast guard supplied Tri-Metal Fabricators Model 0832V fan in line with the ductwork as shown in the MSI drawing. This fan shall be suitably supported from the deckhead above.
- 3.1.51** This fan shall be connected to the existing 4" natural vent piping on the outboard of the space.
- 3.1.52** Transition from the 8 inch fan to the 4 inch opening shall be done using an evase transition piece 4" to 8' with 15 degree angle as shown in the supplied MSI drawing.
- 3.1.53** The ductwork shall be fitted with two contractor supplied registers fitted with dampers and connected as shown in the supplied MSI drawing.
- 3.1.54** The contractor is responsible for the removal and reinstallation of any expanded metal and deck installation to make required connections for the motor and ductwork and wiring.
- 3.1.55** All ductwork joints shall be sealed with approved fire rated materials.
- 3.1.56** The contractor shall use an existing 230 volt power supply cable located outside the workshop door in a deck level junction box to feed the newly installed motor.
- 3.1.57** This cable is feed from Panel H2 breakers 13/15 located outside the survivors lounge. This breaker shall be locked out before any electrical work commences.
- 3.1.58** The contractor shall pull the cable described above back into the work shop through the existing transit. The transit shall then be resealed.
- 3.1.59** This wire shall be fed back through the existing cable and ran to the newly installed motor.
- 3.1.60** The cable shall be suitably supported from the deck head.
- 3.1.61** The contractor is responsible for the connection of the wiring to the newly installed fan.
- 3.1.62** The contractor shall supply and install an remote operated start stop switch to mounted in an easily accessible location inside the work shop. The contractor is responsible for supplying service suitable wiring for this installation.
- 3.1.63** Once the installation is complete the fan and controls shall be tested for operation with the Chief Engineer or delegate.

3.5 Location:

- a. Bosun's Workshop**

3.6 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.**

Part 4: PROOF OF PERFORMANCE:

4.2 Inspection

4.1.11. All work shall be inspected by Lloyd's Technical Inspector and Chief Engineer.

4.1.12. All work shall be completed to the satisfaction of the Chief Engineer.

4.2 Testing

4.2.1 Once the installation is complete the fan, controls, and dampers shall be tested for operation with the Chief Engineer or delegate and a defects corrected by the contractor.

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.5 Drawings/Reports

5.1.1 Contractor to update copy of 230 volt line diagram

5.6 Spares

N/A

5.7 Training
N/A

5.8 Manuals
N/A

HD-18 Forward Machinery Space Ventilation

Spec item #: HD-18	SPECIFICATION	LLOYDS #
HD-18 Forward Machinery Space Ventilation		

Part 1: SCOPE:

- 1.1** The intent of this specification is to alter the trunking for the forward machinery space supply ventilation. Currently the space is feed forced air from the bow thruster supply fan. This spec outlines the details required to modify the current arrangement ductwork to allow the area to be feed from the main deck accommodation ventilation supply trucking.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- 2.1.1. Bow Thruster Ventilation Arrangement Hold Deck S-111-9
- 2.1.2. Ventilation Arrangement Main Deck FWD S-111-6
- 2.1.3. Fire Fighting Plan 590-82-1
- 2.1.4. MSI Drawing – Forward Machinery Space Modifications

2.2 Standards

- 2.2.1 SOLAS
- 2.2.2 Marine Machinery Regulations
- 2.2.3 National Fire Protection Association standards.
- 2.2.4 ACR 2013 Standard for Cleaning and Restoration of HVAC Systems

2.3 Regulations

- 2.3.1 Canadian Coast Guard Fleet Safety and Security Manual (DFO/5737)
- 2.3.2 Canadian Coast Guard ISM Lockout/Tagout
- 2.3.3 Canadian Coast Guard ISM Hotwork Procedures
- 2.3.4 Canadian Coast Guard Enclosed Space Entry Procedures

2.4 Owner Furnished Equipment

- 2.4.9 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- 3.1.1** The Contractor shall ensure the Bowthruster and Main Deck supply fan is locked out before commencing any work.
- 3.1.2** The Contractor is responsible for the removal and re-installation of any bulkhead and deckhead paneled required to gain working access to the ventilation ductwork identified in this specification.
- 3.1.3** All modified ductwork joints shall be sealed with approved fire rated materials
- 3.1.4** The Contractor shall modify the current ventilation trucking in accordance to MSI Drawing – Forward Machinery Space Ventilation Modification #2907-01A-00
- 3.1.5** The supply trucking to the forward machinery space in the vessels forward stores shall be cut and blanked with 20 gauge galvanized sheet metal separating it from the main from the Bowthruster fan supply.
- 3.1.6** The sections of remaining 18"x6" trunking that protrudes through the bulkhead of the space shall be removed, along with the section that protrudes to the deck below.
- 3.1.7** The bulkhead and deckhead shall then be sealed with a welded steel insert the same thickness of the existing material. See drawing MSI drawing for reference.
- 3.1.8** The existing 18x6 forward machinery space ductwork located in the forward lounge shall be tied in with the 12"x6" main deck supply ventilation located in the starboard side deckhead of the forward lounge. See MSI drawing for reference.
- 3.1.9** The joining ductwork shall be 20 gauge galvanized sheet metal and suitably supported from the deckhead above.
- 3.1.10** A contractor supplied Lloyds's approved manually operated fire damper shall be installed in the vertical section of the forward machinery space supply trucking. This is located behind bulkhead paneling in the forward machinery space.
- 3.1.11** The fire damper trip and reset mechanism shall be easily accessible and not require the removal of any bulkhead material to operate.

3.2 Location:

- a. Forward Engineroom Stores**
- b. Forward Lounge**
- c. Forward Machinery Space**

3.3 Interferences

- a.** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. All work shall be inspected by Lloyd's Technical Inspector and Chief Engineer.

4.1.2. All work shall be completed to the satisfaction of the Chief Engineer.

4.2 Testing

4.2.1 Fire damper trip and reset ability shall be tested and witness by Chief Engineer and Lloyd's inspector

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 Updated Bow Thruster Ventilation Arrangement Hold Deck S-111-9

5.1.2 Updated Ventilation Arrangement Main Deck FWD S-111-6

5.1.3 Updated Fire Fighting Plan 590-82-1

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals
N/A

HD-19 Seabay and Sea Chest Coating

Part 1: SCOPE:

- 2.1 The intent of this spec is to grit blast, prep and paint the internal Seachest and Seabay coatings.
- 2.2 This work shall be carried out in Conjunction with the following: HD-06 Underwater Hull Painting, HD-03 Cathodic Protection

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- **Total Areas**

Port Sea Chest (Frames 42-44)	Approximately 24m2
Starboard Sea Chest (Frames 42-44)	Approximately 24m2
Centerline Inboard Sea Bay (Frames 42-44)	Approximately 85.5m2
Forward Port Sea Chest (Frames 80-82)	Approximately 32m2

2.2 Standards

2.2.1 Follow Manufacture's product data sheets.

2.3 Regulations

- 2.3.1 Meet the satisfaction of an NACE Inspector.
- 2.3.2 Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.3.3 Coast Guard ISM Lockout/Tagout
- 2.3.4 Coast Guard ISM Hotwork procedures
- 2.3.5 Coast Guard Enclosed Space Procedures

2.4 Owner Furnished Equipment

- 3.3.1. It is noted that Canadian Coast Guard will provide the service of an independent NACE Inspector.
- 3.3.2. The contractor shall supply all: materials, equipment, including staging, rigging, scaffolding, enclosures, heating, painting equipment and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

4.1 General

- 4.1.1. The areas listed above shall be opened for cleaning, grit blasting, coating, and survey by a Lloyd's Surveyor and the Chief Engineer. The Owner will provide the services of a NACE inspector to witness all aspects of painting.
- 4.1.2. Prior to entry, areas to be certified "Safe for Workers" or "Safe for Hot Work" as required by Transport Canada Marine Safety TP3177E. The certificates shall be given to the Chief Engineer and copies posted by the tank manhole and gangway.
- 4.1.3. All of the above listed areas shall be inspected by a Lloyd's Surveyor, Chief Engineer and NACE inspector prior to cleaning.
- 4.1.4. The contractor shall High pressure water clean all areas listed at 242bar, and quote per one square meter to be adjusted up or down by PWGSC 1379 action. Collect the high pressure wash residue and remove from Site. Care must be taken to properly protect all anodes located in the areas from high pressure water blasting.
- 4.1.5. Contractor to carry out chloride ion testing of prepared surfaces to ensure the chloride ion are not imbedded into the substrate when cleaning seabay to near white metal (SSPC-SP10) as specified. The acceptable chloride ion level shall be less than 2µg/cm². If chloride ion level, as specified is not attained, a rewash of the affected area shall be carried out using a soluble salt remover, such as Chlor-Rid Liquid Salt Remover at a dilution ratio of 1:100, sprayed on the affected area at a minimum of 20 mps (3000 psi).

- 4.1.6. Contractor prior to grit blasting shall plug all outlets (pump suction/discharge, level transducer) sounding, vents.
- 4.1.7. Extreme care must be taken to thoroughly protect all anodes located in the areas from damage from grit blasting.
- 4.1.8. Contractor to bid on grit blasting to all areas listed to bare metal as per SSPC SP-10/NACE 2 Near White Abrasive Blast clean with an angular Surface Profile of 50-75 microns (2-3 mils) and quote per one square meter to be adjusted up or down by PWGSC 1379 action.
- 4.1.9. Contractor to clean all debris from grit blasting in preparing for coatings.
- 4.1.10. Contractor shall remove all debris from grit blasting put ashore and properly disposed of it in accordance with its provincial environmental regulations.
- 4.1.11. All ventilation requirements to assist in drying out of tanks prior to painting and to assist paint curing shall be Contractor supply.
- 4.1.12. Contractor shall coat all areas listed in this spec and provide unit cost for complete coating per square meter.
- 4.1.13. All anodes shall be affixed prior to painting. Hull sacrificial anodes shall be protected from paint and grit blasting , the protection shall be removed prior to undocking.

4.1.14. Coating Specification for Application

The paint shall be a Primer coat Intershiel ENA 300 – Bronze and Top coat Intershiel ENA 300 – Aluminium as manufactured by International Paints Canada, or approved equal, applied to a dry film thickness of:

- (1) Total dry film thickness applied in two (2) full coats and (2) striped coats. (12mils) on flat and combined with striped coats (16 mils) on curved surfaces.
- (2) Two Stripe coats it shall be applied to all corners, crevices, rivets, bolts, welds, and other edges using the specified coating prior to application of each full coat on the interior structure. First coating is to be Colour **bronze** and second stripe coat to be **Aluminium** Such striping

shall extend a minimum of 2.2 cm from the edge. The stripe coat shall set to touch before the full coat is applied. Note: stripe coating is most effective on edges that are rounded by grinding.

4.1.15. Quality Assurance

- Only skilled painters shall be used in performing work to produce the highest quality product. In the acceptance or rejection of applied finishes, no allowances will be made for lack of skill on the part of the painters. Contractor shall submit names and work experience of skilled painters to the Chief Engineer for review prior to commencement of coating system application.
- Contractor shall strictly adhere to the manufactures specific application instructions.
- The Contractor shall require strict quality control over surface preparation and application of coatings to ensure compliance with the specifications and applicable requirements of the paint manufacturer.
- All cleaned and prepared surfaces shall be inspected by NACE Certified Coating Inspector prior to the application of coating.
- The following tests and checks shall be carried out before, during, and after the painting process. A Coating Application Log of these tests shall be maintained and submitted to the Chief Engineer upon completion of the Project.
 - Surface preparation including anchor profile and abrasive used.
 - Wet and Dry film thicknesses.
 - Surface temperature, ambient temperature, room temperature, relative humidity, dew point and coating temperature.
 - Continuity of Paint to be checked using low voltage detector (Sponge Test) as specified by the Nace Inspector.
 - Adhesion tests as specified by the Nace Inspector.
 - Coating Batch Numbers.

4.2 Location

Port Sea Chest (Frames 42-44)	Approximately 24m2
Starboard Sea Chest (Frames 42-44)	Approximately 24m2
Centerline Inboard Sea Bay (Frames 42-44)	Approximately 85.5m2
Forward Port Sea Chest (Frames 80-82)	Approximately 32m2

4.3 Interferences

3.2.1. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. All work shall be completed to the satisfaction of the Chief Engineer, NACE Inspector and Lloyds Inspector

4.2 Testing

4.3 Certification

4.3.1 Copy of Manufacture data sheets to be supplied to Chief Engineer.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 Two hard copies and one electronic of refit reports of all items carried out in this refit specification will be supplied to Chief Engineer.

5.2 Spares N/A

5.3 Training N/A

5.4 Manuals N/A

HD-20 Fuel Oil Tanks		
Spec item #: HD-20	SPECIFICATION	LLOYDS #
HD-20 Fuel Oil Tanks		

Part 1: SCOPE:

- 1.1** The intent of this specification is to open up all listed tanks for the 5 year survey required by Lloyd's and the Chief engineer. Tanks are to be cleaned, inspected and air tested. Contractor shall contact Lloyd's to arrange scheduling of Surveyor for the inspection and testing of all tanks. Contractor shall inform Chief Engineer when tanks are ready for inspection and air tests.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- 2.1.1. Docking plan drawing No. 590-96 Rev. 2
- 2.1.2. General Arrangement Dwg No. 590-70
- 2.1.3. Vents and sounding pipes 590-40-01, 590-40-03
- 2.1.4. Fuel oil piping 590-42-01
- 2.1.5. Capacity Plan #590-79.
- 2.1.6. #590-54 Manhole and level transmitter locations.

2.2 Standards

- 2.2.1 Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.2 Coast Guard ISM Lockout/Tagout
- 2.2.3 Coast Guard ISM Hotwork procedures
- 2.2.4 Coast Guard Enclosed Space Procedures

2.3 Regulations

2.4 Owner Furnished Equipment

- 2.4.1** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- 3.1.1** The following tanks listed in the table shall be sounded and the level of fluids recorded by the Docking Master prior to docking the vessel. Tanks listed in this table are the tanks to be cleaned, inspected and tested.
- 3.1.2** The tanks shall be pumped empty by crew. Contractor to remove manhole covers and remove the residual fuel oil for disposal ashore and disposed of in accordance with the provincial environmental regulations The Contractor shall quote on the removal and disposal of 1.0 Cubic Meters of residual fuel per tank. Contractor to quote separately a unit cost per liter and the total shall be adjusted up or down by 1379 action. The contractor will provide fuel metering or reception tank soundings to accurately measure fuel removed.
- 3.1.3** The contractor shall have the tanks gas freed “safe for personnel” as per Provincial regulations. Certificates to be given to Chief Engineer, and posted by manhole for tank to be entered and posted by gangway.
- 3.1.4** The contractor shall thoroughly clean the internal surfaces of each tank as listed above. In addition all fuel tanks shall be hot water cleaned to ensure all microbiological contaminants are killed. The required water temperature shall be 70 degrees Celsius, minimum. The contractor shall supply the hot water source. Hot water from the ship’s supply is not to be used. Tanks to be wiped down using lint free wiper rags to remove any water and fuel residue that is remaining including all mud and debris and disposed of in accordance with the provincial environmental regulations. Contractor shall bid on disposal of 20 cubic meters of residual fuel and water mixture and quote per cubic meter to be adjusted up or down by PWGSC 1379 action.

- 3.1.5** All tanks shall be cleaned and the contractor will provide metering or tank sounding to accurately measure fuel removed.
- 3.1.6** Contractor shall be responsible for removing and subsequent replacement of all docking plugs for the purpose of carrying out the work in this specification. No docking plugs are to be removed from the tanks until tanks have been pumped as low as possible and confirmed by the vessel's Chief Engineer. Contractor shall supply and fit all docking plugs openings with wooden plugs to prevent ingress of dirt during operations such as sandblasting, painting, etc. which could cause contamination of tanks to occur. After all tank work is completed all docking plugs shall be installed using new sealing thread and white lead. Tap to be run over threads in hole. Docking plug threads shall be cleaned on a lathe if required. Contractor to quote on thread cleaning 14 docking plugs in lathe.
- 3.1.7** Contractor to quote on fabricating three new docking plugs and quote on fabricating per one docking plug.
- 3.1.8** The tanks shall be inspected by Lloyd's and the Chief Engineer or his delegate Engineer.
- 3.1.9** After final inspection by the Chief Engineer the manhole covers shall be replaced with new approved **Nitrile** rubber gasket and anti-seize compound on all studs. Studs to be wire brushed clean.
- 3.1.10** Contractor to quote on replacing three manhole cover studs and quote on replacing one stud.
- 3.1.11** The contractor shall remove vent caps from vent pipes and check all vent cap fire arrestor screens for damage / blockage.
- 3.1.12** The contractor shall conduct an air pressure test on all tanks as per Lloyd's requirements. Lloyd's Surveyor and the Chief Engineer must witness all testing.
- 3.1.13** After testing is completed the Contractor shall install all vent caps. Bolt threads on Victaulic couplings shall be cleaned and coated with never seize prior to installation by the contractor. Tightening of manhole covers, installation of vent caps and docking plugs shall be witnessed by the Chief Engineer or a person delegated by the Chief Engineer.
- 3.1.14** Upon completion of all work in this spec the Contractor shall arrange with the Chief Engineer to have fuel transferred to the tanks as per the condition prior to docking the vessel. The docking master shall verify same.
- 3.1.15** All work in this specification shall be to the satisfaction of the Chief Engineer.

3.2 Location:

Fuel Tanks

TANK #	DESCRIPTION	FRAME No.	CAP. C/M
No.1	FUEL OIL TANK PORT	58-66	37.2
No.1	FUEL OIL TANK STBD	58-66	37.2
No.2	FUEL OIL TANK PORT	52-58	53.7
No.2	FUEL OIL TANK STBD	52-58	53.7
No.3	FUEL OIL TANK PORT	44-52	31.6
No.3	FUEL OIL TANK STBD	44-52	34.6
No.4	FUEL OIL TANK PORT	28-44	29.6
No. 4	FUEL OIL TANK CENTER	29-42	52.1
No.4	FUEL OIL TANK STBD	28-44	29.6
No.5	FUEL OIL TANK PORT	12-18	43.2
No.5	FUEL OIL TANK STBD	12-18	22.5
No.6	FUEL OIL TANK PORT	05-12	28.6
No.6	FUEL OIL TANK STBD	05-12	28.6
	FLUME FUEL TANK	58-66	154.7
	FUEL OIL DAY TANK	18-21	15.1
	AVIATION FUEL TANK	AE-04	9.1
	FUEL OIL DRAIN TANK	28-29	2.4

Lube Oil Tanks

3.3 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

- 4.1.1.** 100% visual to be carried out by Chief Engineer and Lloyd's Surveyor.
- 4.1.2.** All work shall be completed to the satisfaction of the Chief Engineer.
- 4.1.3.** Upon completion of all repairs and testing, the Contractor and the Chief Engineer (or designate) shall conduct a final inspection and ensure all tanks, covers, vents and piping connections have been returned to operating conditions and the attending Lloyd's Surveyor has completed all inspections.

4.2 Testing

- 4.2.1.** This testing is to be carried out in the presence of the attending Lloyd's Surveyor and the Chief Engineer. The contractor is to be responsible to contact Lloyd's Surveyor for all inspections.
- 4.2.2.** Tank shall be air tested to the satisfaction of the Chief Engineer and Lloyd's.
- 4.2.3.** The contractor is responsible for all air quality testing to ensure hot work and entry into tanks is permitted. The contractor shall issue and post such permits and shall maintain the appropriate watch that is required.
- 4.2.4.** The contractor shall supply all necessary materials, fittings blanks and labor for respective tests. All blanks installed in order to perform a pressure test are to be recorded on a list according to location on the tank and shall be accounted for by the contractor and the Chief Engineer or his delegate upon their removal.
- 4.2.5.** The Contractor is to be responsible for all inspections and is to consult with Lloyd's Surveyor, prior to commencement of work, to determine an inspection schedule; at each inspection point, the Contractor is to advise the Chief Engineer, in advance, to allow his/her attendance.

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.13 Drawings/Reports

5.1.1 Contractor to supply Chief Engineer with two written and one electronic copy of reports for the work completed

5.14 Spares
N/A

5.15 Training
N/A

5.16 Manuals
N/A

HD-21 Lube Oil Tanks		
Spec item #: HD-21	SPECIFICATION	LLOYDS #
HD-21 Lube Oil Tanks		

Part 1: SCOPE:

- 1.1 The intent of this specification is to open up all listed tanks for the 5 year survey required by Lloyd's and the Chief engineer. Tanks are to be cleaned, inspected and air tested. Contractor shall contact Lloyd's to arrange scheduling of Surveyor for the inspection and testing of all tanks. Contractor shall inform Chief Engineer when tanks are ready for inspection and air tests.
- 1.2 **The Gearbox Lube oil storage tank shall not be emptied and cleaned until after the completion on the gearbox oil change as indicated in spec # E-03**

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- 2.1.1. Docking plan drawing No. 590-96 Rev. 2
- 2.1.2. General Arrangement Dwg No. 590-70
- 2.1.3. Vents and sounding pipes 590-40-01, 590-40-03
- 2.1.4. Lube Oil Diagram #590-33
- 2.1.5. Lube Oil Piping #590-41
- 2.1.6. Capacity Plan #590-79.
- 2.1.7. #590-54 Manhole and level transmitter locations.

2.2 Standards

- 2.2.1 Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.2 Coast Guard ISM Lockout/Tagout
- 2.2.3 Coast Guard ISM Hotwork procedures

2.2.4 Coast Guard Enclosed Space Procedures

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

2.4.10 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.64 The following tanks listed in the table shall be sounded and the level of fluids recorded by the Docking Master prior to docking the vessel. Tanks listed in this table are the tanks to be cleaned, inspected and tested.

3.1.65 The Contractor is responsible for the removal and storage of oil from all 4 tanks. The oil shall be pumped off through a filtering system and upon completion of the tank work be pumped back into the tank through a filtering system. The oil shall be stored in clean storage containers certified for oil. The contractor shall bid on unit cost for the transfer and storage of 7 cubic meters of oil.

3.1.66 When proven empty the Contractor is to remove manhole covers, tanks gas freed “safe for personnel” as per Provincial regulations. Certificates to be given to Chief Engineer, and posted by manhole for tank to be entered and posted by gangway.

3.1.67 All tanks shall be cleaned and wiped down using lint free wiper rags to remove any water and fuel residue that is remaining including all mud and debris and disposed off in accordance with the provincial environmental regulations. Contractor shall bid on disposal of 10 cubic meters off residual oil and water mixture and quote per cubic meter to be adjusted up or down by PWGSC 1379 action.

3.1.68 The contractor will provide fuel metering or tank sounding to accurately measure oil removed.

- 3.1.69** Immediately after the tanks are cleaned the Contractor shall give the lube oil tanks surface a thin coat of oil of the type which is going to be stored in the tanks.
- 3.1.70** The tanks shall be inspected by Lloyd's and the Chief Engineer or his delegate Engineer.
- 3.1.71** After final inspection by the Chief Engineer the manhole covers shall be replaced with new approved **NITRILE** rubber gasket and anti-seize compound on all studs. Studs to be wire brushed clean.
- 3.1.72** Contractor to quote on replacing three manholes cover studs and quote on replacing one stud.
- 3.1.73** The contractor shall remove vent caps from vent pipes and check all vent cap fire arrestor screens for damage / blockage.
- 3.1.74** The contractor shall conduct an air pressure test on all tanks as per Lloyd's requirements. Lloyd's Surveyor and the Chief Engineer must witness all testing.
- 3.1.75** After testing is completed the Contractor shall install all vent caps. Bolt threads on Victaulic couplings shall be cleaned and coated with never seize prior to installation by the contractor. Tightening of manhole covers, installation of vent caps and docking plugs shall be witnessed by the Chief Engineer or a person delegated by the Chief Engineer.
- 3.1.76** All work in this specification shall be to the satisfaction of the Chief Engineer.

3.12 Location:

Lube Oil Tanks

HD-21 Lube Oil Tanks

DESCRIPTION	FRAME #	CAP C/M
AUXILIARY LUBE OIL TANK	18-21	4.4
HYDRAULIC OIL TANK	18-21	2.3
GEAR OIL TANK	18-21	2.3
M/E LUBE OIL STORAGE TANK	18-21	6.6

3.13 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

- 4.1.13.** 100% visual to be carried out by Chief Engineer and Lloyd's Surveyor.
- 4.1.14.** All work shall be completed to the satisfaction of the Chief Engineer.
- 4.1.15.** Upon completion of all repairs and testing, the Contractor and the Chief Engineer (or designate) shall conduct a final inspection and ensure all tanks, covers, vents and piping connections have been returned to operating conditions and the attending Lloyd's Surveyor has completed all inspections.

4.2 Testing

- 4.2.1.** This testing is to be carried out in the presence of the attending Lloyd's Surveyor and the Chief Engineer. The contractor is to be responsible to contact Lloyd's Surveyor for all inspections.
- 4.2.2.** Tank shall be air tested to the satisfaction of the Chief Engineer and Lloyd's.

- 4.2.3. The contractor is responsible for all air quality testing to ensure hot work and entry into tanks is permitted. The contractor shall issue and post such permits and shall maintain the appropriate watch that is required.
- 4.2.4. The contractor shall supply all necessary materials, fittings blanks and labor for respective tests. All blanks installed in order to perform a pressure test are to be recorded on a list according to location on the tank and shall be accounted for by the contractor and the Chief Engineer or his delegate upon their removal.
- 4.2.5. The Contractor is to be responsible for all inspections and is to consult with Lloyd's Surveyor, prior to commencement of work, to determine an inspection schedule; at each inspection point, the Contractor is to advise the Chief Engineer, in advance, to allow his/her attendance.

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

- 5.1.1 Contractor to supply Chief Engineer with two written and one electronic copy of reports for the work completed

5.2 Spares N/A

5.3 Training N/A

5.4 Manuals N/A

HD-22 Sludge Tank		
Spec item #: HD-22	SPECIFICATION	LLOYDS #
HD-22 Sludge Tank		

Part 1: SCOPE:

- 1.1 The intent of this specification is to open up tank for Lloyd's 5 year survey inspection and air pressure tested. Contractor shall arrange scheduling of the Lloyd's Surveyor's for inspection and testing.
- 1.2 Contractor shall clean the tank and prove operational all of the level float switches. All work shall be inspected by the Chief Engineer including inspection after cleaning, and before the tank is closed up and to witness operational tests.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- 2.1.1. Capacity 11.2 cubic meters.
- 2.1.2. Drawing #590 Revision 2 (for the location of the docking plugs).
- 2.1.3. Drawing #590-79 Capacity Plan.

2.2 Standards

- 2.1.1. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.1.2. Coast Guard ISM Lockout/Tagout
- 2.1.3. Coast Guard ISM Hotwork procedures
- 2.1.4. Coast Guard Enclosed Space Working procedures

2.3 Regulations

- 2.3.1 Entry into confined spaces shall be carried out in accordance Provincial Regulations.

2.4 Owner Furnished Equipment

2.4.11 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1 The sludge tank shall be isolated from the inlets and provision for the removal of waste while the tank is undergoing cleaning and inspection is the responsibility of the Contractor. Upon completion of all work in this spec the Contractor shall remove all blanks / by-passes that were fitted to isolate the tank.

3.1.2 The contractor shall pump down the sludge tank to its lowest level, the manhole cover removed, tank gas freed “safe for personal” certificate to be given to chief engineer, and posted by manhole for tank to be entered and on the vessel’s gangway. Any remaining water and debris shall be disposed of in accordance with the provincial environmental regulations. Contractor to bid on removal 4 cubic meter and quote per 1 cubic meter.

3.1.3 All internal surfaces of the tank shall be cleaned by the Contractor and wiped down using lint free wiper rags. Any oil/residue that is remaining including sludge and debris shall be disposed of by the Contractor in accordance with provincial environmental regulations. The contractor shall bid on disposal of 200 liters of residual oil/water.

3.1.4 The tanks shall be inspected by Lloyd’s and the Chief Engineer. The Contractor shall be responsible for scheduling the inspectors for inspections.

3.1.5 Suction pipe from discharge pump shall be removed and proven clear and re-installed.

3.1.6 Sounding pipe shall be proven clear.

3.1.7 All float and level switches shall be cleaned.

3.1.8 The contractor shall remove the vent cap from the vent pipe and check the vent cap fire arrestor screens.

- 3.1.9** After all work is completed the contractor shall replace manhole covers using new contractor supplied 1/4" nitrile gaskets gasket. Manhole securing studs are to be wire brushed cleaned and nuts shall be cleaned up and coated with anti seize compound.
- 3.1.10** Contractor shall conduct an air pressure test on the tank as per Lloyd's rules and requirements Lloyd's surveyors and the Chief Engineer witnessing all testing.
- 3.1.11** After all testing is completed the sounding pipes, suction pipes and vents (vent caps) shall be proven clear. The bolt threads on the Victaulic couplings shall be cleaned and coated with never seize prior to installation. The high level alarm shall be proven operational by the contractor.
- 3.1.12** All work is to be carried out to the satisfaction of the Chief Engineer.

3.14 Location:

- a. Shaft tunnel Frames No. 21 – 28.**

3.15 Interferences

- a.** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

- 4.1.1.** Tanks shall be inspected by a Lloyd's Surveyor and the Chief Engineer.
- 4.1.2.** All work shall be completed to the satisfaction of the Chief Engineer.

4.2 Testing

4.2.1. Tank has to be air tested for Lloyd's five year survey it has to be witness by a Lloyd's Surveyor and Chief Engineer.

4.2.2. Contractor has to prove alarms and probe working after air testing is carried out.

4.2.3. The sounding pipes, suction pipes and vents shall be proven clear.

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 Contractor to supply two typed copies and one electronic copy of reports to Chief Engineer.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals

N/A

HD-23 Steering Compartment Bilge Painting

Spec item #: HD-23	SPECIFICATION	LLOYDS #
HD-23 Steering Compartment Bilge Painting		

Part 1: SCOPE:

- 1.7 The Contractor shall provide the necessary services and equipment to clean and prepare and paint the steering compartment bilge area.

Part 2: REFERENCES:

2.17 This specification shall be carried out in conjunction with following spec items:

- 2.1.1. Underwater Hull Painting
- 2.1.2. Lloyds Special Survey Thickness testing
- 2.1.3. Steering Gear Overhaul

2.18 Guidance Drawings/Nameplate Data

- | | |
|--|--------|
| 2.1.1. Structural Sections, AFT – FR. 20 | 590-02 |
| 2.1.2. Transverse Bulkheads, FRS. 5 – 52 | 590-05 |
| 2.1.3. Skeg Structure & Sternframe | 590-08 |
| 2.1.4. Shell Expansion | 590-01 |
| 2.1.5. Capacity Plan | 590-79 |
| 2.1.6. Docking Plan | 590-96 |

2.19 Standards

- 2.1.1. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.1.2. Coast Guard ISM Lockout/Tagout
- 2.1.3. Coast Guard ISM Hotwork procedures
- 2.1.4. Coast Guard Enclosed Space Working procedures

2.20 Regulations

2.3.1

2.21 Owner Furnished Equipment

2.4.12 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated .

Part 3: TECHNICAL DESCRIPTION:

3.5 General

3.1.77 The contractor shall be responsible for cleaning, preparing and coating all areas of the steering compartment bilge.

3.1.78 The contractor shall assume and approximate total surface area of 2100 sq. ft. for this specification. Contractor shall verify area and any discrepancies shall be discussed with Chief Engineer and dealt with PWGSC 1379.

3.1.79 All areas of bilge, framing, piping, machinery seats, and all other structure beneath level of deck plates shall be thoroughly degreased with solvent cleaner and high pressure washed to SSPC-SP-1 standard. Contractor to quote unit cost per square foot for cleaning and degreasing for adjustment purposes.

3.1.80 Upon completion of initial cleaning the space shall be inspected by the Chief Engineer for cleanliness and original coating condition.

3.1.81 On completion of general cleaning, and degreasing as defined above, all areas of failing coating, scale and bare steel shall be power tooled or grit blasted to SSPC-SP-10 standard. All loose paint, scale and rust shall be removed. Contractor shall assume 90% of area shall require grit blasting to bare steel.

3.1.82 The contractor shall quote separately a unit cost per square foot for grit blasting and power tool cleaning to bare steel. All areas of intact coating shall be further prepared by grinding or buffing to achieve necessary surface profile for adhesion of new coating system.

3.1.83 Prior to grit blasting the contractor is responsible for securing and sealing all manhole covers located in the steering gear compartment. This shall be done to prevent dust from migrating inside the compartment.

- 3.1.84** Any debris that finds its way into the internal steering compartment space or equipment shall be cleaned at the contractor's expense.
- 3.1.85** Access to the bilge for power tooling or grit blasting shall be through contractor cut holes in the vessels shell plating. Contractor to quote on cutting four access holes a minimum of 41cm by 61cm in the steering gear bilge area these inserts must be re installed as per Lloyd's Specification. The Contractor quote per one access hole for adjustment purposes.
- 3.1.86** All work areas shall be adequately ventilated to exterior of ship to prevent dust from surface prep from migrating to other areas within machinery space and/or contaminating machinery in the space.
- 3.1.87** All fluids and debris from cleaning effort shall be removed and disposed of in accordance with provincial environmental regulations.
- 3.1.88** All valve bonnets shall be wrapped and taped with suitable protective material.
- 3.1.89** All electrical cabling identification tagging shall be taped.
- 3.1.90** High level bilge alarms shall be removed before sandblasting. The contractor is responsible for their re-installation and testing on the completion of the work described in this spec.
- 3.1.91** All areas shall be coated with two coats of International Interbond 808, each coat of contrasting colour, and one top coat of International Interthane 990. Top coat must be applied to Interbond within specific time period as specified by manufacturer for proper adhesion. Final coat shall be light grey in colour.
- 3.1.92** Contractor to quote unit cost per square meter for coating as described above for adjustment purposes.
- 3.1.93** The contractor shall remove all taping and other protective materials upon completion of the coating cure time.
- 3.1.94** Means of paint application shall be via airless spray and over spray shall be limited and contained. Any over spray on structure or machinery above deck plate level shall be top coated to original colour scheme.

3.16 Location:

- a. Steering Gear Compartment1 Frs D to 5**

3.17 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.4 Inspection

4.1.16. All work shall be inspected by Chief Engineer and Lloyd's Surveyor.

4.1.17. All work shall be completed to the satisfaction of the Chief Engineer.

4.2 Testing

4.2.1. All welded inserts shall be tested in accordance to Lloyds instructions.

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.17 Drawings/Reports

5.1.1 Contractor to supply two typed copies and one electronic copy of report to Chief Engineer.

5.18 Spares

N/A

5.19 Training
N/A

5.20 Manuals
N/A

Spec item #: HD-24	SPECIFICATION	LLOYDS #
---------------------------	----------------------	-----------------

HD-24 Anchor Chains and Chain Locker

Part 1: SCOPE:

- 1.1 The Contractor shall remove both Port and Starboard anchors and anchor chains and prepare the chains and anchors and the Port and Stbd Chain Lockers for five year survey inspection by a Lloyd's Surveyor and the Chief Engineer.
- 1.2 This shall include cleaning, de-scaling, painting and inspection of anchors, anchor chains, chain lockers, and chain locker drain hats. Contractor shall contact Lloyd's to arrange scheduling of surveyor's for all inspection and testing.
- 1.3 Contractor shall inform Chief Engineer prior to start of work..

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- 2.1.1. Drawing #590-81 Anchor arrangement as fitted
- 2.1.2. Drawing # 590-94 Anchor chain emergency release as fitted.
- 2.1.3. Drawing # 590- 36 Bilge Ballast and Fire system as fitted.
- 2.1.4. Chains are 220m in length each x 36mm Grade U3.
- 2.1.5. Anchors are 2100 Kg each.
- 2.1.6. Chain locker drain piping is 2 inch diameter schedule 40.

2.2 Standards

2.2.1

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

2.4.13 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- 3.1.1** The Contractor shall remove the Port and Starboard anchors and anchor chains from the vessel under the supervision of the vessel's Chief Officer and lower from ship to wharf by contractor supplied crane. The Contractor shall flake out the chains on the wharf or dock to allow for the work required and inspection by Lloyd's Surveyor.
- 3.1.2** The Contractor shall disconnect the "bitter end" of each anchor chain. The bitter ends are located in the Bosun's store and the engineer's room store port and stbd. respectively. The contractor shall disconnect the anchors from the chains and flake the Port and Stbd Anchor chains on the dock/wharf for cleaning and inspection. The chains are 220m in length each x 36 mm grade U3. Anchors are 2100 Kg each.
- 3.1.3** The Contractor shall de-scale port and starboard anchor chains, after de-scaling, the anchors and chains shall be inspected by a Lloyd's Surveyor and the Chief Officer. There shall be 20 measurements taken on each chain for a total of 40 measurements. The measurements shall be typed written in tabature form and a copy given to the Chief Officer. Prior to start of measurements, the Chief Officer shall be informed. The Chief Officer will determine where chain measurements shall be taken.
- 3.1.4** The contractor shall take measurements of both chains to determine chain wear down. Measurements of the chain will be taken in two places diametrical opposite of each other, their totals added and divided by 2 to obtain the diameter of the chain.
- 3.1.5** Then paint the chains bare areas with two coats of contractor supplied International add interprime red 3.5 mil DFT and two coats of interlac black CL 3.5 mil DFT to all chains.
- 3.1.6** Any defects found in the anchors or chain shall be immediately brought to the attention of the Chief Engineer. Six random links of chain shall be measured at the throat to check amount of wastage/wear. Original diameter of chain 36 mm grade U3. A typewritten copy of measurements is to be given to the Owner's Representative.
- 3.1.7** The Contractor shall change chains end for end, mark chains at every shot (27.432 M) with stainless steel wire and paint with white anti-corrosive paint the correct number of chain links either side of the wire to indicate the number of shots, starting from the anchor to the bitter end. Consult owner's representative for correct marking sequence.
- 3.1.8** The Contractor shall de-scale both anchors, bare areas apply two coats of contractor supplied International interprime red 3.5 mil DFT and two coats of contractor supplied inter-sheen black, 3.5 mil DFT, to total surface area of both anchors.
- 3.1.9** The Contractor shall open up both the port and stbd chain lockers for inspection and cleaning. The Contractor shall remove the false bottoms in each chain locker and prepare the chain locker for Lloyd's Inspection and inspection by the Chief Engineer. Contractor shall clean both chain lockers including false bottoms using wire brush. Contractor shall dispose of all debris and rust as per the provincial environmental regulations.
- 3.1.10** Port and stbd Chain lockers, Contractor shall quote on cleaning 100 m² and provide unit cost for cleaning per m². Any rust areas and/or bare areas in the tank are to be surface prepared,

as per the coating manufacturer's specifications. The Contractor shall bid on repairing 25m2 of tank coating and shall provide unit cost per m2 for repair Bare areas apply two coats of interprime red 3.5 mil DFT and two coats of interlac black CL 3.5 mil DFT, to total surface area of both chain lockers 100m2.

- 3.1.11 The Contractor shall ensure that all bilge suction lines from the chain locker are proven clear and pump proven operational.
- 3.1.12 The Contractor shall reinstall the false bottoms in the chain locker and re-connect the anchor and chain (ensure pin on shackle secured with lead plug.) Bitter end is to be reconnected at respective positions onboard the ship and chain stowed in chain lockers.
- 3.1.13 Use of shipboard equipment to store anchor is to be carried out by Ship's Crew only. Contractor is to contact the Chief Engineer when anchors are to be lifted aboard.
- 3.1.14 All work is to be to the satisfaction of the Chief Engineer and Lloyd's Surveyor.
- 3.1.15 Lloyd's Surveyor and Chief Engineer shall witness testing.

3.6 Location:

- a. **Chain lockers – FR 88-91.**

3.7 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

- 4.1.1. The contractor shall insure that the Chains and chain locker are inspected by Lloyd's Surveyor
- 4.1.2. All work shall be completed to the satisfaction of the Chief Engineer.

4.2 Testing N/A

4.3 Certification N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 Three hard copies of refit reports of all items carried out in this refit specification will be supplied to Chief Engineer.

5.2 Spares
N/A

5.3 Training
N/A

5.4 Manuals
N/A

HD-25 Bow Thruster Bilge Painting

Spec item #: HD-25	SPECIFICATION	LLOYDS #
HD-25 Bow Thruster Bilge Painting		

Part 1: SCOPE:

- 1.1 The Contractor shall provide the necessary services and equipment to clean and prepare and paint the Bowthruster compartment bilge area.

Part 2: REFERENCES:

- 2.1 This specification shall be carried out in conjunction with following items:

2.1.1. E-01 Bow Thruster Inspection

- 2.2 Guidance Drawings/Nameplate Data

2.1.1. Structural Sections FRS 67-99 Drawing # 590-03

2.1.2. Bow Structure Drawing # 590-27

- 2.3 Standards

2.1.1. Canadian Coast Guard Fleet Safety Manual (DFO 5737)

2.1.2. Coast Guard ISM Lockout/Tagout

2.1.3. Coast Guard ISM Hotwork procedures

2.1.4. Coast Guard Enclosed Space Working procedures

- 2.4 Regulations

2.3.1

- 2.5 Owner Furnished Equipment

2.4.14 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

- 3.1 General

- 3.1.1** The contractor shall be responsible for the removal of all grated decking in the area and tagging to ensure proper reinstallation.
- 3.1.2** The contractor shall be responsible for cleaning, preparing and coating all areas of the bow thruster compartment beneath deck plating level as well as the complete area of Bowthruster tunnel inside the space.
- 3.1.3** The contractor shall assume and approximate total surface area of 115m² for this specification. Contractor shall verify area and any discrepancies shall be discussed with Chief Engineer and dealt with PWGSC 1379.
- 3.1.4** All areas of bilge, ships side, piping, machinery seats, deck plate framing and all other structure beneath level of deck plates shall be thoroughly degreased with solvent cleaner and high pressure washed to SSPC-SP-1 standard. Contractor to quote unit cost per square foot for cleaning and degreasing for adjustment purposes.
- 3.1.5** On completion of general cleaning, steel replacement and degreasing as defined above, all areas of failing coating, scale and bare steel shall be power tool cleaned to SSPC-SP-3 standard. All loose paint, scale and rust shall be removed. Contractor shall assume 90% of area shall require power tool cleaning to bare steel.
- 3.1.6** The contractor shall quote separately a unit cost per square meter for power tool cleaning to bare steel. All areas of intact coating shall be further prepared by grinding or buffing to achieve necessary surface profile for adhesion of new coating system.
- 3.1.7** All work areas shall be adequately ventilated to exterior of ship to prevent dust from surface prep from migrating to other areas within machinery space and/or contaminating machinery in the space.
- 3.1.8** All fluids and debris from cleaning effort shall be removed and disposed of in accordance with provincial environmental regulations.
- 3.1.9** All valve bonnets shall be wrapped and taped with suitable protective material.
- 3.1.10** All electrical cabling identification tagging shall be taped.
- 3.1.11** The contractor shall ensure that all equipment including Bowthruster motor, Bowthruster Controls, Electrical Panels and Boxes, FM200 equipment, be completely sealed and protected from ingress of any dust or debris from cleaning and coating prep effort. Contractor shall also cover ships side expanded metal above the bilge area to the best of their ability. Any debris that finds its way into equipment shall be cleaned at the contractor's expense.
- 3.1.12** All areas shall be coated with two coats of International Interbond 808, each coat of contrasting colour, and one top coat of International Interthane 990. Top coat must be applied to Interbond within specific time period as specified by manufacturer for proper adhesion. Final coat shall be light grey in colour.

- 3.1.13** Contractor to quote unit cost per square meter for coating as described above for adjustment purposes.
- 3.1.14** The contractor shall remove all taping and other protective materials upon completion of the coating cure time.
- 3.1.15** Means of paint application shall be via airless spray and over spray shall be limited and contained. Any over spray on structure or machinery above deck plate level shall be top coated to original colour scheme.
- 3.1.16** The contractor is responsible for the reinstallation of all grated decking on completion of the described work.

3.8 Location:

- a. Bowthruster Compartment1 Frs 82-91**

3.9 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.**

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

- 4.1.5.** All work shall be inspected by Chief Engineer.
- 4.1.6.** All work shall be completed to the satisfaction of the Chief Engineer.

4.2 Testing

N/A

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

- 5.1.1** Contractor to supply two typed copies and one electronic copy of report to Chief Engineer.

5.2 Spares

N/A

5.3 Training
N/A

5.4 Manuals
N/A

HD-26 Hull Repair Stbd Aft Quarter

Spec item #: HD-26	SPECIFICATION	LLOYDS #
--------------------	---------------	----------

HD-26 Hull Repair on Stbd Aft Quarter

1.0 HULL REPAIRS

1.1 Identification

1.1.1 The purpose of this specification item is to conduct repairs to the hull plate on the stbd side aft of the vessel

1.1.2 This work is to be carried out in conjunction with HD-01 Dry-Docking, HD-02 Underwater Hull Inspections, HD-06 Underwater Hull Painting, HD-07 Hull Painting Above Ice Belt, HD-08 Hull Butts & Seams, HD-16 Water Ballast Tanks,

1.2 References

Contractor to refer to Scope of Work from Poseidon Marine in Appendix A

1.2.1 Equipment Data

1.2.1.1 The areas specified for hull replacement are all Grade “E” Lloyds plate. All repairs are to be conducted with Lloyd’s approved Grade “E” plate with thickness determined in accordance with 590-01 Shell Expansion drawing.

1.2.2 Drawings

1.2.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Drawing Number	DRAWING TITLE	Number of Sheets
590-70	General Arrangement	2
590-04	Profile & Deck	2
590-01	Shell Expansion	1
590-18	Stringer Plan	1

HD-26 Hull Repair Stbd Aft Quarter

590-77	Insulation Plan	3
590-78	Fire Zone Plan	1
590-79	Capacity Plan	1
590-91	Painting Schedule	2
590-96	Docking Plan	1
2014-VLE-01	Shell Expansion-VLE Renewals	1

1.2.3 Regulations and Standards

1.2.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Provincial Regulation or Standard:

FSSM Procedures Title Included Yes/No

Ship Specific Vessel Specific - Asbestos Risk Assessment Report and Management Plan

Ship Specific Vessel Specific – Lead Paint Test Report

Publications

TP 14231 Marine Occupational Health and Safety Program

CSA W47.1 Certification of Companies for Fusion Welding of Steel Structures
Division 2 Certification

CSA W59 Welded Steel Construction – Metal Arc Welding

ISO 9712:2005 International Standards for NDT

CT-043-EQ-EG-001 Welding Specification

Regulations

MOHS Maritime Occupational Health and Safety

CSA Canada Shipping Act

Hull Regs. HULL INSPECTION REGULATIONS (C.R.C., C. 1432)

Canada Labour Code Canada Labour Code (R.S.C., 1985, c. L-2)

Lloyd's Register (LR) Rules & Regulations for the classification of ships.

1.3 Statement of Work

1.3.1 The Contractor must provide copies of certification under CSA W47.1 (Fusion Welding of Steel Structures Division 2) in accordance with the Documentation section of the General Notes. Welding conducted must be in accordance with CSA W59 (Welded Steel Construction – Metal Arc Welding)

1.3.2 Prior to conducting any repairs to the hull and structure in the vicinity of the Steering Gear Compartment, the Contractor must establish a datum for the rudder stock alignment. The Coast Guard Technical Authority Chief Engineer and Lloyd surveyor must be afforded the opportunity to witness the Datum alignment check.

1.3.3 The Contractor must conduct the welding operations in such a way as to mitigate locked in stresses and to prevent general large scale deformity due to stress. The Contractor's welding plans must clearly demonstrate these mitigations.

1.3.4 The Contractor must provide to the Chief Engineer and Lloyd's copies of all plate certification in accordance with the Documentation section of the General Notes.

1.3.5 Contractor to refer to Scope of Work from Poseidon Marine in Appendix A

1.3.2 General Requirements

1.3.1 Contractor shall supply all material and services necessary to carry out repairs/renewals and additions.

1.3.2 Contractor shall provide cut-outs for access where required, i.e. both removal and refitting.

1.3.3 Contractor shall provide for removal of scale, mud, coating adjacent to areas to be cut either for access, removal or renewal (including fairing of adjacent structure).

1.3.4 Contractor shall provide protection of adjacent areas, especially in coated tanks, accommodations (furniture, paneling and flooring) and any storage areas or machinery rooms. Any damages to adjacent steelwork and/or coatings done during repairs, to be rectified by the Contractor to the Contractor's account, to the satisfaction of the Chief Engineer.

1.3.5 Handling of all materials and equipment to and from the vessel.

1.3.6 Contractor to remove approximately 2000 liters of aviation fuel from Av Gas tank and certify safe for hot work for adjacent hull repair. Contractor to provide unit price for removal of Aviation fuel to be adjusted by 1379.

1.3.7 Removal and disposal of oil residues, sludge, scale, old steel replaced and debris, this to include cleaning after repairs. To be disposed of as per provincial regulations.

1.3.8 All new steel to be grit blasted to SSPC-SP10 and coated in accordance with (Paint Specification).

1.3.9 Disturbed steelwork also to be surface prepared and coated as per specification.

1.3.10 Fire watches in way of repair and adjacent areas affected to have proper fire watches as per provincial regulations.

1.3.11 NDT requirements in accordance with CT-043-EQ-EG-001 Welding Specification

1.3.12 Pressure tests and/or hose tests. This to include any retests.

1.3.13 Contractor shall supply all new plating shall be LR Grade 'E' mild steel plate, or equivalent (235 N/mm² Yield Strength, 400 – 502 N/mm² Tensile Strength, 22% Elongation). In addition to the specified area, Contractors shall bid a unit rate per square meter to supply steel plating for PWGSC adjustment purposes.

1.3.14 Contractor shall quote an all in price for the increase and decrease of scope of work on a per square meter basis for each individual strake identified in this specification. This will be used to adjust the price up or down as necessary

1.3.15 Contractor quote shall be inclusive of all services including staging, lighting, ventilation, disposal, removal and re-installation or replacement with equivalent of all interferences to undertake the cropping and replacement of the plating and stiffeners identified within this specification.

1.3.3 General notes regarding steel renewal work

- 1.3.1 All steel used for “in-situ” repairs to be supplied onboard, blasted and primed. After fitting, these repairs to be coated in accordance with specification.
- 1.3.2 When coatings are found damaged after final welding has been carried out, the damaged area shall be surface prepared, adjacent coatings feathered and coatings applied in accordance with original specification.
- 1.3.3 Steel work is to be repaired or renewed as stated in this specification. The dimensions indicated can be used for estimating purposes.
- 1.3.4 Prior to any work being carried out, the repairs must be “lined off” on board and subsequently approved by Chief Engineer and Lloyd’s surveyor.
- 1.3.5 Where defective steelwork is removed, the resultant edges shall be ground smooth and edge prepared in accordance with welding detail necessary for subsequent renewals.
- 1.3.6 Where plating only is removed, the remaining edges of internals shall be ground smooth prior to the new plating being fitted.
- 1.3.7 Where internals only are removed, the plating in way of the removed internals shall be ground smooth prior to new internals being fitted.
- 1.3.8 Any damages caused by removal of plating and or/internals shall be repaired to the satisfaction of the Chief Engineer and Lloyd’s prior to any new steelwork being fitted.
- 1.3.9 Any temporary steelwork inside tanks, etc., such as lifting lugs or staging pieces, need only be cropped at welds, but remaining weld shall be well rounded. Such temporary steelwork on external areas shall be ground flush and any scars repaired by welding/grinding.
- 1.3.10 In general all fairing aids shall be removed. Removal of temporary pieces shall be by gas cutting and remains ground flush – they must not be hammered off.
- 1.3.11 When coatings are found damaged after final welding or in way of temporary steelwork removal has been carried out, the damaged area shall be surface prepared, adjacent coatings feathered and coatings applied in accordance with specification.
- 1.3.12 New steel shall be fitted and faired, with due care to ensure proper alignment, i.e., moulded lines in general to be maintained. The TA and Lloyd’s surveyor shall witness “fit-up” condition prior to any production welding being carried out.
- 1.3.13 All welding shall be in accordance with CT-043-EQ-EG-001 Welding Specification and Lloyd’s requirements. Approved electrodes shall be used throughout

repairs/renewals, together with agreed welding procedures. Where high tensile steel is being fitted, pre-heating shall be carried out prior to welding, as per CT-043-EQ-EG-001 Welding Specification requirements. Approved low-hydrogen electrodes must be used; these shall be kept in heat ovens adjacent to the work site.

1.3.14 All butt welding shall be continuous full penetration welding, welded from both sides with the edges of plates being welded have firstly been properly edge prepared. The Chief Engineer and Lloyd's surveyor to inspect the condition of all back gouging prior to final welding.

1.3.15 In general, fillet welding shall be double continuous welding Care shall be taken to ensure all welding is returned in way of plate thicknesses at slots, scallops, brackets, etc.

1.3.16 The Contractor's welding sequence is to be submitted for approval to the Lloyd's Surveyor and Chief Engineer. All welding practices and sequences to be carried out with due care to minimize built-in welding stresses.

1.3.17 Where horizontal members are repaired by fitting inserts, the top weld reinforcement shall be ground flush. Where inserts are fitted in way of original access/drainage holes, these holes shall be reinstated.

1.3.18 Edges of all openings, holes, slots, etc., cut during renewals shall be ground smooth with no serrations remaining.

1.3.19 After completion of all steelwork, repairs shall be inspected by Lloyd's Surveyor and Chief Engineer and any defects found repaired to their satisfaction. After completion of repairs, where applicable, the area shall be coated in accordance with the coating specification and/or as detailed in repair specification whichever applies.

1.3.20 The Contractor shall mark out on the hull recommended final cut-lines and the Technical Authority will be afforded opportunity to witness cut lines before work commences.

1.3.9 Welding Requirements

1.3.9.1 The Contractor must have or obtain Lloyd's Class Surveyor and approved weld procedures for all welding conducted. Copies of all approved weld procedures must be provided to the Lloyd's Class Surveyor and Chief Engineer in accordance with the Documentation Section of the General Notes. Welding procedures found under CT-043-EQ-EG-001 Welding Specification may be used; however the Contractor must

indicate to the Lloyd's Class Surveyor and Chief Engineer which procedures are being used for which repairs.

1.3.9.2 The Contractor must provide a repair plan for the overall scope of work and afford Lloyd's Class Surveyor an opportunity to approve the plan. A contingency for additional work must be incorporated into the plan.

1.3.9.3 The Contractor must prepare the steel plate in accordance with the requirements of Lloyd's Class Surveyor and CT-043-EQ-EG-001 Welding Specification. In the event of any conflict between the two requirements, Lloyd's Class Surveyor is to take precedence. This includes but is not limited to plate edge preparation, plate blasting, and priming of the plate prior to installation.

1.3.10 Weld Inspections

1.3.10.1 The Contractor must conduct weld inspections in accordance with the CCG Standard CT-043-EQ-EG-001 Welding Specification. This includes both visual and NDT methods.

1.3.10.2 Welds are to be NDT tested by a certified person in accordance with the requirements of CCG Standard CT-043-EQ-EG-001 Welding Specification and ISO 9712:2005 International Standards for NDT. Copies of the NDT technician qualifications must be provided to the Lloyd's Class Surveyor and Chief Engineer in accordance with the Documentation section of the General Notes.

1.3.11 Hull Plating and Structure Known Work

1.3.11.1 The Contractor must remove and replace with new Contractor Supplied Material, the hull plating identified within this specification.

1.3.11.2 The Contractor must inspect the structure in the areas of Hull Plating Known work. Any damage to structure found in these areas not specified must be reported to the Lloyd's Class Surveyor and Chief Engineer. Any repairs made to the structure are to be covered by the Additional Work procedures and must meet the requirements for welding specified.

1.3.12 Item 1 – Shell Plate

1.3.12.1 The Contractor must replace the 9 mm plating in the area between frame 4 and frame 6, just aft of the furthest port porthole.

1.3.12.2 The area affected by these repairs includes the structure in way of the Av Gas Cofferdam, and Aft Port Cabin #5 Main Deck.

1.3.12.3 Estimated plating: Qty: 1 x 2000 x 1000 mm x 14mm, Lloyd's Grade 'E'.

1.3.12.4 There are two dented sections in this area. The removed plating shall encompass these damaged areas, and steel is to be cut back to stress free area.

1.3.12.5 Prior to conducting any cutting or welding the AV gas cofferdam must be certified gas free and safe for welding.

1.3.12.6 In the area affected by these repairs in the way of the crew cabin the Contractor to bid on stripping out crew cabin and re-installing items listed after work is completed , items consists of:

1.3.12.7 Contractor shall take down 6 to 8 feet of paneling to gain access to plating from inside cabin. Then bid on removing 2m squared insulation on the bulkhead and bid per one meter square for adjustment purposes.

1.3.12.8 Insulation to be replaced with new marine grade rock wool 50mm thick and aluminum on one side contractor bid on supplying 2m squared and bid per one meter square for adjustment purposes.

1.3.12.9 Carpet in this room shall be protected during the repair process.

1.3.12.10 Note contractor has to protect this room from damage during the work period this means physical damage, damage due to the area not being protected from the elements outside meaning rain, snow low temperatures causing freezing that may rupture water piping.

1.3.12.11 Once work is completed and insulation reinstalled, panels to be replaced and room put back to original shape.

1.3.13 Coatings

1.3.13.1 The Contractor must coordinate this specification with HD-06 Underwater Hull Painting, HD-07 Hull Painting Above Ice Belt for exterior painting of the described sections.

1.3.13.2 The interior section of the new insert shall be given two coats of marine grade primer.

1.3.13.3

1.4 Proof of Performance

1.4.1 Inspection points

1.4.1.1 The Contractor must afford the Lloyd's Class surveyor and Chief Engineer an opportunity to witness all tank testing.

1.4.2 Testing/Trials

1.4.2.1 The Contractor must conduct NDT testing on welds in accordance with Lloyd's Class surveyor requirements and the CCG Standard CT-043-EQ-EG-001 Welding Specification. All results must be provided to the Lloyd's Class surveyor and Chief Engineer in accordance with the Documentation section of the general notes.

1.4.2.2 The Contractor must conduct testing on tanks affected by repair work in conjunction with the Tank Survey specification. The Contractor must afford Lloyd's Class Surveyor and Chief Engineer an opportunity to witness testing for the purpose of receiving a survey credit as part of the Vessel's Continuous Periodic Inspection Program.

1.4.3 Certification

1.4.3.1 The Contractor must provide a copy of the mill certificate for each plate used for repairs in accordance with the Documentation section of the General Notes.

1.4.3.2 The Contractor must provide a marked up shell expansion view indicating location of plates used in reference to location on vessel and applicable mill certificate.

1.4.3.3 The Contractor must provide copies of all company or individual welding certificates indicating compliance with CSA regulations referenced. All certificates must be provided to the Lloyd's Class Surveyor and Chief Engineer in accordance with the Documentation section of the General Notes.

1.4.3.4 All hot work carried out as per provincial regulations all hot work permits supply.

1.4.3.5 Enclosed spaces have to have the confined spaces permit copies approved by a certified chemist or qualify person.

1.4.3.6 The Contractor must provide copies of the NDT technician's or company's certification in reference to ISO 9712:2005 International Standards for NDT.

1.4.4 Documentation

1.4.4.1 The Contractor must submit to the Lloyd's Class surveyor and Chief Engineer a report of all NDT test results in accordance with the Documentation section of the General Notes.

1.4.4.2 The Contractor must provide copies of all approved welding procedures in accordance with the Documentation section of the General Notes.

1.4.4.3 Drawing indicating location of all plate used with its corresponding mill certificate number in accordance with the Drawings section of the General Notes.

1.4.4.4 Contractor to supply three written and one electronic copy of all work completed in this specification also to include all certification for welders, mill certificates for all material and the location they were used, NDT Technicians and any other certifications mention in this specification.

1.4.5 Training – Not Used

Spec item #: HD-27	SPECIFICATION	LLOYDS #
HD-27 Funnel Structure Repair		

Part 1: SCOPE:

1.1 The intent of this specification shall be for the contractor to renew a section of corroded steel in way of the vessel's Funnel Deck, crop the corroded aluminum stiffeners under the louvers on the port and stbd side and repair corroded aluminum plating on the funnel structure, stbd side.

NOTE: The extent of renewals as reflected in this specification is subject to approval by Lloyds.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- 2.1.1** CCG Dwg. No. 590-13 (Wheelhouse and Funnel Structure)
 CCG Dwg. No. 590-77 Insulation Plan
 Poseidon Marine Scope of Work, Appendix B

2.2 Standards

- 2.2.1** Contractor must adhere to the vessels ISM Hot Work, Confined Space, Lock-Out and Fall Protection procedures.

2.3 Regulations

- 2.3.1** Welding shall be in accordance with the Canadian Coast Guard Welding Specifications for ferrous Materials, Rev. 4 (TP6151E).
2.3.2 Contractor performing the welding shall be certified by the Canadian Welding Bureau (CWB) at the time this work is performed..

2.4 Owner Furnished Equipment

- 2.4.1** The contractor shall supply all materials, equipment, labor, and parts required to perform the specified work unless otherwise stated.

2.5 General Requirements.

- 2.5.1** Acceptance of the work.

2.5.2 All work shall be completed to the satisfaction of CCG and Lloyds.

2.5.3 The Contractor shall provide appropriate steel/aluminum certificates and welding procedures to Lloyds, in accordance with the criteria listed below. The Contractor shall establish critical milestones at which the work may be inspected.

2.5.4 The Contractor must provide to the Chief Engineer and Lloyd's copies of all plate certification in accordance with the Documentation section of the General Notes.

2.5.5

Contractor to bid on repairing 130 ft² of funnel deck plating. Contractor to supply unit price per square meter to be adjusted up or down by 1379.

2.5.6 Contractor to bid on repairing 0.25 square meters of aluminum plating and supply unit cost for repairing additional plating per 0.25 square meters.

2.5.7 Contractor quote shall be inclusive of all services including staging, lighting, ventilation, disposal, removal and re-installation or replacement with equivalent of all interferences to undertake the cropping and replacement of the plating and stiffeners identified within this specification.

2.5.8 When coatings are found damaged after final welding has been carried out, the damaged area shall be surface prepared, adjacent coatings feathered and coatings applied in accordance with original specification.

2.6. Materials & Welding.

2.6.1 Unless otherwise specified, all new plating shall be provided with appropriate certification,

owing to the grade of steel required for each renewal. Unless noted otherwise, all new steel plating shall be Lloyd's Register Grade 'A' or approved equivalent.

2.6.2 Unless otherwise specified, all aluminum plate to be 5086 or equal.

2.6.3 Execution of the work.

2.6.3.1 In general, the Contractor shall progress repairs in a manner that:

- Regards prevailing and forecasted weather conditions, such that CCG property and equipment is suitably sheltered where applicable.
 - does not compromise the structural integrity of the vessel.

- enables periodic and systematic inspections of ongoing and completed work by CCG and Lloyds.

2.6.3.2 In preparation for steel renewals, the Contractor shall:

- provide all ancillary services necessary to complete the subject repair. These may include, but are not limited to strip out, craneage, staging, cleaning, debris removal, water, shore power, etc.
- remove any furnishings, fittings, fixtures, linings, deck coverings, etc. as required to complete cropping and renewal of steelwork.
- provide all appropriate permits or other documentation for entrance into and completion of welding in confined spaces or at height.
- ensure new steel is shot blasted and coated with weldable primer prior to placement onboard.

2.6.3.3 Prior to any work being carried out, the repairs must be "lined off" on board and subsequently approved by Chief Engineer and Lloyd's surveyor.

2.6.3.4 Contractor to remove the insulation on top of the funnel deck plating. The insulation is 45mm Cafco Type "C" A60.

2.6.3.5 Contractor to remove and protect interference items in the areas below the funnel deck plating. The areas will include the Electronics Room, Main stairwell and Bridge wash room. Special care is to be taken to protect the wiring and cabling in the affected area of the Electronics Room.

2.6.3.6 During the completion of hot work, the Contractor shall:

- supply fire watch while hot work is ongoing, with appropriate class portable fire extinguisher and charged fire hose ready for use.
- utilize existing seams/butts as practical when completing plate renewals.
- ensure new seams maintain a minimum parallel separation of 100mm from nearest internal stiffening.
- ensure existing adjacent seam welds are released appropriately over a minimum distance of 4".
- subject work to inspection as coordinated with CCG and Lloyds personnel.

2.6.3.7 Following the completion of hot work in specific areas of the vessel, the Contractor

_____ shall:

- complete ND testing and subject work to final inspections by CCG and Lloyds.
- subject to the requirements of the attending Lloyds surveyor, new seams shall be subjected to 100% UT testing, while all tee connections shall be subjected to 100% MPI.
- clean affected spaces and remove debris from vessel.
- clean and apply primer to welded seams and other disturbed areas. Apply internal and external coatings as directed by CCG personnel.

2.6.3.8 Contractor to renew the insulation on the funnel deck plating with 45mm Cafco Type "C" A60 insulation or equivalent based on approval by the Chief Engineer and Lloyds.

Part 3: TECHNICAL DESCRIPTION:

3.1 Scope of Renewals.

3.1.1 Renewal of Funnel Deck plate, aluminum stiffeners and repair of aluminum plating on the stbd side shall be completed in the regions identified in the Poseidon Scope of Work.

Areas and offsets indicated are approximate and shall be confirmed onsite by Contractor prior to renewal, in conjunction with CCG, their designate & Lloyds.

See **Annex B** for sketches relevant to areas subject to renewal.

Note: Indicated steel grade is based on equivalency with referenced vessel drawings.

3.2 Funnel Deck Area

See Appendix "B", Poseidon Scope of Work

3.3 Aluminum Bulkhead Stiffeners

3.3.1 The Contractor shall crop and renew the outboard most bulkhead vertical stiffeners located below the louvers on the port and stbd sides.

3.3.2 The subject stiffeners is located in a narrow space between the bottom of the louvers and the funnel deck.

3.3.3 Final extent of renewal and weld procedure will be subject to approval by the attending Lloyd's surveyor.

3.4 Aluminum Plating Repair

See Appendix “B”, Poseidon Scope of Work

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. All work shall be completed to the satisfaction of Chief Engineer and Lloyds.

4.2 Testing

4.2.1 Complete ND testing and subject work to final inspections by CCG and TCMS.

4.2.2 Subject to the requirements of the attending Lloyds surveyor, new seams shall be subjected to 100% UT testing, while all tee connections shall be subjected to 100% MPI.

4.3 Certification

4.2.1 Contractor performing the welding shall be certified by the Canadian Welding Bureau (CWB) at the time this work is performed.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 Contractor to supply Chief Engineer with both a typed and electronic copy of all work carried out in the specification.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals

N/A

Spec item #: E-01	SPECIFICATION	LLOYDS #
E-01 Bow Thruster Survey		

Part 1: SCOPE:

- 1.1 The intent of this specification is to carry out manufacture recommended maintenance and 5 year Survey of the vessels transverse Bowthruster unit
- 1.2 Contractor to change out all seals and bearings and change oil.
- 1.3 Contractor shall supply a certified Ulstein Field Service Representative (FSR) to supervise the overhaul and record all wear measurements. Contractor shall include in the bid costs an allowance of \$10,000.00 for FSR labour, travel and accommodations.
- 1.4 Contractor shall adhere to manufacture's specifications for all test and work carried out.
- 1.5 A visual inspection of Bow Thruster unit shall be carried out by Chief Engineer and Lloyd's Surveyor.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- 2.1.1. Ulstein type 90 TV-A, Plant No.T
- 2.1.2. Service and Instruction manual, parts list, & Drawings all on board vessel for successful bidder. Manual 12 Chief Engineers Cabin

Hydraulic Thruster Make and type

Ulstein type 90 TV-A, Plant No. T 972
 Four blades Variable Pitch @ 390 R.P.M.
 Drawing No. 62200 P00087-Y
 Electric drive motor:
 Siemens type 1RA6 310-4SB98-2, IEC315S 1MV1, 1984
 31097401/1
 440 V.A.C., 310 Amps, 1800 R.P.M.
 Full Load Eff. = 250 h.p.
 Oil type and quantity for Gearbox and Propeller hub:
 Ultima EP-150
 Quantity 150 Liters

2.2 Standards

2.2.1

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

2.4.15 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

2.4.16 Owner will supply all bearings and seals

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.95 Contractor shall remove the transverse tunnel grids to gain access to the unit and the contractor shall re-install them on after completion of all work and operational testing of blades is confirmed.

3.1.96 Contractor shall drain system oil and dispose of as per the provincial regulations.

3.1.97 Contractor to remove electrical motor in bow thruster compartment to gain access to the hold down bolts for the hydraulic unit.

3.1.98 Contractor support the thrust unit in the tunnel and then un bolt unit. When unit has been dis connected under the supervision of the FSR then Contractor is to bring complete unit to their facilities’.

3.1.99 Contractor under supervision of the Field Service Representative (FSR) disassemble the unit and arrange for inspection by Lloyd’s Surveyor and the Chief Engineer.

3.1.100 Contractor under supervision of a FSR is to overhaul the unit and replace all seals and bearings.

3.1.101 Contractor on completion off overhauling unit, Contractor to re-install unit following steps in reverse under the supervision of the FSR.

3.1.102 Contractor to installed drain plug with new seal and secured drain plug from coming loose due to vibration.

3.1.103 Contractor shall refill the complete oil system with new Ultima EP-150 oil that is heated filtered with 3 micron absolute filtration and as per manufacturer’s recommendations.

3.1.104 After re-assembly and re-installation of the thruster gear unit the Contractor shall have Lloyd’s Surveyor and the Chief Engineer to witness the blade operation to full pitch port and starboard checking for leaks and bleeding any entrapped air

3.1.105 All work shall be to the satisfaction of the Chief Engineer

3.18 Location:

- a.** Electric drive motor is located forward Bow Thruster Compartment
- b.** Bow Thruster hydraulic gear unit is located in transverse thruster tunnel Frame No.83-85.

3.19 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

- 4.1.18. 100% visual By Chief Engineer and Lloyd's Surveyor.
- 4.1.19. All work to be inspected by Lloyd's Surveyor and Chief Engineer.
- 4.1.20. Contractor shall arrange scheduling of inspections, trials and tests with Lloyd's Surveyors and Chief Engineer.
- 4.1.21. All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyd's Surveyor.

4.2 Testing

- 4.2.1. After re-assembly and re-installation of the thruster gear unit the contractor shall have the classification societies and the Chief Engineer to witness the blade operation to full pitch port and starboard checking for leaks and bleeding any entrapped.
- 4.2.2. Sea trials: Bow Thruster to be tested at various pitch angles and full pitch port and starboard while vessel is in operation.
- 4.2.3. Contractor to carry out a function test to the satisfaction of the Chief Engineer and the attending Lloyd's Surveyor.

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

- 5.1.1 The Contractor shall supply the Chief Engineer with two typed copies and one electronic of the FSR report off overhaul / work report which shall include all wear measurements, clearances and operational tolerances for comparison.
- 5.1.2 Contractor shall also include a list of all new parts fitted including their corresponding position / part numbers and quantities.

5.2 Spares
N/A

5.3 Training
N/A

5.4 Manuals
N/A

E-02 Port and Stbd Clutch Survey/Overhaul

Spec item #: E-02	SPECIFICATION	LLOYDS #
E-02 Port and Stbd Clutch Survey/Overhaul		

Part 1: SCOPE:

- 1.1 The Intent of this specification shall be to carry out a scheduled 5 year survey required by Lloyd's classification societies. Remove the clutch from the main engine and dismantle it in entirety and check all component wear. Re-build clutch and install unit back on engine. To record axial and radial run out and alignment measurements before and upon completion of work for comparison to the manufacturer's specifications. Conduct dockside and sea trials.
- 1.2 Contractor shall supply a Rexroth Field Service Representative (FSR) Kevin Sanford phone number 902-468-4500 to supervise the overhaul and record all wear measurements. Contractor shall include \$10,000 allowance in the bid costs for FSR labour, travel and accommodations. Contractor shall have the FSR prepare 2 copies of work report with all wear measurements.
- 1.3 Work should be done in Conjunction with ____ Gearbox Inspection, and Rudder, Propeller, Shaft, and Bearings.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. No. 16B Lohmann & Stolterfoht "Installation – Operation – maintenance – Including Parts and drawings (Manual 16 – Engine Room MCR)

2.1.2. Installation Drawing No. 3/1182/5007/0Clutch particulars

- i. Pneumaflex Highly Elastic Double Cone Friction Clutch.
- ii. Manufactured by Lohmann and Stolterfoht
- iii. Type and Size: KAP 240/design 1000/1251 & 125
- iv. Hardness degree of Rubber elements "W"
- v. Input speed 750 R.P.M.
- vi. Order No. 12/321 176
- vii. Weight: approx. 690 kg.

2.2 Standards

2.2.1

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

- 2.4.2** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection. Owner will supply seal kits and a set of “Spiroflex” elements and linings if required.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- The Ship’s crew will isolate and lockout control/supply air to the clutches.
- **This procedure shall be duplicated for both clutch assemblies**

- b. Contractor shall remove the guard housing and step that covers the clutch. The contractor shall remove any necessary piping, wiring, etc. to facilitate the removal of the clutch assembly.

- c. Prior to commencing and again after all the work in this specification is completed the Contractor shall record the axial and radial run out with the clutch engaged and dis-engaged. Contractor shall record the readings starting from the same point and in the same direction of rotation as per the work history data contained in the vessel’s maintenance program for comparison to check if current readings are still within the manufacturer’s tolerances. Check

condition of all magnetic pins and pickups for the clutch slippage unit, there are four pins on the input and four on the output. Check clearance between pins and pick-ups. Chief Engineer shall witness this check.

- d. Prior to uncoupling the clutch from the engine the Contractor shall check and record the thickness of all friction pad linings on the input and output sides of the clutch by following the manufacturer's detailed instructions outlined in the service manual. Minimum thickness of friction linings is 5 mm, if thickness readings of the friction linings are below the manufactures recommended value the Contractor shall replace the friction linings. The friction linings will be Owner supplied. Chief Engineer shall witness this check.
- e. The four Spiroflex elements are to be inspected visually for cracks and wear. Contractor shall also check by measuring that all elements have not reached their tensional angle of twist limitation as set out in the service manual. Maximum allowable twist 10 degrees. **NOTE: The Spiroflex elements on the port clutch shall be replaced with new owner supplied elements. The starboard elements will be re-used.**
- f. Prior to uncoupling the clutch from the engine and gearbox, the contractor shall ensure that all faces of the associated flanges and spacer plates are properly "proof" marked for subsequent reassembly and correct orientation.
- g. Contractor shall also proof" mark all coupling bolts. The sizes of the bolts are different this will save time when re- assembling. Contractor to bid on reaming of 10 holes for new fitted bolts allowing a minimum of 4 thousands off one inch per hole to be removed. And quote per one reamed hole as above.
- h. The contractor shall remove the clutch from the engine and reduction gearbox to the engine room deck plates. The clutch is to be dismantled and all components to be cleaned and inspected for wear or damage. All parts to be inspected by Lloyds Surveyor. All measurements and clearances to be checked and recorded as per the manufacturers service manual.
- i. The magnetic pins (8) four on the input side and four on the output side for the clutch slippage unit are to be checked and any damaged or missing pins shall be replaced. Contractor shall check clearance between magnetic pick ups (2) and all magnetic pins and adjust to within service manual tolerances.

- j. Contractor shall re-build the clutch with all new seals, o-rings, clutch linings and gaskets.
- k. Upon completion of reassembly of the clutch pack, the contractor is to perform an air pressure test of 100 P.S.I. on the clutch to demonstrate that all components are tight and that all seals are operating correctly. All of the testing shall be carried out in the presence of the Chief Engineer.
- l. Contractor is to re-install the clutch in good order using newly machined fitted bolts. Machined bolts shall be Contractor supplied. Once installed, the radial and axial alignment of the clutch is to be checked and recorded with the clutch engaged and disengaged. The contractor shall check the working air pressure and engagement time, making adjustments if required, as stated in the manufacturer's instruction manual. Note: Contractor is to quote on the replacement of 10 fitted bolts and provide a price per bolt to be adjusted up or down by PWGSC 1379 action.
- m. After the clutch is installed the Contractor shall check the friction cone travel at four points on the periphery to ensure equal travel of both friction cones to equalize the axial reaction forces of the pre-stressed elastic rubber ring elements "Spiroflex". Refer to page 5/6 of the service manual.
- n. All guards, as well as any disturbed piping, wiring, and metal work are to be replaced in good order upon completion of the above work.
- o. All work and testing to be carried out to the satisfaction of attending surveyors Lloyds and Chief Engineer.

3.2 Location:

3.3.1 Main Engine room

3.3 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

- 4.1.3.** 100% visual By Chief Engineer and Lloyd's Surveyor. All work shall be completed to the satisfaction of the Chief Engineer.
- 4.1.4.** All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyd's inspector

4.2 Testing

- 4.2.1.** Dock trials: Upon completion of all work, the clutch shall be tested with the engine running and clutch engaged. Contractor shall adjust slippage time for engagement if required. Contractor shall record the clutch temperature for one hour while alongside the dock taking temperature readings throughout the hour. Contractor shall use a hand held digital infra-red temperature unit to monitor temperature as there is no permanent transducer in place. Contractor shall supply proof of accuracy for the instrument.
- 4.2.2.** Sea trials: After clutch operation and temperature proves acceptable during the dock trials the vessel shall carry out a two hour sea trial with the Contractor in attendance witnessing the engine / clutch operation through various load conditions up to 100% load. Contractor shall continue to monitor and record the clutch temperature at 15 minute intervals throughout the sea trials.
- 4.2.3.** Contractor to carry out a function test to the satisfaction of the Chief Engineer and the attending Lloyd's Surveyor. Contractor shall be responsible for contacting the Lloyd's surveyor when items are ready for the inspections.

4.3 Certification

- 4.3.1** This specification is to be carried out in order to obtain Lloyd's Survey credit.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 The Contractor shall supply the Chief Engineer with two typed copies and one electronic of the Contractors overhaul / work report which shall include all wear measurements, clearances and operational tolerances for comparison, engine to gearbox alignment readings, clutch axial and radial run out readings and the clutch temperature readings log sheet with Engine R.P.M. and pitch taken during trials. Contractor shall also include a list of all new parts fitted including their corresponding position / part numbers and quantities.

5.2 Spares
N/A

5.3 Training
N/A

5.4 Manuals
N/A

E-03 Gearbox Bearing Replacement

Spec item #: E-03	SPECIFICATION	LLOYDS #
E-03 Gearbox Bearing Replacement		

Part 1: SCOPE:

- 1.1 Opening up the gearbox for inspection of all internal gearwheels and to record the gearing backlash.
- 1.2 Opening up the Mitchell thrust bearing for inspection of the thrust pads and to record the clearance ahead and astern.
- 1.3 Remove the forward and aft slide bearings and replace with new owner supplied bearings.
- 1.4 Pump out gearbox and remove residue oil.
- 1.5 Contractor shall supply a Lohmann and Stolterfoht (FSR) to supervise the overhaul and record all wear measurements. Contractor shall include in the bid costs an allowance of \$10,000.00 for FSR labour, travel and accommodations.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data/Manuals

2.1.1. Gearbox particulars

2.1.2. Manufactured by Lohmann and Stolterfoht
S/N: GVA 1250 B/1358
Order Number: 12/ 240 489
Year of Manufacture: 1984
Input Power: 2 x 1560 KW
Input Speed: 750 1/min
Ratio: 3.2632:1
Lubricating Group: HP 100

2.1.3. Related specifications: Port and Stbd Main Engine Clutches and Rudder, Propeller, Shafts and Bearings.

2.2 Standards

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

- 2.4.17 Parts / Materials / Equipment / Rigging** Contractor shall supply consumables, tools, equipment and rigging to carry out the work in this specification unless otherwise stated in the description of work. Owner will supply seal kits and bearings required.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

Prior to the commencement of the work in this spec the Contractor shall contact the Chief Engineer to lock out all associated equipment to prevent rotation including all pneumatic and electric devices.

- .1 Gearbox inspection**
 - i. Contractor must ensure that the FSR be present and supervise all work carried out by Contractor in this specification.
 - ii. Contractor shall remove all inspection covers to gain access to the gearbox internal gearing. Backlash to be recorder on all gear wheels. Lloyd's surveyor and Chief Engineer to inspect all gearing and witness backlash measurements.
 - iii. Contractor shall pump out the used oil from the gearbox and dispose of in accordance with the provincial environmental regulations. Contractor shall bid on removing 1m3 of gear oil. The Contractors shall flush gearing and gearbox with varisol to remove residue. Contractor shall flush gearbox with new oil and pumped it out again. Contractor shall supply and fill gearbox to correct operating level with Ultima EP 150 oil, approx. 1000 liters.
 - iv. Contractor shall install all inspection covers with new gasket material and torque fasteners to manufacturer's specifications.
- .2 Slide Bearing Replacement**
 - i. Contractor shall remove the forward slide bearing and Mitchell thrust bearing top covers
 - ii. The contractor is responsible for the remove all associated piping, gauges and sensors. They shall be tagged for correct re-installation.
 - iii. The contractor shall remove the existing forward and aft slide bearings and replace with Coast Guard supplied bearings.
 - iv. One bearing replacement shall be completed at a time.
 - v. The contractor shall jack up/lift the gearbox output shaft slightly to allow for the removal and installation of the lower bearing shells. Care must be taken to ensure the shaft is suitable supported when the lower bearing shells are removed.
 - vi. Bearings shells shall be lubricated with Ultima EP 150 oil before installation.
- .3 Mitchell thrust block inspection**
 - i. Contractor shall remove all associated piping, gauges and tag same for correct re-installation.

- ii. Contractor shall remove Mitchell thrust bearing top cover for inspection of thrust collar, fore and aft kidney pieces. Contractor shall record thickness of the individual kidney piece pads on the ahead and astern sides of thrust collar. Contractor shall record thrust collar to kidney piece clearances.
- iii. The Lloyd's surveyor and Chief Engineer shall inspect all components and witness all measurements and clearances..

.4 Oil Change

- i. Contractor shall supply and fill gearbox to correct operating level with Ultima EP 150 oil, approx. 1000 liters.
- ii. Contractor shall install all inspection covers with new gasket material and torque fasteners to manufacturer's specifications.

.5 Dock Trials

- i. Trials shall be conducted in conjunction with the Port and Stbd Clutch Spec, and Propulsion Shafting Spec
- ii. Contractor shall record pressures and temperatures of all components listed in this specification during the dock trials.
- iii. Contractor shall repair all leaks and defects to equipment worked on as per this specification.
- iv. Contractor shall allow 4 hours labour for dock trials. FSR shall be present for dock trials.

.6 Sea Trials

- i. Contractor shall record pressures and temperatures of all components listed in this specification during the sea trials.
- ii. Contractor shall repair all leaks and defects to equipment worked on as per this specification.
- iii. Contractor shall allow 4 hours labour for sea trials. FSR shall be present for sea trials.

3.10 Location

- a. Main Engine room

3.11 Interferences

- 3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. 100% visual By Chief Engineer and Lloyd's Surveyor.

4.1.2. All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyd's inspector

4.2 Testing

4.2.1. Dock trials and Sea Trials carried out..

4.2.3. Contractor to carry out a function test to the satisfaction of the Chief Engineer and the attending Lloyd's Surveyor.

4.2.4. Contractor shall be responsible for contacting the Lloyd's surveyor when items are ready for the inspections.

4.3 Certification

4.3.1. This specification is to be carried out in order to obtain Lloyd's Survey credit.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 The Contractor shall supply the Chief Engineer with two typed copies and one electronic of the Contractors overhaul / work report which shall include all wear measurements, clearances and operational tolerances for comparison, taken during trials.

5.1.2 Contractor shall also include a list of all new parts fitted including their corresponding position / part numbers and quantities.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

Spec item #: E-04	SPECIFICATION	LLOYDS #
E-04 : Rudder Propeller Shaft and Bearings		

Part 1: SCOPE:

- 1.1 The intent of this specification is for the Contractor to open up the following equipment and do all necessary removals to carry out the following Lloyd's inspection surveys for the tail shaft, intermediate shafting, intermediate shaft bearing, fore and aft stern tube bushings, propeller / hub and mechanism, stern tube fore and aft mechanical seals and the oil distribution box. Contractor shall unship the vessel's rudder and re-install the rudder on completion of all the work in this specification. Contractor shall conduct N.D.T. as detailed in the work description. Contractor supply labour to assistance all FSR's in this spec item.
- 1.2 This specification shall also cover draining, flushing, cleaning, inspection and filling of the controllable pitch propeller (C.P.P.) hydraulic oil system and the stern tube lubrication system.
- 1.3 This specification shall also cover dismantling; cleaning, inspection and pressure testing of the stern tube lube oil heat exchanger and the C.P.P. hydraulic oil heat exchanger. The exchangers are shell and tube type.
- 1.4 Contractor to strictly adhere to manufacturer's specifications for all work carried out in this specification.
- 1.5 Contractor shall be responsible for contacting and arranging scheduling of all Lloyd's surveys involved in carrying out the work in this specification.
- 1.6 All manuals / drawings shall be made available to successful bidder.
- 1.7 The contractor shall include in his bid an allowance of \$70,000 for FSR

Field service representative (F.S.R.)

Contractor shall supply the services of a FSR to dismantle and re-build the propeller hub and mechanism, inspect and gauge stern tube bushings, overhaul CPP Oil distribution box, removal and re-assembly of SKF shaft coupling and inspection of both the fore and aft stern tube seals. The FSR shall be responsible for all system(s) component adjustments required to bring the system within the operational functional requirements as per the manufacturer's tolerances and recommendations.

Suggested FSR :

Mr. Ron Van der Linden 902-468-1264, E-Mail: ron.vanderlinden@wartsila
Wartsila Canada Inc.

Contractor shall supply the services of a Tenfjord Steering FSR for removing and re-installation of the steering gear actuator to rudder stock lock rings. This FSR shall also inspect the rudder stock sea water seal.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Lips CPP Order No. H02185 / CP 142

Manual No. 4 Contents include instructions, assembly drawings and parts lists for shafting arrangement / propeller, hub & blades / SKF sleeve coupling / Intermediate shaft bearing and Stern tube bush(s) one each fwd and aft.

2.1.2. Tenfjord steering gear Type SR 722, SER# 15123-92,

Manual No. 9 Contents include assembly drawing for actuator to rudder lock rings / Tolerances and torque values / Instructions and parts lists

2.1.3. Stern Tube Seals

Inboard stern tube seal

John Crane – Lips Simplex type 330 MK2 C1 HSG Viton seal

Tail Shaft S.S. liner O.D. 330mm

2.1.4. Outboard stern tube seal

John Crane MN 337 Modified 335 Membrane

Manual No. 50 Includes Instructions / drawings / Parts for both seals

Tail Shaft S.S. liner O.D. 335mm

2.1.5. Tail shaft Dia. 328mm x 9486mm Long Frame No. 2 – 17/18

Intermediate shaft bearing Wausheka – Lips B.V. Order No. W03163

Weight 150 Kg. L.O. Capacity 1.5 liters Cooling Water capacity 1.1 liters

2.1.6. SKF Sleeve coupling Type OK 270HB 480 Kg. 440mm Dia x 705mm L

2.1.7. Schilling Rudder 2800mm x 2965mm

For details see Industramar Ltd. drawing No. 8321 3 sheets

Upper Thordon bearing to rudder stock diametrical clearance 1.5mm

Lower pintle to Thordon bearing diametrical clearance 1.5mm

Parts / Materials

All parts and materials shall be Contractor supply unless otherwise stated.

Drawings

Manual No. 9 Tenfjord H-6254

File No. 28 Dwg No.590-28 2/2 “Stern Tube Arrangement / Aft Bearing”

Lips Manual No. 4 Dwg. No. W006205045 “Intermediate shaft bearing”

Lips Manual No. 4 Dwg. No. W000400759-A1 “Assembly of oil distribution unit”

Lips Manual No. 4 Dwg. No. W000100627-AO Fig. No. 2 “Arrangement of shafting” {Details weights of shafting}

Shafting Layout Dwg. No. 590-31

Rudder & Stock Arrangement 590-20

Lubrication type(s) & Quantities

Stern tube Hydrex AW68 - Quantity 1600 Liters

C.P.P. Hydrex MV 32 - Quantity 1200 Liters

2.2 Standards

2.2.1

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

2.4.18 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection. This will include scaffolding is to be erected in way of propeller to allow access for the above inspections and removed upon completion of all work and rigging for pulling and installing rudder and tailshaft.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- .1** Prior to commencing any work the contractor shall perform the following.
 - i. Check and record the tail shaft run out axially and radially with a dial gauge, before and after docking vessel and prior to dismantling and subsequent re installation of all components in this specification.
 - ii. Check the tail shaft wear down with the Lloyd’s surveyor’s present.
 - iii. Check centering mark on propeller blade to centering mark on propeller hub.
 - iv. Take and record the clearance between rudder stock and thordon bush, also the lower pintle and bushing clearance and jumping collar clearance. The Lloyd’s surveyor’s to witness.
 - v. Proof mark all shafting flanges.
 - vi. Proof mark rudder stock to actuator assembly.
 - vii. Check and record thrust clearance at Mitchell thrust block.

- viii. Contractor shall remove the drain plugs from the rudder, kort nozzle and skeg and replace plugs and secure them after completion of the work in this specification.
- ix. Prior to and after all work is completed in this specification the Contractor shall verify / test with the Chief Engineer that the following temperature and alarm transducers are working correctly:
 - 1. Fore and aft stern tube bearing temperature transducers on the VTS Alarm and monitoring system in the Motor Control room.
 - 2. Alarm and temperature unit for the intermediate shaft bearing and inboard stern tube seal.
 - 3. Contractor shall take precautions to prevent damage to these transducers and associated wiring for (1) & (2) above during the work in this spec.
 - 4. Chief Engineer to witness all of the above

- .2 Prior to removal of blades, the hydraulic oil shall be drained from CPP system, contractor shall dispose of oil approx. 1200 liters as per the provincial environmental regulations. The complete oil system shall be flushed with new oil until all signs of dirt and water are removed. The CPP header tank located in the tank room stbd side upper deck shall be opened up and cleaned using lint free rags. After cleaning the header tank shall be inspected by the Chief Engineer prior to closing up with new gaskets fitted to the manholes / inspection covers. All system filters shall be renewed from vessel's inventory. System shall be filled by Contractor with new oil using a filter cart with a micron rating of 3 microns absolute. Contractor supply oil and filter cart. System shall be purged of all air and system run up to check for leaks and to prove satisfactory pitch operation to the Chief Engineer.

- .3 Prior to the removal of the tail shaft the stern tube lubrication system shall be drained and disposed of as per the provincial environmental regulations. The complete oil system shall be flushed with new oil until all signs of dirt and water are removed. The stern tube header tank located in the port side foc'sle deck shall be opened up and cleaned using lint free rags. After cleaning the header tank shall be inspected by the Chief Engineer prior to closing up with new gaskets fitted to the manholes / inspection covers. All system filters shall be renewed from vessel's inventory. System shall be filled by Contractor with new oil using a filter cart with a micron rating of 3 microns absolute. Contractor supply oil and filter cart. System shall be purged of all air and system run up to test operation and to check for leaks. Chief Engineer to witness run up.

- .4 Contractor shall remove the aft shaft seal rope guard and fit it back on after completion of all work in this specification. The rope guard is secured by welding.

- .5 Contractor shall unship the rudder to gain access for removal and re-installation of the tail shaft. Contractor with the Chief Engineer shall verify the rudder position when set amidships from the Wheelhouse steering control stand. This shall be verified again after the rudder is fitted. Contractor shall proof mark the rudder stock to steering hydraulic actuator relationship for subsequent re-installation. The steering gear actuator is secured to the rudder stock with two sets of lock rings, refer to Tenfjord steering gear manual for removal / installation of the lock rings.

After completion of all work in this spec the Contractor shall ship the rudder and secure the lock rings as per the manufacturer's procedures and torque values. The rudder palm bolts are to be hardened up and secured with locking bars welded in place and final inspection by Lloyd's shall be carried out. Contractor shall once again take all the clearances as previously mentioned in paragraph 3.1.1.

- .6** The contractor shall proof mark each set of coupling flanges at adjacent sections of all shafting including the SKF sleeve coupling for alignment prior to disassembly. The fitted bolts and nuts on each coupling are to be marked for identification purposes and the contractor is to ensure that each bolt is placed back in its original hole upon final coupling. Coupling bolts, nuts, and holes are to be cleaned and examined for wear/defects.
- .7** In conjunction with the propeller survey, the contractor shall remove the propeller tail shaft. The tail shaft is coupled to the intermediate shaft through a SKF sleeve coupling. The owner will supply the high injection pump necessary for withdrawal and installation of the coupling. The contractor shall remove the SKF coupling, strictly following the manufactures procedures and withdraw the tail shaft. Note** the pitch must be adjusted to the full astern position before dismantling the SKF coupling. The tail shaft shall be cleaned prior to inspection by Lloyd's surveyors. Contractor shall ensure the tail shaft is protected at all times from damage, deflection and corrosion due to the elements while it is unshipped. The tail shaft shall be supported at all times during removal, inspection and re-installation. Contractor shall also support the internal oil feed supply and return piping for pitch actuation at all times. This has to be accomplished as soon as the SKF sleeve coupling is released and the tail shaft is first moved back by fitting support pieces for the internal pipes and covering the opening to prevent ingress of foreign matter.
- .8** Once the tail shaft is withdrawn, the contractor shall remove the SKF coupling from the intermediate shaft. The coupling shall be thoroughly cleaned and prepared as per the manufactures procedures prior to replacement. The coupling shall be protected against the ingress of dirt and moisture while removed from the shaft.
- .9** Contractor shall remove the four propeller blades. Contractor to install owner supplied spare set of crated blades. Contractor will use same crating and secure old ones in. The FSR in conjunction with the contractor shall dismantle the propeller hub and mechanism for survey by the classification surveyors. All components shall be inspected for wear. Contractor shall re-build the unit with new seals. New blade foot o-ring seals are to be installed. Propeller blade bolts shall be torqued and bolts shall be locked up as per original method. Refer to Lips drawing No. W00001150-AO "Propeller hub" for welding instructions for propeller blade bolt locking bars. Contractor to quote on 200 hours for machining for this specification.
- .10** Contractor shall conduct non-destructive testing (magnetic particle inspection) to detect the presence of cracks on the tail shaft hub flange radius.
- .11** Contractor in conjunction with the FSR shall open up the oil distribution box (O.D. Box) as part of the CPP system for cleaning and inspection of all components. The O.D. Box shall be re-built using all new seal and o-rings

- supplied with the overhaul kit. Contractor / FSR to open up the O.D. box feed back transmitter and check for worn components and to check condition of potentiometers, bushings and linkages.
- .12** The stern tube shall be cleaned prior to inspection by attending surveyors and chief engineer. Measurements shall be taken on the bore of each stern tube bearing in the vertical and horizontal direction at four equal points along the length of each bearing to check for ovality and uneven wear patterns.
 - .13** Contractor shall open up the intermediate shaft bearing for cleaning and inspection by the classification society surveyors. Contractor shall gauge the bearing wear to shaft clearance for Lloyd's surveyors. Contractor shall remove cooling water passage inspection cover bolted to the bottom of the lower bearing housing and clean the passage of all scale. To access the cooling water passage inspection cover the bearing housing complete has to be unbolted and moved ahead to turn the unit to remove the cover. Contractor shall mark alignment shims for correct re-installation. The intermediate shaft and SKF coupling is to be supported at all times during removal and re-installation of the bearing housing to prevent any deflection in the same. After cleaning, the bearing housing assembly has to be fitted in place and bolts torqued to manufactures specs. Refer to Waukesha – Lips B.V. drawing No. W006205045 manual No. 4 for details of bearing. Upon completion of inspection the shaft bearing is to be closed up with new gaskets and the oil in the base renewed, oil shall be owner supply.
 - .14** Contractor in conjunction with the FSR shall dismantle the inboard and outboard stern tube seals for inspection by the attending surveyor's and the Chief Engineer. The seal assemblies shall be re-built renewing any worn components, all new seals and o-rings shall be fitted. Parts are owner supply.
 - .15** Upon completion of all inspections, the rudder, O.D. box, intermediate shaft bearing, SKF sleeve coupling, tail shaft, stern tube seals, propeller and hub assemble including propeller blades, shall be installed in good order with all fasteners being torqued as required and all locking put in place. Contractor shall prove to the Chief Engineer and Lloyd's surveyors that all system components in this specification including all shafting, couplings, flanges, bearings and seals are within the manufacturer's alignment tolerances.
 - .16** Contractor shall open up the CPP and stern tube heat exchangers for cleaning, inspection and pressures testing. Contractor shall chemically clean and de-scale the tube nests internally and externally including the internal shell and end bells on each exchanger. Heat exchangers shall be pressure tested to the name plate data test pressure for a minimum of 30 minutes to check for leaks. The heat exchangers shall be re-built using all new gaskets and seals. Contractor shall renew the sacrificial zinc anodes on the sea water side of the exchangers. Contractor is responsible for removal and re-installation should exchangers have to be transported to Contractors facilities for the work / testing in this specification. All disturbed piping, flanges and brackets shall be re-installed in good order with new gaskets and pipe sealant applied as required. All fasteners shall be cleaned and anti seize compound applied. Lloyd's surveyor's to witness inspection and pressure testing of exchangers.

- .17 After all work on CPP system is completed, the contractor shall check that all valves are in the correct position, start CPP pumps and check complete system for leaks, check movement of propeller blades in the full ahead and full astern positions and that the blades line up on centering marks on hub.
- .18 All piping, fixtures, wiring, removed or disturbed during the work in this specification shall be replaced in good order.
- .19 After installation of the tail shaft and stern tube seal assemblies the Contractor shall pressure test the stern tube seals to 15 p.s.i. to verify the static integrity. The test shall be applied for 30 minutes. The lube system shall be filled prior to this test as per paragraph (3.1.3.). The Chief Engineer shall witness this test.
- .20 Dockside trials shall be conducted to test the operation of the CPP, stern tube system and rudder operation to the satisfaction of the Chief Engineer. Contractor shall check for overheating at the intermediate shaft bearing and inboard seal.
- .21 A two hour sea trial shall be conducted to prove the all systems operational to the satisfaction of the Chief Engineer working from no load to full load in 15 minute intervals while recording temperatures and pressures.
- .22 Contractor shall supply the Chief Engineer with four typed copies of their work report including all wear measurements and readings, parts used with corresponding part numbers.
- .23 All work in this specification shall be carried out to the satisfaction of the Chief Engineer and Lloyd's.

3.2 Location:

a.

3.3 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

- 4.1.3. All work is to be done to the satisfaction of the Chief Engineer, Wartsila Propulsion FSR representative and attending Lloyd's Surveyor.
- 4.1.4. 100% visual By Chief Engineer and Lloyd's Surveyor.

4.2 Testing

N/A

4.3 Certification

4.3.1. This specification is to be carried out in order to obtain Lloyd's Survey credit. The Contractor shall be responsible for contacting the Lloyd's surveyor when items are ready for the inspections.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 Contractor shall take stern tube wear-down readings prior to drawing the propeller and shafting. Upon completion of all work, a second set of wear-down readings is to be taken and recorded.

5.1.2 The pressure required for release of the SKF coupling halves is to be recorded.

5.1.3 Three hard copies of refit reports of all items carried out in this refit specification will be supplied to Chief Engineer.

5.1.4 All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyds surveyor.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals

N/A

Spec item #: E-05	SPECIFICATION	LLOYDS #
E-05 : Gearbox Lube Oil Pre-heat		

Part 1: SCOPE:

- 1.1 The intent of this specification is to remove two existing submersion style heating elements from the vessels propulsion gear box and install a new forced circulation lube oil heating system.

Part 2: REFERENCES:

1) Guidance Drawings/Nameplate Data

- 1.1 Vessels electrical panel index
- 1.2 Lohmann & Stolterfoht Gearbox Manual #5 Chief Engineers Cabin
- 1.3 Hotstart OLM Heating System Technical Data Sheet

2) Standards

- 2.2.1** The following Coast Guard Standards and/or Technical Bulletins must be followed while executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
 - 2.2.1.1** Canadian Coast Guard Fleet Safety Manual (DFO 5737)
 - 2.2.1.2** Coast Guard ISM Lockout/Tagout
 - 2.2.1.3** Coast Guard ISM Hotwork procedures
 - 2.2.1.4** TP 127E Ships Electrical Standards
 - 2.2.1.5** CSA C-22-2, No.245-95/UL 1309 (Marine shipboard cable)
- 2.3** All cables fitted will be low smoke, zero halogen. All cables will have an insulation rating of at least 85.0°C.
- 2.4** All cables will have identification numbers permanently marked on non-ferrous metal tags, securely affixed to each end of the cable and on both sides of glands where the cable passes through decks or watertight bulkheads.
- 2.5** All cables shall be bronze braid armoured marine type. Insulation shall be cross linked polyethylene, and shall be impervious to oil and moisture. Conductors shall be of the stranded type and high conductivity tin or alloy coating soft annealed copper. Cables shall be manufactured, tested and installed in accordance with the latest TP127E and IEEE 45 requirements.
- 2.6** Cables shall be installed on existing cableways unless otherwise directed by owners representative using corrosion resistant, metal cable ties spaced in accordance with TP127E requirements
- 2.7** Where cables pass through watertight decks, bulkheads or fire zone boundaries, cable transits, stuffing tubes or kick pipes must be used. Any bulkhead and/or deck

penetrations shall be in compliance with Schedule "D" of CCG Regulation TP 2237 "Equivalent Standards for Fire Protection of Passenger Ships."

3) Regulations

4) Owner Furnished Equipment

- 4.1 Hotstart OLM Heating System shall be Coast Guard supplied
- 4.2 All remaining material and tools needed to complete the installation shall be supplied by the contractor unless specified otherwise.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- 3.1.1.** The contractor shall ensure all required electrical and mechanical equipment is locked out before commencement of any work. Chief Engineer or delegate shall confirm
- 3.1.2.** The contractor shall install the new owner supplied Hotstart OLM oil heating system on the inboard side of the vessels aft service air compressor. The current aluminum deck plating shall be removed and its framing modified to allow for suitable mounting of the new oil heating unit. The mounting arrangement shall be designed to limit vibration and support the 160 lbs unit.
- 3.1.3.** The contractor is to run approximately 6 feet of service suitable power supply cable from the heater unit to 460 volt Panel P2. The Panel is located on the aft engine room bulkhead inboard of the new heater unit mounting location. All cables shall be marine approved for specific applications. The contractor shall confirm actual cable length required on site prior to supply, cutting and installation. The power cable shall be connected to a correctly sized contractor supplied breaker, and clearly labeled in the electrical panel.
- 3.1.4.** The contractor shall remove the existing two electric submersion type oil heaters on the port and starboard lower aft end of the gearbox. The cabling shall be removed and supply feed terminated in sealed labeled junction box near the gearbox. This shall be completed in conjunction with the gearbox oil changed Note in spec Item E-03 Gearbox Bearing Replacement
- 3.1.5. Supply Piping**

The contractor shall supply and install schedule 40 seamless mild steel piping for the supply piping to the new heating unit. This piping shall run from the existing 2 inch treaded heater connection on the port side of the gearbox to the new heating unit. This piping shall be reduced from two inches down to 1 inch as near as practice to the gearbox. A

contractor supplied service suitable screw down not return valve shall be installed in the piping in accessible location near the gearbox. All piping shall be sections shall be joined with flanges and service suitable gasket material. This run off piping will be approximately 10 feet in length. Contractor is to determine the actual length and piping layout needed. Reference Gearbox Heating drawing in spec for suggest piping arrangement.

3.1.6. Return Piping

The contractor shall supply and install schedule 40 seamless mild steel piping from the new heating unit to the previous 2 inch threaded heater connection on the starboard side of the gearbox. This piping shall be reduced from two inches down to 1 inch as near as practical to the gearbox. *A contractor supplied screw down screw lift valve shall be installed in an accessible location near the gearbox connection. All piping sections shall be joined with flanges with service suitable gasket material. This run of piping will be approximately 22 feet in length. Contractor is to determine the actual length and piping layout needed. Reference Gearbox Heating drawing in spec for suggest piping arrangement.*

- 3.1.7.** Both the supply and return line should be supported approximately every 4 feet with suitable pipe support brackets. **Note:** A pipe support shall be fitted as near as possible to the threaded connections at the gearbox on the supply and return connections.
- 3.1.8.** For ease of connection final Connections from the welded steel supply and return piping to the 1 inch NPT connection points on the heating unit shall be made with contractor supplied oil compatible 1 inch hoses and fittings. Hoses shall be suitable supported to prevent vibration.
- 3.1.9.** Upon completions of the installation on the unit, and oil change as indicated in Spec item # E-03 the unit shall be tested for proper operation and all piping and fitting checked for leaks. Any defects shall be corrected by the contractor.

3.2 Location

3.2.1. Engine Room Aft

3.3 Interferences

3.3.1 The contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

3.3.2 Work should be completed in conjunction with Gearbox Inspection Spec # E-03

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. All work shall be completed to the satisfaction of the Chief Engineer.

4.2 Testing

4.2.1 Electrical installation shall be metered as required to verify connections and cables are correct and electrically sound.

4.2.2 All piping welds shall be 100% MPI tested and witnessed by Chief Engineer or delegate before installation.

4.2.3 When installation is complete the unit shall be test ran to prove operation and check all piping for leaks.

4.3 Certification

N/A

Part 5: DELIVERABLES:

1) Drawings/Reports

- a. The contractor shall supply the Chief Engineer with 2 written and one electronic copy of reports pertaining to the work completed.

2) Spares

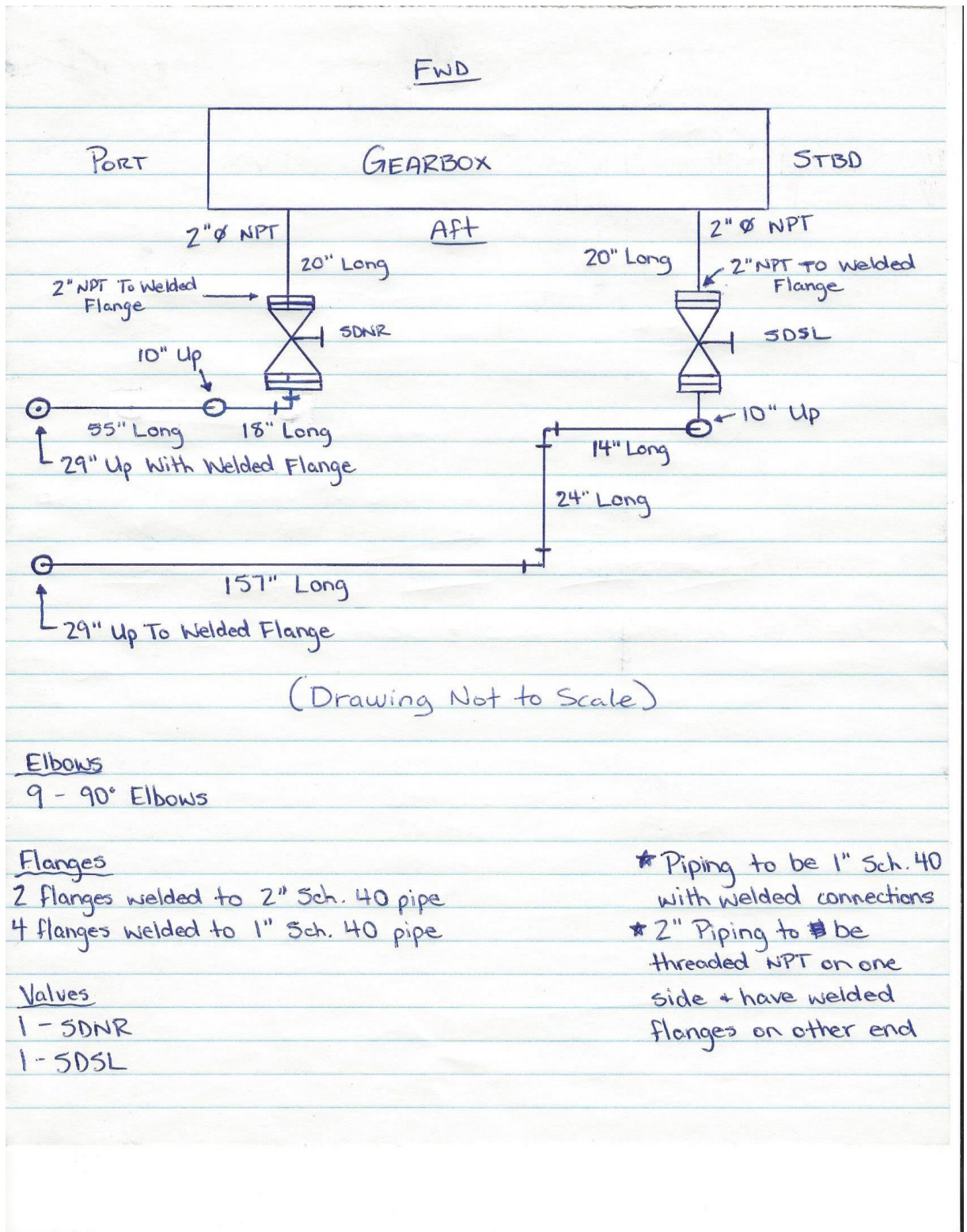
N/A

3) Training

N/A

4) Manuals

N/A



E-06 Steering Gear

Spec item #: E-06	SPECIFICATION	LLOYDS #
E-06 Steering Gear		

Part 1: SCOPE:

- 1.4 The intent of this specification is to carry out the 5 year survey required by Lloyd's.
- 1.5 Contractor shall adhere to manufacture's specifications for all test and work carried out.

Part 2: REFERENCES:

2.5 Guidance Drawings/Nameplate Data

- 2.1.3. STEERING GEAR TENFJORD TYPE SR 722, ORDER #12006.
- 2.1.4. TENFJORD INSTRUCTIONS BOOKLET –Manual 11 Chief Engineers Cabin

EQUIPMENT INFORMATION

Steering gear:

TENFJORD Type SR 722

SER# 15123-92,

MAX. WORKING PRESS=100 BAR

TEST PRESS=188 BAR

HYDRAULIC PUMP UNIT (2)

TYPE PU 50 T6C B14

SER #684, 1992.

CAPACITY 77 LITRES/MINUTE.

ELECTRIC MOTOR:

ABB TYPE NORM IEC 160M,

1750 R.P.M.

18 KW, 3 PHASE 440 V.A.C., 60 HZ.

MANOEUVRING VALVE

TYPE:S45P

SOLENOID VOLTAGE: 24 V.D.C

2.6 Standards**2.2.1****2.7 Regulations****2.3.1****2.8 Owner Furnished Equipment**

- 2.4.3** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:**3.2 General**

- 3.1.12** The contractor shall open up and ready for inspection the listed steering gear components for Lloyd's inspection. Upon completion of the work, the system shall be reassembled in its entirety and tested as per procedures outlined in the manufacturer's instruction book.
- 3.1.13** The contractor shall supply the services of a Tenfjord Field Service Representative to carry out the following work. Contractor supply labour to assistance Rolls Royce FSR for this spec item.
- 3.1.14** Contractor shall have an allowance of \$20,000 included in their bid for a Tenfjord FSR
- 3.1.15** Seal Leakage Test pre and post
- The FSR shall carry a seal leakage test on the actuator with one pump and two pump operation to gauge the quantity of return oil by-passing the actuator seals when in operation from hard over to hard over.
 - Record the time for full travel of the rudder with one pump and two pumps in operation.
 - The FSR shall conduct these test prior to and after completion of the overhaul/survey. Chief Engineer shall witness testing.
- 3.1.16** Contractor shall lock out and tag all electrical power to the steering gear prior to commencing work. On completion of all work the contractor shall remove locks.
- 3.1.17** Prior to opening the actuator the FSR shall mark the attached feedback unit chain and brass linkage for correct re-installation. The FSR shall remove feedback unit with linkage and rudder grounding strap and provide safe storage. Upon completion of the work detailed in this spec the FSR shall re-install all components and make any adjustments required to bring the system to within manufactures working tolerances.
- 3.1.18** Contractor shall isolate the header tanks and drain hydraulic oil from the rudder actuator and dispose of at contractor's facility, bid to include cost of removal of 200 liters of hydraulic oil.
- 3.1.19** Contractor to dismantle rudder actuator for inspection by the classification societies. Any worn parts beyond maker's specifications to be replaced with new. Contractor shall install all new Coast Guard Supplied seals and "o" rings during reassembly.
- 3.1.20** The rudder actuator locking rings are to be replaced with owner supply units. The rings are to be removed and installed and torqued as per manufacturer's specifications and instructions. The rudder and rudder stock have to be supported for this operation.
- 3.1.21** Contractor to install new rudder stock seal against sea water, seal supply by owner.
- 3.1.22** After completion of all work the contractor shall fill the steering gear system to correct levels with new oil. New return oil filter elements are to be installed in each hydraulic power unit. Contractor shall purge all air from the entire system.
- 3.1.23** Contractor shall test the steering gear system after all work has been completed to the satisfaction of Lloyd's Surveyor and Chief Engineer.

3.4 Location:

- a.** In Steering compartment aft main deck.

3.5 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.2 Inspection

- 4.1.5. 100% visual By Chief Engineer and Lloyd's Surveyor. All work shall be completed to the satisfaction of the Chief Engineer.
- 4.1.6. All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyd's inspector

4.2 Testing

- 4.2.1. Upon completion of all work, the steering is to be tested, rudder hard to port then hard stbd.
- 4.2.2. Sea trials: Steering is to be tested at various angles while vessel is in operation also rudder hard to port then hard stbd.
- 4.2.3. Contractor to carry out a function test to the satisfaction of the Chief Engineer and the attending Lloyd's Surveyor. Contractor shall be responsible for contacting the Lloyd's surveyor when items are ready for the inspections.

4.3 Certification

- 4.3.1 This specification is to be carried out in order to obtain Lloyd's Survey credit.

Part 5: DELIVERABLES:

5.5 Drawings/Reports

5.1.1 The Contractor shall supply the Chief Engineer with two typed copies and one electronic of the Contractors overhaul / work report which shall include all wear measurements, clearances and operational tolerances for comparison. Contractor shall also include a list of all new parts fitted including their corresponding position / part numbers and quantities.

5.6 Spares N/A

5.7 Training N/A

5.8 Manuals N/A

--

Spec item #: L-01	SPECIFICATION	LLOYDS #
L - 01 : Fire Detection Systems		

Part 1: SCOPE:

- 1.1** The intent of this specification is to carry out an annual inspection of the Notifier Fire Detection System and to obtain an inspection certificate to satisfy Lloyds requirements.
- 1.2** All work shall be performed by authorized qualified technicians.
- 1.3** All work in this specification shall be inspected by the Chief Engineer , the contract authority and Lloyds.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

- 2.1.1.** # 590-70 Ships General Arrangement,
- 2.1.2.** # 1512-003 Life saving equipment plan,
- 2.1.3.** # 1512-003 Fire Fighting plan
- 2.1.4.** Cowley Fire Alarm Detector Listing- engshare drive
 - a.

2.2 Standards

- 2.2.1** Canadian Coast Guard Fleet Safety and Security Manual (DFO/5737)
- 2.2.2** Canadian Coast Guard ISM Lockout/Tagout
- 2.2.3** Canadian Coast Guard ISM Hotwork Procedures
- 2.2.4** Lloyd's Latest Electrical revision.
- 2.2.5** TP127 – Ship's Electrical Standard
- 2.2.6** IEEE 45:2002 – Recommended Practice for Electrical Installation on Ships

2.3 Regulations

- 2.3.1** Lloyd's Classification.
- 2.3.2** Canada Shipping Act 2001 – Marine Machinery Regulations
- 2.3.3** SOLAS

2.4 Owner Furnished Equipment

The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- 3.1.1** The Contractor shall notify Chief Officer and Chief Engineer prior to starting work and all ship personnel shall be made aware of the testing of the fire detection system.
- 3.1.2** The Contractor shall contact a designated Lloyds' Register representative and schedule of a Marine surveyor to witness any required testing of the systems stated in this specification.
- 3.1.3** The Contractor shall test the operation of all smoke, heat and flame detectors located throughout the ship. All detectors shall activate the Notifier Panel located on the Bridge with correct location observed on Notifier print screen. Also the operation of the general alarm shall be determined for each detector being tested.
- 3.1.4** Contractor shall ensure that LED on Mimic panel located on the Bridge and in Motor Control Room are activated while each detector is tested.
- 3.1.5** Contractor shall test the operation of the ships general alarm from each general alarm pull station.
- 3.1.6** Contractor shall test Notifier Panel emergency batteries and advise Chief Engineer of status. If batteries need replacement the contractor shall replace batteries with owner supplied batteries.
- 3.1.7** Contractor shall test the operation of all shutdowns activated from the Notifier panels and correct operation of watertight and fire doors.
- 3.1.8** Contractor shall test the operation of the low temperature alarm located in the FM-200 storage cabinet.

3.1.9 Upon completion of annual testing of Notifier Fire Detection an inspection certificate shall be issued, satisfactory to Lloyd's Register. Certification shall be on a date as close as practicable to the completion of refit.

3.2 Location:

- a. Various locations throughout vessel as identified in Cowley fire alarm detector listing.pdf and fire plan.

3.3 Interferences

- a. Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1 All work shall be inspected by the Chief Engineer.

4.1.2 All work shall be completed to the satisfaction of the Chief Engineer.

Testing

All testing as per recommended Notifier test procedures. Where non notifier equipment used (IE: Fenwal heat detector) , that manufacturer's instructions to be used.

4.2 Certification

Personnel to perform testing to be certified to work on Notifier fire detection systems

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 A full electronic and hardcopy of all results including any repair procedures undertaken.

5.2 Spares
N/A

5.3 Training
N/A

5.4 Manuals
N/A

Spec item #: L-02	SPECIFICATION	LLOYDS #
-------------------	---------------	----------

L - 02 : Meggar Testing

Part 1: SCOPE:

1.1 The intent of this specification shall be for the Contractor to test the insulation resistance of all the electrical distribution systems onboard, to satisfy the annual requirements of Lloyd's Surveyor. Care is to be taken not to test circuits while electronics (including voltage regulators), which may be damaged by high voltages, are connected. The contractor shall ensure all electronics are unplugged (TV's, DVD's, radios and the like) in cabins, lounges and other common areas before doing insulation testing.

Part 2: REFERENCES:**2.1 Guidance Drawings/Nameplate Data**

2.1.5. Vessel Electrical Panel Index (engshare drive-electrical related)

2.1.6. Meggar Reading Black Document (engshare drive-electrical related)

2.2 Standards

2.2.1 TP127E transport Canada Electrical Standards

2.2.2 Fleet Safety and Security Manual (DFO 5737)

2.2.3 The Contractor shall adhere to the ships ISM Hotwork, Confined Space Entry, Fall Protection and Lockout Procedures.

2.3 Regulations

2.3.1 Canada Shipping Act 2001

2.3.1 The vessel is regulated by Lloyd's and all work performed must be approved and inspected by a Lloyd's Register marine inspector.

2.4 Owner Furnished Equipment

The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

The Following Circuits shall be tested. 1000 VDC for alternators (Current transformers to be shorted for protection and field disconnected from electronic regulators) and 500 VDC for all remaining circuits listed.

- 3.1.1 The Contractor shall megger test all essential and non-essential wiring circuits of vessel's power distribution system, and test all connections of ground cable as outlined in Meggering readings Blank Form.xls.
- 3.1.2 The Contractor shall notify the Technical Authority of deficiencies and conduct repairs as agreed which will be covered with 1379 action
- 3.1.3 Contractor to note any differences in panel listing and official meggar listing
- 3.1.4 All equipment opened shall be properly reconnected and tightly closed.
- 3.1.5 The contractor shall ensure equipment is safe to de-energize and re-energize after work is completed.
- 3.1.6 List of panels attached in drawing package.
- 3.1.7 Contractor is to megger all electrical systems found onboard the vessel. These readings are to be recorded and three (3) copies to be forwarded. One each - Ship Safety, Lloyd's Register of Shipping, Owner. Any Grounds or shorts found in any circuit are to be identified and appropriate action taken to correct. Minimum acceptable 100,000 ohms.

3.2 Location:

3.3 Interferences

Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

- 4.1.1 All work shall be completed to the satisfaction of the Chief Engineer.

4.1.2 This specification is to be carried out in order to obtain Lloyds credit. The contractor shall be responsible for contacting the Lloyds surveyor when items are ready for the inspections

4.1.3 The contractor shall restore all connections to all circuits tested and shall insure that each of the circuits is operating properly.

Testing

N/A

4.2 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 The contractor shall produce two bound copies of readings to be given to the Chief Engineer as well as in electronic Microsoft excel format

5.1.2 The Contractor shall make necessary repairs using 1379 action.

5.1.3 The contractor shall provide current calibration certificates for all meters used during testing.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals

N/A

Spec item #: L-03	SPECIFICATION	LLOYDS #
L - 03: Thermoscan		

Part 1: SCOPE:

1.1 The intent of this specification shall be for the Contractor to address the requirements to survey the ship's electrical generators, switchboards and transformers (over 10 kVA) using Infrared Thermography as required by Lloyd's.

Part 2: REFERENCES:

2.5 Guidance Drawings/Nameplate Data

2.1.1. N/A

2.6 Standards

2.2.1 Fleet Safety and Security Manual (DFO 5737)

2.2.2 The Contractor shall adhere to the ships ISM Hotwork, Confined Space Entry, Fall Protection and Lockout Procedures, and Working on Live Circuit Procedures.

2.2.3 TP127E Shipboard Electrical Standards

2.7 Regulations

2.3.1 Canada Shipping Act 2001

2.3.1 The vessel is regulated by Lloyd's and all work performed must be approved and inspected by a Lloyd's Register marine inspector.

2.8 Owner Furnished Equipment

2.4.19 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.2 General

- 3.1.10** The Contractor shall provide the services of certified Infrared Thermography who will, survey the three Diesel Generators, Emergency Diesel Generator, Main, Emergency and Ship's Service Switchboards, and the required transformers. All surveys shall be done at Vessel's peak operating loads.
- 3.1.11** The Contractor will prepare a written report, detailing any defects or deficiencies discovered and the proposed corrective action to the attending) Lloyd's Register Inspector and Chief Engineer.
- 3.1.12** The Contractor shall make necessary repairs using PWGSC 1379 action.

3.1.13 Summary of Equipment to be surveyed:

Main Engine Room

Cell #	Description
1A	440 Volt Dist. Breakers
1B	440 Volt Dist. Breakers
2A	Shore Power Controls
2B	460 Volt Buss
3A	Generator # 1 Metering
3B	Generator # 1
4A	Breaker/Buss Synch. Section
4B	Emergency Gen. Tie
5A	Gen # 2 Controls
5B	Gen # 2 Breaker
6A	Gen # 3 Controls
6B	Gen # 3 Breaker
7A	440 Volt Dist. Breakers
7B	440 Volt Dist. Breakers
8A	120 Volt Dist. Breakers
8B	220 Volt Dist. Breakers

Generator # 1, approximate load = 150 Amps

Generator # 2, approximate load = 150 Amps

Generator # 3, approximate load = 180 Amps

Ship Services Transformers, 460 – 230 Volt, 3 single phase@ 25 kVA/Phase

Ship Services Transformers, 460 –120 Volt, 3 single phase@ 25 kVA/Phase

Emergency Generator Room

1A	Emerg Gen Controls
1B	Emerg Gen Breaker
2A	120 Volt Section
2B	460 Volt Section
3A	DC Section
3B	Emergency Tie

Emergency Generator, approximate load = 150 Amps

Emergency 3 X 15KVA Transformers
Shorepower Transformer 300KVA

3.4 Location:

a.

3.5 Interferences

- a.** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

4.1 PROOF OF PERFORMANCE:

4.1.1 All work shall be completed to the satisfaction of the Chief Engineer.

4.1.2 This specification is to be carried out in order to obtain Lloyd's survey credit. The Contractor shall be responsible for contacting the Lloyd's Surveyor when items are ready for the inspections.

5.1 DELIVERABLES:

5.1.1 The Contractor shall produce three bound copies and one electronic copies of the reports of readings and digital images of deficiencies identified to be given to Chief Engineer. The contractor shall include an IR image and normal photographic views of each deficiency.

5.1.2 The Contractor shall make necessary repairs using PWGSC 1379 action.

5.1.3 The Contractor shall provide the current certification of Thermographer

L-04 Speed Log Upgrade

Spec item #: L-04	SPECIFICATION	LLOYDS #
L - 04: Doppler Speed Log Upgrade		

Part: 1 SCOPE:

1.1 The intent of this specification is to remove the existing Sperry SRD-331 Doppler Speed Log system and the existing Raytheon DSN-450 Doppler Log equipment and replace with a new Sperry Naviknot 450D Doppler Speed Log system.

1.2 Contractor must supply all materials, and parts required to perform the specified work unless otherwise stated.

1.3 Contractor shall provide proof of cabling being ordered within 4 days of contract being awarded.

Part: 2 REFERENCES:

2.1 Guidance Drawings and Documents

Drawing Number	Description	Electronic Number
Preliminary	CCGS Leonard J. Cowley Sperry Marine Naviknot 450 D Doppler Speed Log Block Diagram	
59019301	C.C.G.S. Leonard J. Cowley Sperry SRD-331 Doppler Speed Log Interconnection Diagram	
590-EYR-7	CCGS Leonard J. Cowley Doppler Speed Log Block and Cable Diagram	
590-SK9	Transducer Hull Penetration	
590-56	Transducer Compartment Arrangement	
590-96	CCGS Leonard J. Cowley Docking Plan	

590-70	CCGS Leonard J. Cowley General Arrangement Profile	
005005-0125-001/H	Sperry Marine Doppler Transducers, Gate Valve and Tank Mount and Preamplifier D Type 5005 for Doppler Speed Log Systems Naviknot 450 D 600 SD Installation, Maintenance, and Service Instructions	
4983-0112-01 Sheet 1 / 2	Doppler Speed Log Sensor Transducer and Sea Chest for Steel and Aluminum Vessels	
4983-0112-01 Sheet 2 / 2	Doppler Speed Log Sensor Transducer and Sea Chest for Steel and Aluminum Vessels	

2.2 Standards

2.2.1 Fleet Safety and Security Manual (DFO/5737)

2.2.2 TP127E – Ships Electrical Standards

2.2.3 IEEE 45:2002 – Recommended Practice for Electrical Installations on Ships

2.2.4 Specification for the Installation of Shipboard Electronic Equipment (70-000-000-EU-JA-001)

2.2.5 General Information for the Rules and Regulations for the Classification of Ships.

2.2.6 CWB, Welding Procedures

2.3 Regulations

2.3.1 Canada Shipping Act, 2001

2.4 Owner Furnished Equipment

- 2.4.1** The contractor must supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part: 3 TECHNICAL DESCRIPTION

3.1 General

- 3.1.1** The contractor must supply all equipment, enclosures, ventilation, staging, chain falls, carnage, crane, slings, and shackles necessary to perform the work. All lifting equipment must be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, or a safe working load for the expected duties. Any brackets, mounts, or any other welded attachments required in the performance of this specification must be welded into place by certified welders.
- 3.1.2** Prior to any hotwork taking place, the contractor must ensure that the area of work and all equipment, wiring, transits, etc. have been sufficiently protected from any sparks or metal filings.
- 3.1.3** All cabling, once installed, must be marked with a stamped stainless steel metal tag for all outside cabling and an appropriate label type for all inside cabling. The labels are to be securely affixed to the cable at each end and through any deck, deck heads, and/or gland penetrations with the designation for each cable as provided in this specification.
- 3.1.4** Contractor responsible for the temporary removal and reinstallation of any deck heads, bulkheads, paneling, insulation, and any items that is deemed to be interfering to the running of any cables and mounting of any equipment.
- 3.1.5** All cabling must follow existing cable trays throughout the vessel where fitted. Once installed, all cabling must be secured as per TP127.
- 3.1.6** All cabling which has been deemed surplus as a result of this specification item shall be disposed of at the contractor's expense.
- 3.1.7** The contractor must be responsible to ensure that all areas have been cleaned and free of any debris resulting from the performance of this specification item.
- 3.1.8** Prior to the commencement of any electrical work, the contractor must ensure that all electrical supplies feeding the systems have been isolated at the source following an established lockout/tag out procedure. Contractor must ensure

that Chief Engineer or Senior Electrical Officer is notified of any lockout/tag out completed.

3.1.9 Electrical Isolations for AC power are as follows:

3.1.9.1 **EL2-18/20** Nav. Bridge Port Side

3.1.10 Upon final installation, testing must be carried out as per Section 4.2 of this specification item.

3.1.11 The contractor must work in conjunction with a Coast Guard Electronic Technician to oversee the installation of the new Doppler Speed Log system to ensure compliance with applicable Coast Guard standards. Terminations of all equipment must be completed by CCG technicians with the exception of those for electrical supply which must be the contractor's responsibility as well as any grounding requirements.

3.1.12 Contractor must remove the following equipment listed below in **Equipment Removal** table and referencing drawing numbers **590-EYR-7** and **59019301**.

3.1.13 Equipment Removal

Equipment	Location
Sperry SRD-331 Master Display Unit	Nav. Bridge Aft Center Console Upper above Radar Display B
Sperry SRD-331 Electronics Unit	Hold Deck Transducer Compartment Under Sewage Compartment Frame 58 Bulkhead
Sperry SRD-331 Remote Display Unit	Nav. Bridge

L-04 Speed Log Upgrade

	Starboard Wing Upper Bulkhead above Window
Sperry SRD-331 Remote Display Unit	Nav. Bridge Port Wing above Window
Transducer and Gate Value	Hold Deck Base Line Between Frames 63 & 64
Raytheon DSN 450 Main Electronics Unit (Used as Junction Box)	Nav. Bridge Starboard Side
Raytheon DSR-121 Display (x2)	Nav. Bridge Starboard Wing Console
Raytheon DSR-121 Displays (x2)	Nav. Bridge Port Wing Console
Raytheon DSR-121 Displays (x2)	Nav. Bridge Forward Center Console
Raytheon DSR-121 Display	Hold Deck Motor Control Room Console
Raytheon DSN-450 Transducer Electronic Unit	Hold Deck Sewage Compartment aft bulkhead

3.1.14 Contractor must remove the following cables listed in **Cable Removal** table below and with reference to drawings numbers **590-EYR-7** and **59019301**.

3.1.15 Cable Removal

Cable Label	From	To
??	Sperry SRD-331 Electronics Unit	Transducer (cable attached to transducer)
Y-1	Raytheon DSN-450 Main Electronics Unit Nav. Bridge Starboard Side	Nav. Bridge Forward Center Console DSR-121 Displays
Y-2	Raytheon DSN-450 Main Electronics Unit Nav. Bridge Starboard Side	Nav. Bridge Starboard Wing Console DSR-121 Displays
Y-3	Raytheon DSN-450 Main Electronics Unit Nav. Bridge Starboard Side	Nav. Bridge Port Wing Console DSR-121 Displays
Y-4	Raytheon DSN-450 Main Electronics Unit Nav. Bridge Starboard Side	Nav. Bridge Aft Center Console above Display B radar
Y-5 (x2)	Raytheon DSN-450 Main Electronics Unit Nav. Bridge Starboard Side	Nav. Bridge Steering Helm

L-04 Speed Log Upgrade

Y-9	Raytheon DSN-450 Main Electronics Unit Nav. Bridge Starboard Side	Nav. Bridge Aft Center Console Port
Y-11	Raytheon DSN-450 Main Electronics Unit Nav. Bridge Starboard Side	Nav. Bridge Aft Center Console Starboard
Y-12	Raytheon DSN-450 Main Electronics Unit Nav. Bridge Starboard Side	Nav. Bridge Aft Center Console Port
??	Sperry SRD-331 Master Display Nav. Bridge AFT Center Console above Display B Radar	Sperry SRD-331 Remote Display Nav. Bridge Starboard Wing Upper Bulkhead
??	Sperry SRD-331 Master Display Nav. Bridge AFT Center Console above Display B Radar	Sperry SRD-331 Remote Display Nav. Bridge Port Wing Upper Bulkhead
??	Sperry SRD-331 Remote Display Nav. Bridge Starboard Wing Upper Bulkhead	Sperry SRD-331 Remote Display Nav. Bridge Port Wing Upper Bulkhead
??	Raytheon DSN-450 Main Electronics Unit (Used as	Sperry SRD-331

L-04 Speed Log Upgrade

	Junction Box) Nav. Bridge Starboard Side	Remote Display Nav. Bridge Starboard Side Upper Bulkhead
??	Raytheon DSN-450 Main Electronics Unit (Used as Junction Box) Nav. Bridge Starboard Side	Sperry SRD-331 Remote Display Nav. Bridge Port Side Upper Bulkhead
??	Raytheon DSN-450 Main Electronics Unit (Used as Junction Box) Nav. Bridge Starboard Side	Display B Radar Nav. Bridge Aft Center Console
??	Raytheon DSN-450 Main Electronics Unit (Used as Junction Box) Nav. Bridge Starboard Side	Display A Radar Nav. Bridge Forward Starboard Side
??	Raytheon DSN-450 Main Electronics Unit (Used as Junction Box) Nav. Bridge Starboard Side	Trimble NT200D GPSD Unit Nav. Bridge Aft Center Console Starboard Side

3.1.16 Contractor must re-route the following cables listed in **Cable Re-Route** table below.

3.1.17 Cable Re-Route

Cable Label	From	To
??	Sperry SRD-331 Master Display Nav. Bridge Aft Center Console above Display B Radar	New Sperry 5005 Electronics Unit Nav. Bridge Aft Center Console starboard side under console
??	Raytheon DSN-450 Main Electronics Unit (Used as Junction Box) Nav. Bridge Starboard Side	New Sperry 5005 Electronics Unit Nav. Bridge Aft Center Console starboard side under console
Y-6	Raytheon DSN-450 Main Electronics Unit Nav. Bridge Starboard Side	New Sperry 5005 Electronics Unit Nav. Bridge Aft Center Console starboard side under console
Y-7 & Y-8	Raytheon DSN-450 Main Electronics Unit Nav. Bridge	New Junction Box Nav. Bridge Aft Center Console starboard side

L-04 Speed Log Upgrade

	Starboard Side	under console
Y-8	Raytheon DSN-450 Transducer Electronics Unit Hold Deck Sewage Compartment/Transducer Compartment	New Junction Box Hold Deck Sewage Compartment/Transducer Compartment Deck Head
EL2 18/20	Raytheon DSN-450 Main Electronics Unit (Used as Junction Box) Nav. Bridge Starboard Side	New Sperry 5005 Electronics Unit Nav. Bridge Aft Center Console Starboard Side under console

3.1.18 Contractor must supply and install two (2) suitable junction boxes for marine environment complete with cable glands. Cables Y-7 & Y-8 will be isolated and grounded in one junction box on the Nav. Bridge under the Aft Center Console in the area of the old Raytheon DSN-450 Main Electronics Unit and the other will be mounted to the support beams in the Sewage Compartment/Transducer Compartment for cable Y-8.

3.1.19 Contractor must ensure any unused cables are isolated and grounded.

3.1.20 Contractor must install the following **owner** supplied equipment listed in **Equipment List** below and with reference to the preliminary **CCGS Leonard J. Cowley Doppler Speed Log Block Diagram**.

3.1.21 Equipment List

Equipment	Location
Sperry Marine Pre-amplifier 5005	Hold Deck Sewage Compartment/Transducer Compartment

	Bulkhead Frame 58
Sperry Marine Transducer Gate Valve 4983	Base Line Between Frames 63 & 64 where the existing gate valve was located
Sperry Marine 5020AA Transducer c/w 18 m cable	Within Gate Valve
Sperry Marine 4894-AC Terminal Boxes (x10)	<ul style="list-style-type: none"> • 4 – located in starboard wing deck head • 4 – located in port wing deck head • 1 – located in fwd starboard deck head • 1 – located in fwd port deck head
Sperry Marine 4891-CB Universal Digital Repeater	Flush mounted in forward center console in new plate
Sperry Marine 4891-CB Universal Digital Repeater	Flush mounted in MCR console in new plate

3.1.22 Contractor must supply and install new mounting plate for the pre-amplifier in the Sewage Compartment/Transducer Compartment on the bulkhead. Plate to be of 3/16" thick of the same composite. Plate to be 12" by 14" and secured to the existing brackets using 1/4" stainless steel hardware.

3.1.23 Contractor must supply and install plates or flat bar of the same composite throughout the Nav. Bridge to mount the Sperry Marine 4894-AC Terminal Boxes. Two (2) plates to mount four (4) terminal boxes and two (2) plates to mount a terminal box each. Location to be determined by Technical Authority or CCG representative.

3.1.24 Contractor must fabricate and install new 1/8" plate of same composite 4.5" x 6" to flush mount new Sperry Marine 4891-CB Universal Digital Display in MCR console. Plate must be primed and painted to match existing console.

3.1.25 Contractor must fabricate and install new 1/8" plate of same composite 10" x 9.5" in Forward Center Console. Plate must be primed and painted to match existing console.

3.1.26 Contractor must use stainless steel hardware for mounting equipment, plates, and panels listed within this specification.

3.1.27 Contractor must follow the manufacturer's instructions when installing the new Sperry Marine Transducer Gate Valve 4983. Reference document is

Sperry Marine Doppler Transducers, Gate Valve and Tank Mount and Preamplifier D Type 5005 for Doppler Speed log Systems NAVIKNOT 450 D / 600 SD Installation, Maintenance and Service Instructions 005005-0125-001/H 29 Jun 2016.

3.1.28 Contractor must supply and install all cables listed in the **Cable List** below. All cables must be Shipboard Approved Marine Cable. Refer to **CCGS Leonard J. Cowley Doppler Speed Log Block Diagram Preliminary**.

3.1.29 Contractor must ensure there is at least 3 meters of cable at each cable endpoint location.

3.1.30 For the purpose of adjustments, Contractor must provide a unit cost for the supply and install of 10m of cable listed in **Cable List** below.

3.1.31 Cable List

Cable Label	Cable Type	From	To	Signal	Length (m)
SDL-1	Factory cable (SWE)	Transducer/Gate Valve Frame 63 & 64 Transducer Compartment	Sperry marine Preamplifier 5005 Hold Deck Transducer Compartment Frame 58	Data	3
SDL-2A	6C 20AWG Shipboard Approved Marine	Sperry Marine 5003 Electronics Unit under Aft Center Console Starboard Side	Junction Box for existing cable from old Sperry SRD-331 Master Display Unit	Data	10
SDL-4	8C 20AWG Shipboard	Sperry Marine 5003 Electronics Unit under Aft Center Console	Sperry Marine 5001 Control and Display Unit Nav. Bridge Aft	Data	10

L-04 Speed Log Upgrade

	Approved Marine	Starboard Side	Rack #1		
SDL-6	6C 20AWG Shipboard Approved Marine	Sperry Marine 5003 Electronics Unit under Aft Center Console Starboard Side	Sperry Marine 4891-CB Universal Digital Display Nav. Bridge Port Wing Upper Bulkhead	Data	15
SDL-7	6C 20AWG Shipboard Approved Marine	Sperry Marine 5003 Electronics Unit under Aft Center Console Starboard Side	Sperry Marine 4891-CB Universal Digital Display Nav. Bridge Forward Center Console	Data	15
SDL-8	6C 20AWG Shipboard Approved Marine	Sperry Marine 5003 Electronics Unit under Aft Center Console Starboard Side	Sperry Marine 4891-CB Universal Digital Display Nav. Bridge Aft Center Upper Console	Data	10
SDL-9	6C 20AWG Shipboard Approved Marine	Sperry Marine 5003 Electronics Unit under Aft Center Console Starboard Side	Sperry Marine 4891-CB Universal Digital Display Nav. Bridge Starboard Wing Upper Bulkhead	Data	10

L-04 Speed Log Upgrade

SDL-15	4C 20AWG Shipboard Approved Marine	Sperry Marine 5003 Electronics Unit under Aft Center Console Starboard Side	Nav. Bridge Aft Center Console Display A Radar	Data	10
SDL-16	4C 20AWG Shipboard Approved Marine	Sperry Marine 5003 Electronics Unit under Aft Center Console Starboard Side	Nav. Bridge Forward Console Starboard Side Display B Radar	Data	15
SDL-17	4C 20AWG Shipboard Approved Marine	Sperry Marine 5003 Electronics Unit under Aft Center Console Starboard Side	Nav. Bridge Steering Helm	Data	10
LC-40	6C 20AWG Shipboard Approved Marine	Nav. Bridge Electronics Equipment Room F.O.G. Distribution Unit	Nav. Bridge Starboard Wing Deck Head	Data	20
LC-41	6C 20AWG Shipboard Approved Marine	Nav. Bridge Electronics Equipment Room F.O.G. Distribution Unit	Nav. Bridge Port Wing Deck Head	Data	20
LC-42	6C	Nav. Bridge	Nav. Bridge	Data	25

L-04 Speed Log Upgrade

	20AWG Shipboard Approved Marine	Electronics Equipment Room F.O.G. Distribution Unit	Forward Starboard Deck Head		
LC-43	6C 20AWG Shipboard Approved Marine	Nav. Bridge Electronics Equipment Room F.O.G. Distribution Unit	Nav. Bridge Forward Port Deck Head	Data	25
LC-44	6C 20AWG Shipboard Approved Marine	Nav. Bridge Electronics Equipment Room F.O.G. Distribution Unit	Nav. Bridge Aft Upper Center Console above Display A Radar	Data	20
ES1-3	6C 20AWG Shipboard Approved Marine	Skipper GDS-101 Echo Sounder Display Nav. Bridge Aft Center Console Port Side	Nav. Bridge Aft Center Console Starboard Side under console	Data	10
ES1-4	6C 20AWG Shipboard Approved Marine	Nav. Bridge Aft Center Console Starboard Side under console	Nav. Bridge Starboard Wing Deck Head	Data	10
ES1-5	6C	Nav. Bridge	Nav. Bridge	Data	15

L-04 Speed Log Upgrade

	20AWG Shipboard Approved Marine	Aft Center Console Starboard Side under console	Port Wing Deck Head		
ES2-3	6C 20AWG Shipboard Approved Marine	Nav. Bridge Aft Center Console Starboard Side under console	Nav. Bridge Forward IR-301 Remote Display Upper Deck Head	Data	15
ES2-4	6C 20AWG Shipboard Approved Marine	Nav. Bridge Aft Center Console Starboard Side under console	Nav. Bridge Starboard Wing Deck Head	Data	10
ES2-5	6C 20AWG Shipboard Approved Marine	Nav. Bridge Aft Center Console Starboard Side under console	Nav. Bridge Port Wing Deck Head	Data	15

3.1.32 Contractor must supply and install suitable marine junction box complete with terminal blocks and cable glands for cable from old Sperry SRD-331 master display to new Sperry Marine 5003 Electronics Unit. Cable SDL-2A will run from this junction box to new Electronics Unit.

3.2 Location

3.2.1 Navigation Bridge Deck

3.2.2 Hold Deck

3.3 Interferences

3.3.1 Contractor is responsible for the identification of interference items, their temporary removal, storage, and refitting to vessel.

Part: 4 PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1 All work must be subject to witness by the Chief Engineer of delegate and the attending surveyor.

4.2 Testing

4.2.1 All cables are to be checked for continuity after installation to ensure operational capability. Should any cable run fail to pass testing, the cable must be replaced at the contractor's expense.

4.2.2 All cable testing must be verified by a Coast Guard Technician.

4.2.3 New AC/DC circuits must be proven operational.

4.2.4 Electronic equipment which has been removed for the performance of this specification item must be returned to operational condition as it will be used as spares for similar equipment used in CCG fleet.

4.3 Certification

4.3.1 All original Class approval certificates for all system components must be submitted to the owner prior to acceptance of this item.

Part: 5 DELIVERABLES:

5.1 Drawings/Reports

- 5.1.1** The contractor must provide the Chief Engineer with a typewritten report of the contractors work in both electronic and hardcopy formats outlining the details of the inspections and any alterations / repairs to the acceptance of this item.

5.2 Spares

- 5.2.1** All owner supplied cable which has not been used must be returned to the owner prior to the acceptance of the item.

5.3 Training

N/A

5.4 Manuals

N/A

Spec item #: L-05	SPECIFICATION	LLOYDS #
L-05 Focle Deck Light Replacement		

Part 1: SCOPE:

- 1.2 The intent of this specification is to remove 15 existing focsle deck exterior bulkhead lights, repair doubler mounting plates, and install new Coast Guard supplied LED lights.

Part 2: REFERENCES:

1) Guidance Drawings/Nameplate Data

- 1.1 Vessels electrical panel index

2) Standards

- 2.2.1** The following Coast Guard Standards and/or Technical Bulletins must be followed while executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.

2.2.1.1 Canadian Coast Guard Fleet Safety Manual (DFO 5737)

2.2.1.2 Coast Guard ISM Lockout/Tagout

2.7.1.3 Coast Guard ISM Hotwork procedures

2.7.1.4 TP 127E Ships Electrical Standards

2.7.1.5 CSA C-22-2, No.245-95/UL 1309 (Marine shipboard cable)

- 2.2** All cables fitted will be low smoke, zero halogen. All cables will have an insulation rating of at least 85.0°C.
- 2.3** All cables will have identification numbers permanently marked on non-ferrous metal tags, securely affixed to each end of the cable and on both sides of glands where the cable passes through decks or watertight bulkheads.
- 2.4** All cables shall be bronze braid armoured marine type. Insulation shall be cross linked polyethylene, and shall be impervious to oil and moisture. Conductors shall be of the stranded type and high conductivity tin or alloy coating soft annealed copper. Cables shall be manufactured, tested and installed in accordance with the latest TP127E and IEEE 45 requirements.
- 2.5** Cables shall be installed on existing cableways unless otherwise directed by owners representative using corrosion resistant, metal cable ties spaced in accordance with TP127E requirements
- 2.6** Where cables pass through watertight decks, bulkheads or fire zone boundaries, cable transits, stuffing tubes or kick pipes must be used. Any bulkhead and/or deck penetrations shall be in compliance with Schedule "D" of CCG Regulation TP 2237 "Equivalent Standards for Fire Protection of Passenger Ships."

3) Regulations

4) Owner Furnished Equipment

- 4.1 Coast Guard supplied Sceptalight LED LVPF-LED with 90 degree mounting brackets.
- 4.2 All remaining material and tools needed to complete the installation shall be supplied by the contractor unless specified otherwise.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

- 3.1.10.** The contractor shall ensure all required electrical equipment is locked out before commencement of any work. Chief Engineer or delegate shall confirm
- 3.1.11.** The contractor shall disconnect wiring and remove 15 existing Focle deck exterior bulkhead lights from their existing mounting plates. Many of the mounting studs are currently in poor condition and may hinder removal.
- 3.1.12.** The contractor shall repair the existing corroded aluminum mounting plates. The corroded areas shall be buffed clean and holes built up flush with aluminum compatible Belzona 1111 Super Metal. Contractor shall supply Belzona
- 3.1.13.** Once hardened any high spots shall be ground flush with the existing mounting plates.
- 3.1.14.** The contractor shall drill and tap new mounting holes in the aluminum mounting plates. Care must be taken to sure holes are not drilled completely through the super structure.
- 3.1.15.** All disturbed bulkhead areas shall be given one coat of primer and two top coats of Matchless super white paint.
- 3.1.16.** The contractor shall supply aluminum studs and nuts for the mounting of the new lights. Aluminum studs shall be set in the mounting holes with locktight to ensure they do not work free.
- 3.1.17.** The contractor shall fasten the new Coast Guard supplied lights and 90 degree mounting brackets to the Focle deck bulkhead in the existing light positions.
- 3.1.18.** The contractor shall make all electrical connections to the new lighting, ensure that all glands and junction boxes are seal water tight.

3.4 Location

3.2.2. Focle Deck

3.5 Interferences

3.3.1 The contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

Part 4: PROOF OF PERFORMANCE:

4.2 Inspection

4.1.2. All work shall be completed to the satisfaction of the Chief Engineer.

4.3 Testing

4.2.1 Electrical installation shall be metered as required to verify connections and cables are correct and electrically sound.

4.3 Certification

N/A

L-06 GMDSS Replacement

Spec item #: L-06	SPECIFICATION	LLOYDS #
L-06 Global Maritime Distress & Safety System Replacement		

Part: 1 SCOPE:

1.1 The intent of this specification is to remove the entire Sailor Global Maritime Distress and Safety System for A3 International Operation, and replace with new **owner supplied** Sailor 6000 series Global Maritime Distress and Safety System for Sea Area A3 International Operation.

1.2 Contractor shall supply all materials, and parts required to perform the specified work unless otherwise stated.

Part: 2 REFERENCES:

2.1 Guidance Drawings

Drawing Number	Description	Electronic Number
59015901	Antenna Layout	
59015001	GMDSS Wiring Diagram (Existing)	
59015101	GMDSS VHF Wiring Diagram	
	Sailor 6000 Series A3 International GMDSS Block Diagram External Wiring	
	Sailor 6390 Navtex Wiring Diagram	
	Sailor 6222 VHF #1 Block Diagram External Wiring	
	Sailor 6000 GMDSS Console System Installation Manual	

2.2 Standards

2.2.1 Fleet Safety and Security Manual (DFO/5737)

2.2.2 TP127E – Ships Electrical Standards

2.2.3 IEEE 45:2002 – Recommended Practice for Electrical Installations on Ships

2.2.4 Specification for the Installation of Shipboard Electronic Equipment (70-000-000-EU-JA-001)

2.2.5 General Information for the Rules and Regulations for the Classification of Ships.

2.3 Regulations

2.3.1 Canada Shipping Act, 2001

Part: 3 TECHNICAL DESCRIPTION

3.1 General

- 3.1.1** The contractor shall supply all equipment, enclosures, ventilation, staging, chain falls, carnage, slings, and shackles necessary to perform the work. All lifting equipment shall be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, or a safe working load for the expected duties.
- 3.1.2** Prior to any hotwork taking place, the contractor shall ensure that the area of work and all equipment, wiring, transits, etc. have been sufficiently protected from any sparks or metal filings, proper fire watches are to be maintain as per Fleet Safety Manual.
- 3.1.3** The Contractor prior to any work starting Chief Engineer must be informed and all equipment must be locked out and tag out as per ISM Fleet Safety Manual.
- 3.1.4** The Contractor must remove all old equipment and wiring that is specified to be replaced and dispose of it as per provincial regulations.
- 3.1.5** All cabling, once installed, shall be marked with a stamped non-ferrous metal tags securely affixed to the cable at each end, and on both sides of glands where the cable passes through decks or watertight bulkheads with the designation for each cable as provided in this specification.
- 3.1.6** All cabling shall follow existing cable trays throughout the vessel where fitted. Once installed, all cabling shall be secured as per TP127. Contractor shall re-use existing cable penetrations and repack with LRS approved products. Alternatively, contractor may choose to replace the existing glands with new Roxtec, or equal LRS approved glands.
- 3.1.7** For the purpose of adjustments, the contractor shall include a unit cost for the supply and install for one (1) Roxtec, or equal LRS approved glands.
- 3.1.8** All cabling which has been deemed surplus as a result of this specification item shall be removed and disposed of at the contractor's expense.
- 3.1.9** The contractor shall dispose of all cables that have been identified for removal below and in the reference drawings attached.

3.1.10 Prior to the commencement of any electrical work, the contractor shall ensure that all electrical supplies feeding the systems have been isolated at the source following an established lockout/tagout procedure.

3.1.11 Upon final installation, testing shall be carried out as per Section 4.2 of this specification item.

3.1.12 Contractor shall remove all the equipment and cabling associated with the GMDSS system as detailed in reference drawings 59015901, 59015001, 59015101, and accompanied in the table below.

L-06 GMDSS Replacement

Cable Removals

Cable Number/Type/Label	Equipment (From)	Equipment (To)	Total Length
ATU Control Cable Belden 9261	250W ATU RT2110 Port Forward Deckhead Bridge Frame 69	T2130 250W Transceiver Located at GMDSS Console	15 meters
ATU RF RG214	250W ATU RT2110 Port Forward Deckhead Bridge Frame 69	T2130 250W Transceiver Located at GMDSS Console	15 meters
LMR-400	Sat C Antenna Stbd Yard Arm of main mast	Sat C Transceiver Located in GMDSS Console frame 53	20 meters
RG-214 MF/HF TeleX Rx	BBMT50 Matching Transformer Bridge Top (upper) Aft Stbd Railing	RM2151 #1 Watch Receiver Navigation Bridge GMDSS Console via H1223	15 meters
RG214 MF/HF DSC RX	BBMT50 Matching Transformer Bridge Top (upper) Aft Stbd Railing	RM2150 Scanner Receiver Navigation Bridge GMDSS Console via H1223	15 meters
RG-58 SP-Bus	T2130 250W Transceiver at GMDSS Console	GMDSS Console Connection Board	3 meters
Belden 9261 Control Cable	T2130 250W Transceiver at GMDSS Console	GMDSS Console Connection Board	3 meters
RG58 RF I/O	T2130 250W Transceiver at GMDSS Console	GMDSS Console Connection Board	3 meters
DC Power	T2130 250W Transceiver at GMDSS Console	N2161 250W Power Supply At GMDSS Console	3 meters
DC Power	GMDSS Console	Skanti DU3000 #2 over GMDSS Console	3 meters
DC Power	GMDSS Console	Skanti VHF #2 under GMDSS Console	3 meters
DC Power	H2096B Under GMDSS Console	GMDSS Console	3 meters
Control Cable	N1674 Charger Unit at GMDSS Console	GMDSS Console	3 meters
DC Power	N2161 Power Supply under GMDSS Console	GMDSS Console	2 meters
DC Power	N1674 Charger Unit at GMDSS Console	H2096B Power Supply under GMDSS Console	3 meters
DC Power	N1674 Charger Unit at GMDSS Console	N2161 Power Supply under GMDSS Console	3 meters
DC Power	N1674 Charger Unit at GMDSS Console	Skanti VHF #1 DSC Controller	3 meters
DC Power	N1674 Charger Unit at GMDSS Console	Skaanti VHF #1 R/T	3 meters

L-06 GMDSS Replacement

AC Feed	Panel EL-3 Beside GMDSS Console	GMDSS Pony Panel under GMDSS Console	2 meters
AC Feed	GMDSS Pony Panel under GMDSS Console	H2096B Power Supply under GMDSS Console	2 meters
AC Feed	GMDSS Pony Panel under GMDSS Console	N2161 Power Supply under GMDSS Console	2 meters
AC Feed	GMDSS Pony Panel under GMDSS Console	N1674 Charger Unit at GMDSS Console	3 meters
AC Feed	Sailor 6222 VHF #1 Over Bridge Chart Table	Panel EL7-22/24	15 meters
AC Feed	Skanti R/T Power Supply in bridge Equipment racks	Panel EL7-13/15	15 meters
AC Feed	EL2-26/28	Electronics Equipment Room Junction Box Labelled Spare	15 meters
RG214 (VHF Antenna)	DU3000 DSC Controller over GMDSS Console	VHF DSC #1 Antenna Located Stbd Side Main Mast Yard Arm	15 meters
RG214 (VHF Antenna)	Skanti3000 VHF Transceiver under GMDSS Console	VHF R/T Antenna Located Stbd Side Main Mast Yard Arm Inverted	15 meters
RG214 (VHF Antenna)	DU3000 DSC Controller over GMDSS Console	VHF DSC #2 Antenna Located Port Side Main Mast Yard Arm	15 meters
RG214 (VHF Antenna)	Skanti3000 VHF Transceiver under GMDSS Console	VHF R/T Antenna Located Port Side Main Mast Yard Arm Inverted	15 meters
LMR-400-UF-FR	VHF #1 Chart Table Overhead Console	Main Mast Port Yard Arm	15 meters
LMR-400-UF-FR	VHF #1 Chart Table Overhead Console	Wheelhouse Top Upper Section Aft Railing	10 Meters
LMR-400-UF-FR	VHF #2 Equipment Rack Aft Bridge	Main Mast Stbd Yard Arm	15 meters
LMR-400-UF-FR	VHF #2 Equipment Rack Aft Bridge	Wheelhouse Top Upper Section Aft Railing	10 meters
SKANTI RG214 TX Cable	Skanti MF/HF Transceiver Bridge Equipment Rack	Wheelhouse Top Aft Port Side Antenna Tuning Unit	15 meters
SKANTI RG214 RX Cable	Skanti MF/HF Transceiver Bridge Equipment Rack	Wheelhouse Top Aft Port Side Antenna Tuning Unit	15 meters
SKANTI Control Cable	Skanti MF/HF Transceiver Bridge Equipment Rack	Wheelhouse Top Aft Port Side Antenna Tuning Unit	15 meters

3.1.13 For the purpose of adjustment, the contractor shall include a unit cost for removal per meter for each type cable.

3.1.14 Contractor shall disconnect and remove all equipment as follows and as detailed in reference drawings.

- N2161 DC Power Supply (Under GMDSS Console)
- T2130 250 Watt Transceiver (at GMDSS Console)
- AT2110 Antenna Tuning Unit (W/H Top Forward Port)
- N1674 Battery Charger (at GMDSS Console)
- H2096B AC/DC Power Supply (Under GMDSS Console)
- Inmarsat C antenna (Main Mast Stbd Yard Arm)
- BBMT50 x 2 (Bridge Top Upper Section)
- Printers x 2 (GMDSS Console)
- Monitors/Keyboards x 2 (GMDSS Console)
- Entire Three (3) Bay GMDSS Console
- 4 VHF Antennas (See Antenna Layout 59015901)
- 3 MF/HF Antennas
- Skanti Transceiver, Control Head, Power Supply (Bridge Equipment Rack), & ATU on Wheelhouse Top.
- Intech 1511 Watch Receiver (Bridge Equipment Rack)

“Pictures of above equipment as reference for removal are available upon request”

3.1.15 Contractor shall remove the GMDSS Pony Panel under GMDSS Console. This panel is paralleled off the adjacent panel EL3. Please ensure this panel is isolated via breaker in emergency generator room.

“Chief Engineer is to be notified of this so panel index can be updated accordingly”

Circuit #'s for isolations are as follows;

- EL3 via emergency switch board in emergency generator room
- EL7-13/15
- EL2-26/28

3.1.16 Contractor shall install a new owner supplied Sailor 6000 series GMDSS console for Sea Area A3, as detailed in reference drawings. The system consists of the following

- Transceiver unit Class A 250 Watt MF/HF with 6 Channel DSC watch receiver with associated antenna tuning unit (Transceiver mounted in bridge deck head fwd stbd in place of old).
- Power Supply x3 and Battery Charger x2 (Under GMDSS Console)
- Three bay prewired GMDSS Console for table top mount comprising of one telex terminal complete with one (1) monitor, two (2) keyboards, and two (2) printers, one (1) Mini-C monitor, one (1) MF/HF control unit and one

VHF Radio with audio replay option), one (1) dimmable light (in place of old console)

- **4 VHF antennas (Sinclair VHF 156-162.5 Mhz CGLS model) Relocate to new locations as per antenna layout drawing # 59015901**
- **1 Comrod MF/HF receiving antenna for DSC/Telex RX operation location as per antenna layout drawing # 59015901**
- Mini C terminal with Sat C Antenna
- 2 VHF DSC Class A Radio's with audio replay option, and associated connection boxes and power converters and supplies.
- Ethernet Switches
- One MF/HF Remote Control Unit
- One (1) Sailor 6390 Navtex Receiver, Display, and Antenna
- One (1) alarm panel connected via Ethernet for mini-c system

3.1.17 The contractor shall work in conjunction with a Coast Guard Electronic Technician to oversee the installation of the new GMDSS system to ensure compliance with applicable Coast Guard standards. Terminations of all equipment shall be completed by CCG technicians with the exception of those for electrical supply which shall be the contractor's responsibility as well as grounding requirements.

3.1.18 All electronic components removed from the vessel resulting from the performance of this specification shall be safely stored and returned to the owner as these components shall be used to service similar systems on CCG vessels.

3.1.19 A new desk has been premade to go in the location for the existing GMDSS desk and will be installed by outside contractor who was responsible for fabricating it.

3.1.20 Once the old desk is removed and the new one installed the contractor shall mount the new console on the newly installed desk.

3.1.21 The Contractor shall supply and install a junction box with proper terminals near the battery chargers and power supplies so the DC feed can be split to feed #1 & #2 Battery Charger/Power Supplies as shown in reference drawing.

3.1.22 Contractor shall install all new equipment and cabling associated with the GMDSS system as detailed in reference drawings and in the table below and according to manufacturer's installation manuals. **"Please note items in red in the table below"**.

L-06 GMDSS Replacement

3.1.23 Contractor shall remove antenna cables from equipment side first before removing antennas as to ensure the wrong antenna is not removed.

Cable Number/Label & Type	Equipment (From)	Equipment (To)	Total Length
GMD-2 LMR-400-UF-FR	250W ATU 6381 Port Forward W/H Top ATU Enclosure	Sailor 6363 250 W MF/HF Transceiver DSC Watch Receiver to be located under GMDSS Desk	20 meters
GMD-1 LMR-400-UF-FR	Sailor 6363 150 W MF/HF Transceiver DSC Watch Receiver to be located under GMDSS Desk	DSC/Telex Receive Antenna located wheelhouse top (upper) railing frame 86 Starboard	15 meters
GMD-5 NMEA 2000 Mini Device Cable Mini-C Factory Cable (SWE)	Sat C Antenna main mast Stbd Yard Arm	Sat C Transceiver Navigation Bridge GMDSS Console	30 meters
GMD-3 LMR-400-UF-FR	VHF #1 R/T in GMDSS Console	Main Mast Port Yard Arm	15 meters
GMD-4 LMR400 UF-FR Coax	VHF #1 DSC in GMDSS Console	Main Mast Inverted	15 meters
GMD-6 LMR-400-UF-FR	VHF #2 R/T Chart Table Overhead Console	Main Mast Stbd Yard Arm	15 meters
GMD-7 LMR-400-UF-FR	VHF #2 DSC Chart Table Overhead Console	Main Mast Inverted	15 meters
VHF #3-R/T LMR-400 UF-FR	VHF #3 R/T Equipment Rack Bridge	Wheelhouse Top Upper Section Aft Railing	10 meters
VHF #3 DSC LMR-400-UF-FR	VHF #3 DSC Equipment Rack Bridge	Wheelhouse Top Stbd Side Post	10 meters
GMD-8 Canbus Communications Cable (SWE)	Sailor 6363 Transceiver Unit 250W MF/HF with 6 Ch. DSC Watch Receiver Under GMDSS Console	GMDSS Console	6 meter Factory Cable
GMD-9 LAN Cable Belden 1300SB Cat5e CCG Supply and Install	Sailor 6363 Transceiver Unit 250W MF/HF with 6 Ch. DSC Watch Receiver Under GMDSS Console	Sailor 6197 Moxa Switch Under GMDSS Console	3 meters
GMD-19 Power Cable 6/3 Marine AC Approved Cable Shielded	Sailor 6363 Transceiver Unit 250W MF/HF with 6 Ch. DSC Watch Receiver Under GMDSS Console	Sailor 6081 P/S & Charger Unit #1 under GMDSS Console	2 meters
GMD-14 Power Cable 6Awg 3 Conductor Marine Approved Shielded	GMDSS Battery Junction Box under GMDSS Console	Sailor 6081 P/S & Charger Unit #1 under GMDSS Console	2 meters
GMD-24 Power Cable 6Awg 3 Conductor Marine Approved Shielded	GMDSS Battery Junction Box under GMDSS Console	Sailor 6081 P/S & Charger Unit #2 under GMDSS Console	2 meters

L-06 GMDSS Replacement

GMD-17 LAN Cable Belden 1300SB Cat5e CCG Supply and Install	Sailor 6197 Moxa Switch under GMDSS Console	Sailor 6081 P/S & Charger Unit #1 in Bridge Crawl Space	3 meters
GMD-23 LAN Cable Belden 1300SB Cat5e CCG Supply and Install	Sailor 6197 Moxa Switch under GMDSS Console	Sailor 6081 P/S & Charger Unit #2 in Bridge Crawl Space	3 meters
GMD-11 12/3 Marine AC Cable with Internal Braided Shield	Sailor 6081 P/S & Charger Unit #1 under GMDSS Console	GMDSS Console	3 meters
GMD-12 12/3 Marine AC Cable with Internal Braided Shield	Sailor 6081 P/S & Charger Unit #1 under GMDSS Console	GMDSS Console	3 meters
GMD-15 12/3 Marine AC Cable with Internal Braided Shield	Sailor 6081 P/S & Charger Unit #1 under GMDSS Console	GMDSS Console	3 meters
GMD-16 12/3 Marine AC Cable with Internal Braided Shield	Sailor 6081 P/S & Charger Unit #1 under GMDSS Console	GMDSS Console	3 meters
GMD-18 12/3 Marine AC Cable with Internal Braided Shield	Sailor 6081 P/S & Charger Unit #1 under GMDSS Console	Sailor 6101 Mini-C Alarm Panel	2 meters
GMD-31 6 Conductor 18Awg Marine Control Cable	Sailor 6081 P/S & Charger Unit #1 under GMDSS Console	Sailor 6081 P/S & Charger Unit #2 under GMDSS Console	2 meters
GMD-28 LAN Cable Belden 1300SB Cat5e CCGS Supply and Install	Sailor 6197 Moxa Switch under GMDSS Console	Sailor 6197 Moxa Switch in GMDSS Console	2 meters
GMD-20 12/3 Marine AC Cable with Internal Braided Shield	Sailor 6081 P/S & Charger Unit #2 under GMDSS Console	GMDSS Console	3 meters
GMD-25 12/3 Marine AC Cable with Internal Braided Shield	Sailor 6081 P/S & Charger Unit #2 under GMDSS Console	GMDSS Console	3 meters
GMD-26 12/3 Marine AC Cable with Internal Braided Shield	Sailor 6081 P/S & Charger Unit #2 under GMDSS Console	GMDSS Console	3 meters
GMD-21 12/3 Marine AC Cable with Internal Braided Shield	Sailor 6081 P/S & Charger Unit #2 under GMDSS Console	Sailor 6090 Power Converter Chart Table overhead console	10 meters
GMD-27 LAN Cable Belden 1300SB Cat5e CCG Supply Contractor Install	Sailor 6197 Moxa Switch under GMDSS Console	VHF #2 Bridge Chart Table overhead console	10 meters
GMD-30 LAN Cable Belden 1300SB Cat5e	Sailor 6197 Moxa Switch in GMDSS Console	Sailor Mini-C Alarm Panel On GMDSS Console	1 meters

L-06 GMDSS Replacement

CCG Supply/Install			
GMD-29 Belden 2Pr-22	DD20 GPS Distribution Aft Stbd Bridge	GMDSS Console	15 meters
GMD-32 6 STP Marine Approved Cable	GMDSS Console	Bridge Equipment Rack	15 meters
GMD-33 LAN Cable Belden 1300SB	Sailor 6197 Moxa Switch #3 under GMDSS Console	Sailor 6301 External Control Head	15 meters
Navtex-1 LAN Cable Belden 1300SB Cat5e	Sailor 6197 Moxa Switch #2 in GMDSS Console	Sailor 6390 Navtex Receiver Bridge Equipment Rack	10 meters
Navtex -2 LAN Cable Belden 1300SB CCG Supply/Install	Sailor 6390 Navtex Receiver Bridge Equipment Rack	Sailor 6004 Navtex Display Bridge Equipment Rack	2 meters
Navtex-3 Power Cable Belden 9367 CCG Supply and Connect	Weildmueller Terminals In Bridge Equipment Rack	Sailor 6390 Navtex Receiver Bridge Equipment Rack	1 meters
Navtex-4 Power Cable Belden 9367	Weildmueller Terminals in Bridge Equipment Rack	Sailor 6004 Navtex Display Bridge Equipment Racks	1 meters
Navtex-5 Power Cable (Existing) CCG Supply and Connect	24Vdc Supply From DC1 Panel on Bridge	Weildmueller Terminals In Bridge Equipment Rack	N/A
VHF #3 – GPS LAN Cable Belden 1300SB	VHF #3 Bridge Equipment Racks	Moxa Switch Under GMDSS Console	10 meters
AC Feed 14/3 Marine Approved Cable	EL7-13/15 on Bridge	Sailor 6081 P/S & Charger Unit #1 under GMDSS Console	15 meters
AC Feed 14/3 Marine Approved Cable	EL2-26/28 on Bridge	Sailor 6081 P/S & Charger Unit #2 under GMDSS Console	15 meters

3.1.24 For the purpose of adjustment, the contractor shall include a unit cost per meter for each type cable installed.

3.1.25 Contractor shall be responsible for all AC and DC power terminations at panels and junction boxes.

3.1.26 Contractor shall be responsible for supplying material for grounding all equipment as per manufacturer's recommendations as well as grounding all equipment.

3.2 Location

3.2.1 Navigating Bridge Deck

3.2.2 Wheelhouse Top

3.3 Interferences

3.3.1 Contractor is responsible for the identification of interference items, their temporary removal, storage, and refitting to vessel. Representative interferences will be available for viewing prior to the bidder's conference.

Part: 4 PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1 All work shall be subject to witness by the Chief Engineer of delegate and the attending surveyor.

4.2 Testing

4.2.1 Electronic equipment which has been removed for the performance of this specification item shall be returned to operational condition.

4.2.2 Contractor shall ensure all relocated equipment is in proper working order witnessed and at the satisfaction of the Chief Engineer.

4.2.3 Contractor shall check all cables after installations to ensure operational capability. Should any cable fail to pass testing, the cable shall be replaced at the contractor's expense.

4.2.4 All cable testing shall be verified by Coast Guard Technician.

4.2.5 Contractor shall ensure new AC/DC circuits are proven operational

CCGS Leonard J. Cowley

70.0m Fisheries Patrol Vessel

Steel Renewal IWO Side Shell Damage

OUTLINE SCOPE OF WORK

Doc. No. 17-136-001

Rev. 0

29 August 2017

Prepared For:

CCG Supervisor / Engineering - St. John's

P.O. Box 5667

St. John's, NL A1C 5X1


Prepared By:

Poseidon Marine Consultants Ltd.

391 Stavanger Drive

St. John's, NL, Canada A1A 0A1



	CCGS LEONARD J. COWLEY STEEL RENEWAL IWO SIDE SHELL DAMAGE OUTLINE SCOPE OF WORK	29 August 2017
---	---	----------------

DOCUMENT INFORMATION

Rev	Date	Description	Prepared	Checked	Approved
0	29 Aug 17	Issued For CCG Review	L. Bragg	A. Mercer	-


REVISION SUMMARY

Rev	Affected Sections	Remarks	By

	CCGS LEONARD J. COWLEY STEEL RENEWAL IWO SIDE SHELL DAMAGE OUTLINE SCOPE OF WORK	29 August 2017
---	---	----------------

TABLE OF CONTENTS

1.0 PURPOSE	4
2.0 REFERENCE DRAWINGS AND DOCUMENTS	4
3.0 DEFINITIONS AND ABBREVIATIONS	4
4.0 GENERAL REQUIREMENTS	4
2.3 ACCEPTANCE OF THE WORK	4
2.4 MATERIALS AND WELDING	4
2.5 EXECUTION OF THE WORK	5
5.0 SCOPE OF RENEWALS	7
5.1 HULL SIDE SHELL (FRS. 4-7 APPROX.; STBD SIDE)	8
ANNEX A	
PHOTOGRAPHS	

	CCGS LEONARD J. COWLEY STEEL RENEWAL IWO SIDE SHELL DAMAGE OUTLINE SCOPE OF WORK	29 August 2017
---	---	----------------

1.0 PURPOSE

This document is intended to provide a baseline scope of work pertaining to steel renewals in way of the subject vessel's side shell plating, further to a visual survey of damage.

NOTE: The extent of renewals as reflected in this specification is subject to approval by LR.

2.0 REFERENCE DRAWINGS AND DOCUMENTS

CCG Dwg. No. 590-01	Shell Expansion
CCG Dwg. No. 590-70	General Arrangement – Upper, Main Deck and Hold

3.0 DEFINITIONS AND ABBREVIATIONS

Contractor	TBD	Refit/Repairer
CCG	DFO - Canadian Coast Guard	Vessel Owner
PMC	Poseidon Marine Consultants Ltd.	Owner's Representative
LR	Lloyd's Register	Flag Admin / Inspection Authority

4.0 GENERAL REQUIREMENTS

4.1 Acceptance of the Work


All work shall be completed to the satisfaction of CCG and LR.

The Contractor shall provide appropriate steel certificates and welding procedures to LR, in accordance with the criteria listed below. The Contractor shall establish critical milestones at which the work may be inspected.

2.5 Materials and Welding

Unless otherwise specified, all new plating shall be provided with appropriate certification, owing to the grade of steel required for each renewal as per Section 5.0. Note: Steel grades involved include Lloyd's Register Grade 'E' for plating or approved equivalent, and Lloyd's Register Grade 'A' or approved equivalent for stiffeners.

All welding shall be completed by electrodes as required for specific weld procedures.

	<p align="center">CCGS LEONARD J. COWLEY STEEL RENEWAL IWO SIDE SHELL DAMAGE OUTLINE SCOPE OF WORK</p>	<p align="center">29 August 2017</p>
---	---	--------------------------------------

2.6 Execution of the Work

In general, the Contractor shall progress repairs in a manner that:

- regards prevailing and forecasted weather conditions, such that CCG property and equipment is suitably sheltered where applicable.
- does not compromise the structural integrity of the vessel.
- enables periodic and systematic inspections of ongoing and completed work by CCG and LR.

In preparation for steel renewals, the Contractor shall:


- provide all ancillary services necessary to complete the subject repair. These may include, but are not limited to strip out, craneage, staging, cleaning, debris removal, water, shore power, etc.
- remove furnishings, fittings, fixtures, linings, deck coverings, etc. as required to complete cropping and renewal of steelwork.
- provide all appropriate permits for entrance into and completion of welding in confined spaces.
- ensure new steel is shot blasted and coated with weldable primer prior to placement onboard.

During the completion of hot work, the Contractor shall:


- supply fire watch while hot work is ongoing, with appropriate class portable fire extinguisher and charged fire hose ready for use.
- utilize existing seams/butts as practical when completing plate renewals. Where no butts/seams are present in the vicinity of new steel, corners to have a minimum radius of 100mm.
- maintain a minimum parallel separation between seams of 100mm.
- extend new welding a minimum 100mm past perpendicular seams to release stresses.
- subject work to inspection as coordinated with CCG and LR personnel.

Following the completion of hot work in specific areas of the vessel, the Contractor shall:

- complete ND testing and subject work to final inspections by CCG and LR.

	CCGS LEONARD J. COWLEY <u>STEEL RENEWAL IWO SIDE SHELL DAMAGE</u> OUTLINE SCOPE OF WORK	29 August 2017
---	--	----------------

- subject to the requirements of the attending LR surveyor, new seams shall be subjected to 100% UT testing, while all tee connections shall be subjected to 100% MPI.
- clean affected spaces and remove debris from vessel.
- Reinstall furnishings, fittings, fixtures, linings, deck coverings, as was existing.
- clean and apply primer to welded seams and other disturbed areas. Apply internal and external coatings as directed by CCG personnel.

	CCGS LEONARD J. COWLEY <u>STEEL RENEWAL IWO SIDE SHELL DAMAGE</u> OUTLINE SCOPE OF WORK	29 August 2017
---	--	----------------


3.5 SCOPE OF RENEWALS

Renewal of side shell plating and internal structure shall be completed in the regions listed below.

Areas and offsets indicated are approximate and shall be confirmed onsite by Contractor prior to renewal, in conjunction with CCG or their designate.

See **Annex A** for photographs relevant to areas subject to renewal.

Note: Indicated steel grade is based on equivalency with referenced vessel drawings.

	CCGS LEONARD J. COWLEY STEEL RENEWAL IWO SIDE SHELL DAMAGE OUTLINE SCOPE OF WORK	29 August 2017
---	---	----------------


3.6 Hull Side Shell (Frs. 4-7 approx.: STBD SIDE)

3.6.2. Shell Plating

	Longitudinal Extent	Vertical Extent	Steel Grade	Approx. Area	New Plate Thickness
a.	16" aft of BHD at Fr. 5 to 26" forward of BHD at Fr. 5	15" below main deck downward 2ft.	LR 'E'	~0.75 m ²	5/8"

3.6.3. Side Shell Stiffening

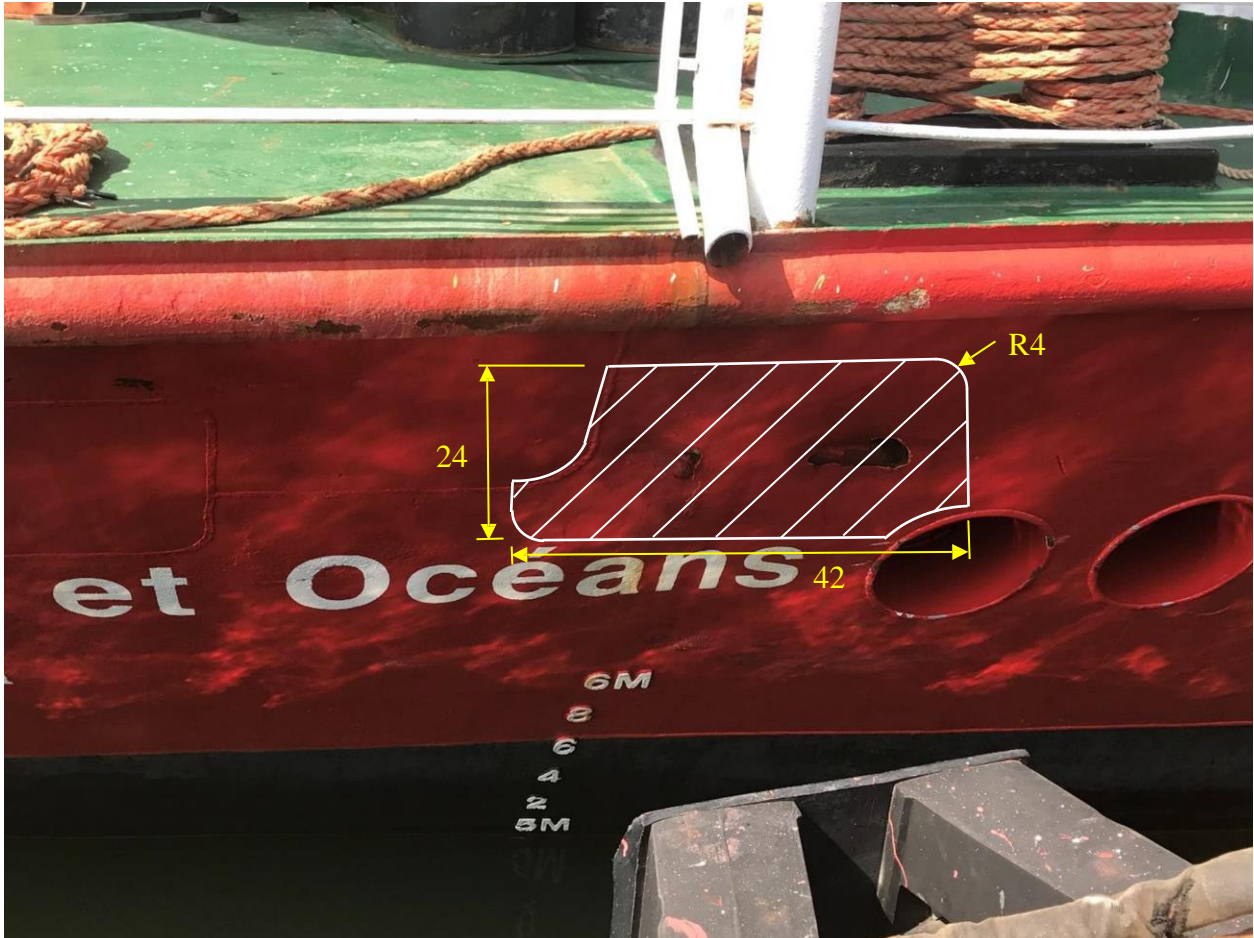
Internal stiffening and intermediate stiffening between frames 5 to 7 to be visually inspected once strip out is complete. If stiffeners are “tripped”, stiffeners to be cropped and renewed per original for full extent of plating renewal.

	CCGS LEONARD J. COWLEY <u>STEEL RENEWAL IWO SIDE SHELL DAMAGE</u> OUTLINE SCOPE OF WORK	29 August 2017
---	---	----------------

ANNEX A
PHOTOGRAPHS

CCGS LEONARD J. COWLEY
STEEL RENEWAL IWO SIDE SHELL DAMAGE
OUTLINE SCOPE OF WORK

29 August 2017



Photograph One: Side Shell Renewal

Appendix B

Spec item #: HD-27	SPECIFICATION	LLOYDS #
Appendix B		

Appendix “B”

CCGS Leonard J Cowley

70.0m Fisheries Patrol Vessel

Steel Renewals IWO Navigation Bridge Deckhead

Technical Specification

Doc. No. 17-123-001

Rev. 1

29 August 2017

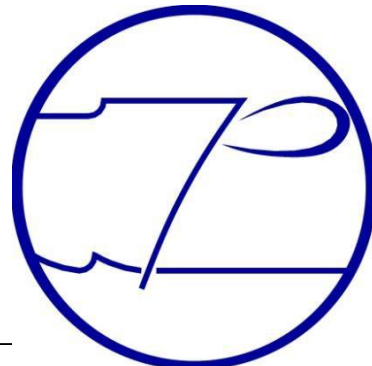
Prepared For:


CCG Supervisor / Engineering - St. John's
P.O. Box 5667
St. John's, NL A1C 5X1

Prepared By:

Poseidon Marine Consultants Ltd.
391 Stavanger Drive St.

John's, NL A1A 0A1
Doc. No. 17-136-001
Rev. 0



	CCGS LEONARD J COWLEY STEEL RENEWALS IWO NAVIGATION BRIDGE DECKHEAD TECHNICAL SPECIFICATION	29 AUGUST 2017
---	---	----------------

DOCUMENT INFORMATION

Rev	Date	Description	Prepared	Checked	Approved
0	10 August 2017	Issued for CCG for Review	L. Bragg	D. Dyke	-
1	29 August 2017	Issued for CCG/LR Review	L. Bragg	A. Mercer	

REVISION SUMMARY

Rev	Affected Sections	Remarks	By
1	5.1.1, 5.1.2	Areas to be renewed updated, and 5.1.2 added	LB



	CCGS LEONARD J COWLEY <u>STEEL</u> <u>RENEWALS IWO NAVIGATION</u> <u>BRIDGE</u> <u>DECKHEAD</u> TECHNICAL SPECIFICATION	29 AUGUST 2017
---	---	----------------

TABLE OF CONTENTS

1.0 PURPOSE	4
2.0 REFERENCE DRAWINGS AND DOCUMENTS	4
3.0 DEFINITIONS AND ABBREVIATIONS	4
4.0 GENERAL REQUIREMENTS	4
2.6 ACCEPTANCE OF THE WORK	4
2.7 MATERIALS AND WELDING	4
2.8 EXECUTION OF THE WORK	5
5.0 SCOPE OF RENEWALS	7
5.1 NAVIGATION BRIDGE DECKHEAD	7
APPENDIX A	PHOTOGRAPHS AND SKETCHES
APPENDIX B	ETS REPORTS

	CCGS LEONARD J COWLEY STEEL RENEWALS IWO NAVIGATION BRIDGE DECKHEAD TECHNICAL SPECIFICATION	29 AUGUST 2017
---	---	----------------

1.0 PURPOSE

This document is intended to provide a baseline scope of work pertaining to steel renewals in way of the subject vessel's Navigation Bridge Deckhead, further to UT readings, and visual survey.

NOTE: The extent of renewals as reflected in this specification is subject to acceptance by Lloyd's Register.

2.0 REFERENCE DRAWINGS AND DOCUMENTS

CCG Dwg No. 550-13	Wheelhouse and Funnel Structure
ETS Report No. 17-605	UT Readings
ETS Report No. 17-648	UT Readings

3.0 DEFINITIONS AND ABBREVIATIONS

Contractor	TBD	Refit/Repairer
CCG	DFO - Canadian Coast Guard	Vessel Owner
PMC	Poseidon Marine Consultants Ltd.	Owner's Representative
LR	Lloyd's Register	Inspection Authority

4.0 GENERAL REQUIREMENTS

4.1 Acceptance of the Work

All work shall be completed to the satisfaction of CCG and LR.

The Contractor shall provide appropriate steel certificates and welding procedures to LR, in accordance with the criteria listed below. The Contractor shall establish critical milestones at which the work may be inspected.

4.2 Materials and Welding

Unless otherwise specified, all new plating shall be provided with mill certification to CSA G40.21 Grade 44W, or an equivalent as approved by the attending LR surveyor. Aluminum plating material to be Aluminum Alloy 5086 or approved equivalent.

All welding shall be completed using electrodes as required for specific weld procedures.

	<p align="center">CCGS LEONARD J COWLEY STEEL RENEWALS IWO NAVIGATION BRIDGE DECKHEAD TECHNICAL SPECIFICATION</p>	<p align="center">AUGUST 2017</p>
---	--	-----------------------------------

29

4.3 Execution of the Work

In general, the Contractor shall progress repairs in a manner that:


- regards prevailing and forecasted weather conditions, such that CCG property and equipment is suitably sheltered where applicable.
- does not compromise the structural integrity of the vessel.
- enables periodic inspections of ongoing and completed work by CCG and LR.

In preparation for steel renewals, the Contractor shall:

- provide all ancillary services necessary to complete the subject repair. These may include, but are not limited to strip out, temporary removal of interference items, craneage, staging, cleaning, debris removal, water, shore power, etc.
- remove fittings, fixtures, linings, deck coverings, machinery, etc. as required to complete cropping and renewal of steelwork.
- provide all appropriate permits for entrance into and completion of welding in confined spaces.
- ensure new steel is shot blasted and coated with weldable primer prior to placement onboard.


During the completion of hot work, the Contractor shall:

- supply fire watch while hot work is ongoing, with appropriate class portable fire extinguisher and charged fire hose ready for use.
- utilize existing seams/butts as practical when completing plate renewals. Where no butts/seams are present in the vicinity of new steel, corners to have a minimum of 100mm radius. Steel renewals are to follow good ship repair practices generally in accordance with IACS 47.
- Maintain a minimum parallel separation between seams of 100mm.
- Extend new welding a minimum 100mm past perpendicular seams to release stresses.
- subject work to inspection as coordinated with LR and CCG personnel.

	CCGS LEONARD J COWLEY STEEL RENEWALS IWO NAVIGATION BRIDGE DECKHEAD TECHNICAL SPECIFICATION	29 AUGUST 2017
---	---	----------------

Following the completion of hot work in specific areas of the vessel, the Contractor shall:

- engage qualified person(s) to complete ND testing, 100% visual and 100% UT of butts welds or as otherwise agreed with LR. Subject work to final inspections by CCG and LR.
- clean affected spaces and remove debris from vessel.
- clean and apply primer to welded seams and other disturbed areas. Apply internal and external coatings as directed by CCG personnel.
- Reinstate linings, outfit wirings, insulation as per CCG direction.

	CCGS LEONARD J COWLEY STEEL RENEWALS IWO NAVIGATION BRIDGE DECKHEAD TECHNICAL SPECIFICATION	
---	---	--

5.1 SCOPE OF RENEWALS

Renewals/modifications shall be completed in the regions listed below. Areas indicated are approximate and shall be confirmed on site by the Contractor prior to renewal, in conjunction with CCG personnel or their approved designate.

5.2 Navigation Bridge Deckhead

The following items are to be completed IWO the Navigation Bridge Deckhead above the stairwell, electronics room, and water closet inside the funnel. Space is accessed through hatch located in water closet on Navigation Bridge. Following all necessary work, area is to be coated with epoxy coating per CCG direction.

5.2.1 Deck Plating (Fr. 46-50)

Existing steel plating is to be cropped and renewed as follows:

	Transverse Extent	Longitudinal Extent	Reference	Approx. Area	New Plate Thickness
a.	Full extent	Forward extent of plate to aft extent of plate	Sketch #1 App. B	~130 ft ²	5/16"


Existing delta couple (bi-metallic strip) is to remain intact as much as possible. If bi-metallic strip is damaged or cut, strip is to be replaced as required at aluminum funnel side shell plating.

5.2.2 Funnel Side Shell Stiffening (Fr. 46-50)

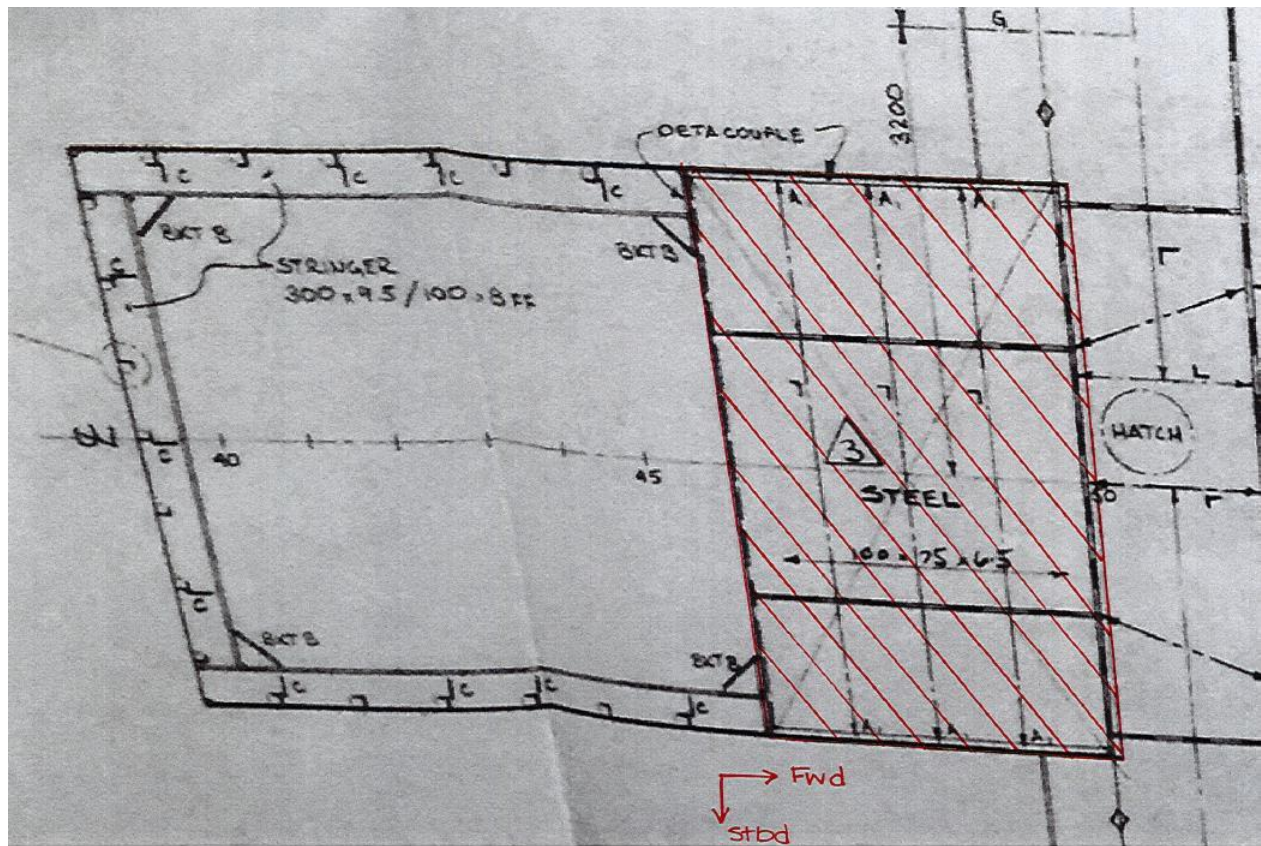
Existing aluminum funnel side stiffeners are to be cropped at bottom to remove existing wastage. Eight stiffeners, four port and starboard, to be zip cut to return edge to original aluminum thickness. Refer to photograph #1.

5.2.3 Funnel Side Shell (Fr. 49-50 Approx.)

Hole existing approximately 3" forward of doubler plate on stardboard side shell IWO funnel louver is to be filled with aluminum weld.

	CCGS LEONARD J COWLEY <u>STEEL</u> <u>RENEWALS IWO NAVIGATION</u> <u>BRIDGE</u> <u>DECKHEAD</u> TECHNICAL SPECIFICATION	29 AUGUST 2017
---	---	----------------

APPENDIX A
PHOTOGRAPHS AND SKETCHES



Sketch 1: Areas to be cropped and renewed




**CCGS LEONARD J COWLEY STEEL
RENEWALS IWO NAVIGATION BRIDGE
DECKHEAD
TECHNICAL SPECIFICATION**

29 AUGUST 2017



Photograph 1: Funnel side stiffeners to be cropped

	CCGS LEONARD J COWLEY STEEL RENEWALS IWO NAVIGATION BRIDGE DECKHEAD TECHNICAL SPECIFICATION	29 AUGUST 2017
---	---	----------------

APPENDIX B
ETS Reports

Visual Inspections Radiography
& Ultrasonics Mag & Penetrant
Inspections Eddy Current
Testing Structural Steel &
Torque

Eastern Technical Services Ltd

PO Box 13517,
709-726-4622

St. John's, NL., A1B 4B8
27 Austin St. Fax 726-4626

Technical Reports
Engineering Studies
Gas Free Testing
Destructive Testing
Insurance Reports

Ultrasonic Report

ETS No.: 17-605

Copy: CECowley@dfo-mpo.gc.ca

Date: 03 August, 2017
Received:

Date 03 August, 2017

Client: D.F.O. Can. Coast Guard,
Directorate, P.O.Box 5667, St. John's,
NL.,

Inspected
by:

A1C 5X1

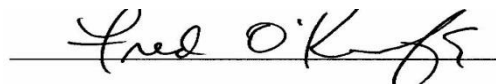
Attn: Mr. Bill Ping
by:
P.O. No.:

Inspected M. Tulk, B.Sc
ASNT TC-1A UT,ET,PT,MT Level II.

Project: C.C.G.S. Leonard J. Cowley -
Funnel Top Deck Plating

Testing Required Ultrasonic Thickness Inspection

Signed:



N.D.E. Supervisor

Remarks

As directed, our technicians performed ultrasonic thickness readings on the deck plating at the top of the funnel of the above noted vessel. Results are shown in (mm) on the attached sketch.

Equipment Used

Krautkramer DMS 2 digital thickness gauge (S/N 00MMRRF).

Krautkramer TC560 probe (S/N 00M581).

Various steel calibration blocks (0.100 to 0.500 " step wedge). Sonotech

Echogel 20 couplant

ETS No.: 17-605, Date: 03 August 2017 Client:
D.F.O. Can. Coast Guard Directorate, Project:
C.C.G.S. Leonard J. Cowley
Testing Required: Ultrasonic Thickness Inspection.

Funnel Top Deck Plating - Starboard (Above Bridge W.C.)

Forward

Port	<i>Frame 50</i>		4.0	4.6	Starboard
			5.9	4.6	
	<i>49</i>		5.8	6.4	
			5.1	6.5	
			5.5		
	<i>48</i>		4.1	6.3	
				5.9	
	<i>47</i>		5.4	6.5	
			5.6	5.4	
	<i>46</i>		4.9	5.6	

Original Thickness - 6.5mm (30% wastage - 4.6mm)

ETS No.: 17-605, Date: 03 August 2017

Client: D.F.O. Can. Coast Guard Directorate,

Project: C.C.G.S. Leonard J. Cowley

Testing Required: Ultrasonic Thickness Inspection

Funnel Top Deck Plating - Port (Above Electronics Room)

Forward

Frame 50

Port

Starboard

	6.3		5.7
49	6.3		5.2
	6.2		5.5
48	5.7		5.4
	6.2		5.0
47	6.3	4.8	5.2
	5.6		4.5
	5.6		4.8
46	5.0		4.1

Original Thickness - 6.5mm (30% Wastage - 4.6mm)

Visual Inspections Radiography
& Ultrasonics Mag & Penetrant
Inspections Eddy Current
Testing Structural Steel &
Torque

Eastern Technical Services Ltd

PO Box 13517,
709-726-4622

St. John's, NL., A1B 4B8
27 Austin St. Fax 726-4626

Technical Reports
Engineering Studies
Gas Free Testing
Destructive Testing
Insurance Reports

Ultrasonic Report

ETS No.: 17-648-1

Copy:

Date: 24 August 2017

Date: 23 August 2017

Received:

Client: D.F.O. Can. Coast Guard,
Directorate, P.O.Box 5667, St. John's,
NL.,
A1C 5X1

Inspected by: C. Purcell, B.Sc. Chem., C.N.S.C., C.E.D.O., ASNT
TC-1A RT, UT, ET, MT, PT level II. CAN/CGSB
48.9712 MT/PT level II, ET/UT level I

Inspected by: T. Baird
ASNT TC-1A UT/ET/MT/PT level II CAN/CGSB
48.9712 MT Level II

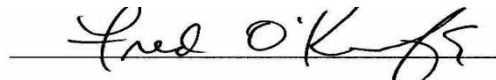
Attn: Mr. William Ping
by:
P.O. No.:

Directed Fred O'Keefe, B.Sc., C.E.T.
C.W.B. W178.2 Visual Level III.
CAN/CGSB 48.9712 & ASNT TC-1A
RT (Gen. & A/S), UT, MT, PT, ET Level III

Project: C.C.G.S. Leonard J. Cowley -
Navigation Bridge Deck Head

Testing Required Ultrasonic Thickness Inspection

Signed:



N.D.E. Supervisor

Remarks

As directed, our technicians performed ultrasonic thickness readings on the navigation bridge deck head on the above noted vessel. Results are shown in (mm) on the attached sketch.

Equipment Used

Krautkramer DMS 2 digital thickness gauge (S/N 00MMRRF).

Krautkramer TC560 probe (S/N 00M581).

Various steel calibration blocks (0.100 to 0.500 " step wedge). Sonotech

Echogel 20 couplant

