# CCGS Leonard J Cowley
# VLE Drydocking Refit  2015 (rev 7)

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# PREAMBLE

## 1.1 Intent

These project requirements are supplied to the contractor outlining the objectives, performance, standards and engineering requirements for the Vessel Life Extension 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, Vessel Life Extension Project 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 Life Extension Refit

Project:

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 monthly 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. The Contractor shall provide a photographic survey of the inspection to the Chief Engineer and the Technical Authority.

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 Life Extension Refit Project.

### 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 monthly 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 monthly 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 monthly 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 monthly 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.

The PMBoK 2000 must be used as the reference for scheduling.

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

1.11.7 Project Reporting

The Contractor shall provide a monthly 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 monthly, three (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 cranage 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 form 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 | Engine 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) |
| 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

| 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 Vessel Life Extension Project

Officer donald.hartery@dfo-mpo.gc.ca, Senior Vessel Maintenance Manager mike.chaisson@dfo-mpo.gc.ca and to the PWGSC Contracting Officer dan.byron@tpsgc-pwgsc.gc.ca 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, Vessel Life Extension Project Officer 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 Vessel Life Extension Project Officer 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**

| 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 cranage/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 the last month of refit for normal operations of the vessel freshwater system. 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.

**.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.

ii. Three (3) parking spaces near the office space (referenced in 3.1.10) 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 500,000 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 responsiblity 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 $m^3$) minimum capacity shall be used. Contractor to remove garbage from work areas on the ship on a daily basis. Cost of cranage 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 Cranage**:

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 provide dedicated personnel for continuous on-board monitoring of the interior and exterior of the vessel. In addition to requirements related to hot work, the Contractor must provide security rounds of the vessel, at a minimum of every 4 hours, outside of the main working hours. These rounds must include a visual inspection of each compartment, and any adverse condition that could affect the vessel must be actioned immediately. Records of these rounds must be presented to the Chief Engineer upon request.

**iv.** 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.

**v.** 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 Facilities for Government Personnel:**

The Contractor shall provide a minimum of 500 square feet of secure office space with the following requirements for CG and PWGSC personnel:

i. Two (2) lockable offices with a minimum of 200 square feet each.
ii. One (1) boardroom with furnishings to seat ten (10) people (arrangements shall consist of one large boardroom table with seating for ten). The boardroom shall also be furnished with a 4 foot by 6 foot whiteboard on one wall.
iii. Three (3) desks, full size with double pedestals containing drawers:
iv. Desk drawers shall be lockable;
v. One (1) desk shall be an "L" shaped secretary style desk with side tables;
vi. One (1) desk size table ;

vii. Ten (10) chairs, of which six (6) shall be fully adjustable and fitted with a swivel base and casters (in addition to the boardroom furnishings);
viii. Two (2) bookcases – 4 foot wide by 6 foot height;
ix. Three (3) filling cabinets – four (4) drawers per cabinet. All cabinets are to be lockable.
x. Four (4) keys shall be provided for each lockable door, desk and filing cabinet;
xi. Three (3) direct telephones – one (1) of which shall be in the boardroom;
xii. Three (3) high speed internet connections;
xiii. One (1) fax machine with dedicated outside line. The fax machine shall use ordinary paper;
xiv. One (1) office copier capable of handling 8.5 by 11 inch paper, 8.5 by 14 inch paper and 11 by 17 inch paper sizes. The copier shall be equipped with an auto sheet feeder and serviceable within two (2) hours of any breakdowns
xv. The offices shall be supplied with heating, ventilation/air conditioning, and lighting as per provincial health and occupancy regulations.
xvi. Washroom facilities shall be located close by.
xvii. All of the above equipment and facilities shall be clean and in good condition to the full satisfaction of Canada.

**.11 Storage Space**

i. The Contractor must provide a minimum of 278.709 square meters of secure, environmentally controlled storage space for the ship's equipment. The storage space environment must be maintained at 15 degrees Celsius and at a maximum relative humidity of 70 percent for the duration of the contract period.
ii. The storage space must also contain 464.515 square meters of standard 2.1336 meter high storage shelving with 5 equally spaced shelves of 55.7418 square meters for 278.709 square meters and shelving with 3 equally spaced shelves of 61.966 square meters for 185.806 square meters.
iii. The Contractor must provide 100 new pallets for the storage of items.
iv. All items must be stored in such a manner so as to be easily accessible for inspection. No items must be stored directly on floors.
v. The storage space must have one (1) desk with two (2) chairs.
vi. The storage space must be on, or close to, the premises of the Contractor's facility.
vii. The Contractor must provide two (2) drivers and two (2) U-Haul 24 foot, single axle, low deck trucks (or equivalent) to assist ship's personnel for five (5) days to de-store the vessel.
viii. The Contractor must provide forklift(s) and forklift driver(s) for 5 days to de-store the vessel.
ix. The Contractor must provide equivalent trucks, forklifts and drivers for 5 days to assist the crew in re-storing the vessel

**.12** Vessel Life Extension is an unmanned refit with approximately 3 crew members working but not sleeping on board for the duration of the refit.

**.13** Contractor to supply washroom facilities as close as possible to the vessel.

**.14** 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.

**.15** 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.

**.16** 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.

**.17** 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 Controls that where installed.Contractor to include in their bid an allowance of $7000.00 for FSR.

**.3** Contractor to supply Wartsila FSR'S to check out new propulsion upgrade controls for Port and Stbd ME, OD Box for CPP system that was overhauled and the Stbd M/E overhaul run in periods. 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 three (3) days.

**.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 Vessel Life Extension 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**

| Spec item #: H-04 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) H-4 : 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** | **2011** |

**2.1.1.**

**2.2 Standards**

**2.2.1**

**2.3 Regulations**

**2.3.1**

**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.

3.1.2. Contractor shall perform annual maintenance on Galley Wet Chemical fixed equipment

3.1.3. 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..

3.1.4. 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.

3.1.5. 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 # |
|---|---|---|
| **(M/E) 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.**

**2.6 Standards**

**2.2.1**

**2.7 Regulations**

**2.3.1**

**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. All work carried out in this specification shall be inspected by Lloyd's Surveyor and Chief Engineer.

3.1.13. 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

Contractor must supply three copies of the certifications of each system.

## Part 5: DELIVERABLES:

## 5.1 Drawings/Reports

**5.1.1** Contractor must supply three hard copies of 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 # |
|---|---|---|
| **(M/E) H-06 : Portable Fire Extingishers** | | |

**1.1 SCOPE:**

The intent of this specification is to carry out the annual safety inspection of all portable fire extinguishers, the galley range guard and the fixed fire fighting systems in the hangar. The contractor shall perform all required annual maintenance. All work shall be inspected by the attending Lloyds surveyor. Contractor shall be responsible for scheduling the Lloyds inspector.

**2 REFERENCES:**

2.1.1 Guidance Drawings:

n/a

2.1.2 AS Fitted Drawings:

n/a

**Related Specifications**

n/a

**3.1 TECHNICAL DESCRIPTION**:

3.1.1 The Contractor shall remove the ship's portable fire extinguishers transport them to an authorized certified fire protection service company centre for annual servicing and testing and replace the extinguishers back on board in the correct location. Annual maintenance shall be performed on sixty-six(**66**) portable extinguishers; both $CO_2$ and dry chemical. These extinguishers shall be thoroughly examined, serviced and refilled as necessary.

3.1.2 The Contractor shall verify that a sufficient number and type of extinguishers are on board to maintain the vessel's fire fighting capability. The contractor shall present the findings to the Chief Engineer stating which regulations were used; include compliance with the Canada Shipping Act - Fire Detection Extinguishing Equipment Regulations. Recommendations for additional fire extinguishers shall be backed up by applicable regulations.

3.1.3 The Contractor shall include in their bid an allowance of $1,500.00 for repairs to the fire extinguishers. The actual amount will be adjusted using PWGSC 1379 action upon delivery of invoices from the fire inspection company.

3.1.4 All maintenance is to comply with applicable National Fire Protection Association standards.

3.1.5 Listing of portable extinguishers onboard:

**ID # TYPE LOCATION**

## Fire Extinguishers

| # | Type | Location | Serial # | Last Serviced | Next Service | Last DC 6 Year Maint. | Next DC 6 Year Maint. | Last Hydro | Next Hydro | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5lb/CO2 | Navigation Bridge | 932941 | Sep 26 2013 | Sep 26 2014 | | | Jul 2010 | Jul 2015 | man.date1990 |
| 1.1 | 10lb CO2 | Navigation Bridge | 646165 | Sep 26 2013 | Sep 26 2014 | | | Aug 2011 | Aug 2016 | man,date2006 |
| 2 | 20lb/DC | Bridge deck alleyway | 546233 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man,date2008 |
| 3 | 20lb/DC | Bridge Deck/Fire stn #7 | 546247 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 4 | 20lb/DC | Focsle deck/Fire stn #4 | 546236 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 5 | 20lb/DC | Focsle deck alleyway/Fire stn #8 | 31972 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 6 | 125lb DC | Focsle deck - In Hangar | 911147 | Sep 26 2013 | Sep 26 2014 | | | Nov 2003 | Nov 2015 | man.date2003 |
| 7 | 15lb/CO2 | Helicopter Hanger | 934569 | Sep 26 2013 | Sep 26 2014 | | | Jul 2010 | Jul 2015 | man.date1990 |
| 8 | 15lb/CO2 | Helicopter Hanger | 247044 | Sep 26 2013 | Sep 26 2014 | | | Nov 2013 | **Nov 2018** | |
| 11 | 15lb/CO2 | Focsle deck-Outside Hangar door | 324171 | | | | | | | Received Feb 13 2014 |
| 12 | 20lb/DC | Upper deck Officers Mess | 546234 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 1 | 20lb/ | Upper deck Officers | 5808 | Sep 26 | Sep 26 | Sep 2008 | Sep 2014 | Feb | Feb | man.date2008 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | DC | Pantry | 35 | 2013 | 2014 | | | 2002 | 2014 | |
| 14 | 20lb/ DC | Emergency Generator Room | 546229 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 15 | 20lb/ DC | Upper deck/Fire stn #10 | 546237 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 16 | 20lb/ DC | Upper deck/Fire stn #9 | 31975 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 17 | 20lb/ DC | Outside Chief Cook's Cabin | 837272 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Feb 2007 | Feb 2019 | man.date2008 |
| 18 | 20lb/ DC | Upper deck/Fire stn #5 | 31963 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 19 | 20lb/ DC | Upper deck Accom. Forward | 31974 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 20 | 20lb/ DC | Upper deck Accom. Forward | 546232 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 21 | 20lb/ DC | Upper deck Accom. Forward | 31993 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 22 | 20lb/ DC | Upper deck Accom. Forward | 31976 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 23 | 20lb/ DC | Upper deck Accom. Forward | 546249 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 24 | 5lb/CO2 | Upper deck Bosun's locker | 982954 | Sep 26 2013 | Sep 26 2014 | | | Jul 2010 | Jul 2015 | |
| | | | | | | | | | | |
| 26 | 20lb/ DC | Survivor's Lounge | 31977 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 27 | 20lb/ DC | Forepeak/Fire stn #2 | 31966 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 28 | 20lb/ DC | Main Deck/Fire stn #1 | 546242 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 29 | 20lb/ DC | Main deck/Fire stn #6 | 546230 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 30 | 20lb/ DC | Main Deck Rec. Room | 31970 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 31 | 10lb/ CO2 | Incinerator room | 508230 | Nov 12 2013 | Nov 12 2014 | | | Nov 2013 | **Nov 2018** | Man date 2013 |
| 32 | 20lb/ DC | Main Deck-under stairs | 31964 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 33 | 20lb/ DC | Main Deck-under stairs | 546246 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 34 | 20lb/ DC | Main Deck-under stairs | 546231 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 35 | 20lb/ DC | Engineers Change Room | 546251 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 36 | 20lb/ DC | Engineers Change Room | 31980 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 37 | 20lb/ DC | Engineers Change Room | 546254 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 38 | 20lb/ DC | Engineers Change Room | 31985 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 39 | 20lb/ DC | Engineers Change Room | 31983 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 40 | 20lb/ DC | Main Deck-crews lounge | 31989 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 41 | 25lb/ K | Main deck-Galley | 713787 | Sep 26 2013 | Sep 26 2014 | | | Oct 2009 | Oct 2014 | man.date2004 |
| 42 | 20lb/ DC | Main deck/Fire stn #15 | 31962 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 43 | 20lb/ DC | Main deck-outside dry stores | 581178 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Feb 2002 | Feb 2014 | man.date2008 |
| 44 | 20lb/ DC | Main deck-outside dry stores | 546238 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 45 | 20lb/ DC | Main deck-outside dry stores | 31982 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 46 | 20lb/ DC | Main deck-outside dry stores | 837259 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Feb 2002 | Feb 2014 | man.date2008 |
| 47 | 20lb/ DC | Main deck-outside dry stores | 31973 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 48 | 20lb/ DC | Main deck-outside dry stores | 000026C | Sep 26 2013 | Sep 26 2014 | Apr 2011 | Apr 2017 | Aug 2011 | Aug 2023 | man.date1999 |
| 49 | 20lb/ DC | Aft Accom.-Steering Flat | 31969 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 50 | 20lb/ DC | Aft Accom/Fire stn #14 | 546250 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 51 | 20lb/ DC | Hold deck/Fire stn #22 | 31987 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 52 | 20lb/ DC | Engine Room/Fire stn #16/Gen.room | 546245 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 53 | 15lb/ CO2 | Engine Control Room | 934568 | Sep 26 2013 | Sep 26 2014 | | | Jul 2010 | Jul 2015 | man.date1990 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 54 | 20lb/DC | Engine Room-under phone | 31981 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 55 | 20lb/DC | Engine Room/Fire stn #17 | 546248 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 56 | 20lb/DC | Engine Room/Fire stn #18 | 31991 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 57 | 20lb/DC | Engine Room/Fire Stn #19 | 31979 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 58 | 15lb/CO2 | Engine Room-Gear Box | 934567C | Sep 26 2013 | Sep 26 2014 | | | Aug 2011 | Aug 2016 | man.date1990 |
| 59 | 20lb/DC | Engine Room-Under escape hatch | 31965 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 60 | 20lb/DC | Purifier Room/Fire stn #20 | 31967 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 61 | 20lb/DC | Engine Work shop/Fire stn #21 | 31971 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 62 | 20lb/DC | Fore Peak Stores | 31968 | Sep 26 2013 | Sep 26 2014 | Sep 2008 | Sep 2014 | Sep 2008 | Sep 2020 | man.date2008 |
| 63 | 20lb/CO2 | Fore Peak Stores | 917314 | Sep 26 2013 | Sep 26 2014 | | | Jul 2010 | Jul 2015 | man.date1990 |
| | 5lb/DC | Port lifeboat | 842575 | Sep 26 2013 | Sep 26 2014 | Jul 2010 | Jun 2016 | Jul 2010 | Jul 2022 | man.date2010 |
| | 5lb/DC | Stbd lifeboat | 842474 | Sep 26 2013 | Sep 26 2014 | Jul 2010 | Jun 2016 | Jul 2010 | Jul 2022 | man.date2010 |
| | 5lb/ABC | Stbd FRC | 312595 | Sep 26 2013 | Sep 26 2014 | Aug 2009 | Aug 2015 | Aug 2009 | Aug 2021 | man.date2009 |
| | 5lb/ABC | Port FRC | 272831 | Dec 18 2013 | Dec 18 2014 | Dec 2013 | Dec 2019 | Dec 2013 | Dec 2014 | man.date2013 |
| | 15lb/ABC | FRC Spare (Survivor's Lounge) | 748332 | Sep 26 2013 | Sep 26 2014 | Oct 2009 | Oct 2015 | Oct 2009 | Oct 2021 | man.date2009 |

**4.1 PROOF OF PERFORMANCE**:

4.1.1 Upon completion of servicing ashore, the Contractor shall transport all extinguishers back onboard the ship and shall install them in their original positions to the satisfaction of the Chief Engineer. Each extinguisher shall be verified as being securely mounted.

4.1.2 Each extinguisher shall be properly tagged to show the recent inspection date.

**5.1 DELIVERABLES:**

5.1.1 The Contractor shall obtain all test certificates from the authorized fire protection service company centre and forward them to the Chief Engineer. The contractor shall provide a report (one written and one electronic) which outlines any repairs carried out to the extinguishers.

5.1.2 Certification shall be on a date as close as practicable to the completion of refit.

| Spec item #: H-07 | SPECIFICATION | TCMSB Field # N/A |
|---|---|---|
| **(M/E) H-07: Firefighters Suits, SCBA'a and Cylinders** | | |

# Part 1: SCOPE:

The purpose of this specification is to carry out the annual safety inspection of the vessel's fire suits including the associated breathing apparatus. The contractor shall perform all required annual maintenance. All work to be inspected by the attending Lloyd's Inspector. Contractor shall be responsible for scheduling the Lloyd's Inspector.

# Part 2: REFERENCES:

### 2.5 Guidance Drawings/Nameplate Data

### 2.6 Standards

All annual maintenance is to comply with applicable National Fire Protection Association standards.

All work to be performed by authorized manufacturer's qualified technicians.

### 2.7 Regulations

### 2.8 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:

### 3.2 General

3.1.1 Annual maintenance and inspection of the five MSZ AirHawk MMR Breathing Apparatus shall be conducted by a certified MSA Technician. The BA's shall be thoroughly examined, tested, cleaned, pass annual performance flow test, overhauled if necessary. Certification of such work shall be provided to the vessel.

3.1.2 Annual maintenance and inspection shall be performed on all thirteen air cylinder bottles. The cylinders shall be thoroughly examined, tested, cleaned, pass annual performance flow test, overhauled if necessary. Hydrostatic tests are **NOT** required . Certification of such work shall be provided to the vessel

3.1.3 The contractor shall inspect seven fire suits for damage and wear and shall alert the Ship's representative of any required repairs.

3.1.4 Each fire suit, cylinder and breathing apparatus shall be reinstalled in its original position and in accordance with Lloyd's requirements. Each suit shall be verified as being ready for donning.

3.1.5 All inspection certificates, satisfactory to Lloyd's, shall be provided for all equipment inspected. Certification (Including Air Quality Certificate from supplying Source ) shall be on a date as close as practicable to the completion of refit. The contractor shall present the findings to the Chief Engineer stating which regulations were used; including compliance with the Canada Shipping Act - Fire Detection Extinguishing Equipment Regulations. Recommendations for additional fire suits shall be backed up by applicable regulations.

**3.4 Location**

**LOCATIONS OF FIVE MSA BREATHING APPARATUS:**

3.2.1 Two in the alleyway aft of Bosun's store

3.2.2 Two in the Engineer's change room

3.2.3 One outside Gym

**LOCATION OF THE Seven FIRE SUITS:**

3.2.4 Three in the alleyway aft of Bosun's store

3.2.4 Two in the Engineer's change room

3.2.5 Two in the Hanger

**DETAILS OF Thirteen CYLINDER LOCATIONS:**

| Location | Cylinder S/N | Regulator S/N | Last Air Change/VIP | Next Air Change | Last Hydro Test | Next Hydro Test |
|---|---|---|---|---|---|---|
| Upper Deck Fwd (Complete Set) | DG253597 | 240583 | Nov 2014 | Nov 2015 | Mar 2013 | Mar 2018 |
| Upper Deck Fwd (Complete Set) | DG253644 | 136913 | Nov 2014 | Nov 2015 | Mar 2013 | Mar 2018 |
| Survivors Lounge (Spare Cyl) Fwd | DG248204 | N/A | Nov 2014 | Nov 2015 | Mar 2013 | Mar 2018 |
| Survivors Lounge (Spare Cyl) Fwd | DG248587 | N/A | Nov 2014 | Nov 2015 | Mar 2013 | Mar 2018 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Survivors Lounge (Spare Cyl) Fwd | DG248323 | N/A | Nov 2014 | Nov 2015 | Mar 2013 | Mar 2018 |
| Upper Deck Fwd (Spare Cyl) | DG253635 | N/A | Nov 2014 | Nov 2015 | Mar 2013 | Mar 2018 |
| Upper Deck Fwd (Spare Cyl) | DG248355 | N/A | Nov 2014 | Nov 2015 | Mar 2013 | Mar 2018 |
| Upper Deck Fwd (Spare Cyl) | DG248317 | N/A | Nov 2014 | Nov 2015 | Mar 2013 | Mar 2018 |
| Main Deck Aft Accom. (Complete Set) | DG248312 | 240577 | Nov 2014 | Nov 2015 | Mar 2013 | Mar 2018 |
| Engineer's Change Rm (Spare Cyl) | DG248589 | N/A | Nov 2014 | Nov 2015 | Mar 2013 | Mar 2018 |
| Engineer's Change Rm (Complete Set) | DG248341 | 240584 | Nov 2014 | Nov 2015 | Mar 2013 | Mar 2018 |
| Engineer's Change Rm (Spare Cyl) | DG248394 | N/A | Nov 2014 | Nov 2015 | Mar 2013 | Mar 2018 |
| Engineer's Chge Rm (Complete Set) | DG105311 | 240581 | Nov 2014 | Nov 2015 | Jul 2012 | Jul 2017 |

**Firesuit Details**

| | **Size** | **Manufacture date** | **Manufacturer** | **Model #** | **Serial #** |
|---|---|---|---|---|---|
| Helmet | n/a | 25 Jan 2010 | Cairns Helmets | 660CRFSY | n/a |
| Liner | Std | Mar 2008 | American Firewear | 3002207 | n/a |
| Jacket | LG | Feb 2009 | Fyersol OSX | 22205K92L | C2002709 |
| Gloves | L | n/a | Laurentide | n/a | n/a |
| Boots | 9M/11W | n/a | Black Diamond | n/a | n/a |

| | | | | | |
|---|---|---|---|---|---|
| Pants | LG | Feb 2009 | Fyrepel OSX | 22305K92L | C2002732 |
| | | | | | |
| Helmet | n/a | 25 Jan 2010 | Cairns Helmets | 660CRFSY | n/a |
| Liner | Uni | n/a | Lifeliners Inc | NOM22ES | n/a |
| Jacket | XL | Feb 2009 | Fyrepel OSX | 22205K92X | C2002785 |
| Gloves | L | n/a | Laurentide | 14325 | |
| Boots | 12M | n/a | Black Diamond | n/a | n/a |
| Pants | XL | Feb 2009 | Fyrepel OSX | 22305K92X | C2002835 |
| | | | | | |
| Helmet | n/a | 25 Jan 2010 | Cairns Helmets | 660CRFSY | n/a |
| Liner | Uni | n/a | Majestic Fire Apparel | PAC II | n/a |
| Jacket | LG | Feb 2009 | Fyrepel OSX | 22205K92L | C2002716 |
| Gloves | L | Dec 1995 | Glove Corporation | Firefighter | n/a |
| Boots | 10M | n/a | Black Diamond | n/a | n/a |
| Pants | LG | Feb 2009 | Fyrepel OSX | 22305K92L | C2002757 |
| | | | | | |
| Helmet | n/a | 25 Jan 2010 | Cairns Helmets | 660CRFSY | n/a |
| Liner | Uni | Dec 2006 | Dire-Dex | H-11-NE-NB | 77284 |
| Jacket | 2XL | Jun 2009 | Fyrepel OSX | 22205K922 | C2003363 |
| Gloves | L | Dec 1995 | Glove Corporation | Firefighter | n/a |
| Boots | 12M | n/a | Black Diamond | n/a | n/a |
| Pants | 2XL | Jun 2009 | Fyrepel OSX | 22305K922 | C2003381 |
| | | | | | |
| Helmet | n/a | 25 Jan 2010 | Cairns Helmets | 660CRFSY | n/a |

| | | | | | |
|---|---|---|---|---|---|
| Liner | Uni | n/a | Majectic Fire Apparel | n/a | n/a |
| Jacket | LG | Feb 2009 | Fyrepel OSX | 22205K92L | C2002730 |
| Glove, L | L | Mar 1998 | American Firewear | 7500 | n/a |
| Glove, R | L | n/a | Laurentide | n/a | n/a |
| Boots | 10M | n/a | Black Diamond | n/a | n/a |
| Pants | L | Feb 2009 | Fyrepel OSX | 22305K92L | C2002758 |
| | | | | | |
| Helmet | 6 ¼ -8 ¾ | Jul 2002 | Chieftan | 911 | n/a |
| Liner | n/a | n/a | Ice Hood Liner Corp | 25397 | n/a |
| Jacket | LG | n/a | Fyrepel OSX | 22205K92L | C2002724 |
| Gloves | XL | n/a | Glove Corporation | Firefighter | n/a |
| Boots | 10M | n/a | Black Diamond | n/a | n/a |
| Pants | LG | Feb 2009 | Fyrepel OSX | 22305K92L | C2002751 |
| | | | | | |
| Helmet | n/a | Dec 2008 | Cairns Helmets | 360SFSY | n/a |
| Liner | n/a | n/a | Majestic Fire Apparel | n/a | n/a |
| Jacket | XL | Sep 2005 | Fyrepel OSX | 12202Y98X | C100045 |
| Gloves | XL | n/a | Laurentide | n/a | n/a |
| Boots | 10 med | n/a | Fire Pro | 002 | n/a |
| Pants | XL | Aug 2006 | Fyrepel OSX | 12302498 | C0002288C |

### 3.5 Interferences

## Part 4: PROOF OF PERFORMANCE:

### 4.2 Inspection

**4.2 Testing**

N/A

**4.3 Certification**

N/A

## Part 5: DELIVERABLES:

**5.1 Drawings/Reports** 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**

| Spec item #: H-08 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) H-08 : Liferafts ande 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 2015.

3.4 Contractor is 2 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-09 | SPECIFICATION | |
|---|---|---|

**H - 09 : Fuel Oil Piping/Valves Replacement**

**Part 1: SCOPE:**

**1.1** The intent of this specification is to replace all fuel manifold valves as well as all deteriorated piping with new.

**1.2** Coast Guard will arrange for a NACE inspector to view specification and inspect the coatings to make sure they are applied as per manufacture's product data sheets.

**Part 2: PROCUREMENT**

**2.1 Owner Supplied**

**2.1.1.** Owner supplied equipment required for this specification is two 200DN mm valves for the flume tank. Owner reserves the right to direct procurement.

**2.2 Contractor Supplied**

**2.2.1.** Contractor shall supply all materials, equipment, and parts required to perform the specified work. Unless otherwise noted.

**2.3 Guidance Drawings**

**2.2.1.** Fuel Oil Diagram, 590-35, Rev. B.
**2.2.2.** General Arrangement, 590-70, Rev. C.
**2.2.3.** Fuel Oil Piping (As Fitted), 590-42-01.
**2.2.4.** Fuel Oil Piping (As Fitted), 590-42-02.

## Part 3: TECHNICAL DESCRIPTION:

**General**

**3.1.1.** Prior to commencement of the work the Contractor shall inform the Chief Engineer.

**3.1.2** The Contractor shall ensure, with the help of the Chief Engineer, that the Fuel Oil system piping, fuel oil tanks, and any other affected systems, has been locked out and drained before commencement of any work.

**3.1.3** The Contractor shall ensure all work areas are neat and tidy before the end of the work day to ensure a safe environment.

**3.1.4** The Contractor shall remove all sharp edges and grind all burrs smooth.

**3.1.5** The Contractor shall repaint damaged areas as per client specs. 1 coat of primer and 2 finish coats.

**3.1.6** All new piping, fittings and penetrations shall be as per original system. Piping to be Sch.40 Black Seamless Mild Steel. Connections over DN50 to be welded neck flanges. DN50 and under to be socket weld, Lloyds approved.

**3.1.7** All welding to be completed to Lloyd's latest revision.

**3.1.8** The maximum length of pipe that can be maneuvered within the vessel is 6 feet, however 8 foot lengths of pipe can be maneuvered within the Engine Room via the access hatch on the STBD side.

**3.1.9** Contractor shall store all materials as instructed by Chief Engineer.

**3.1.10** Contractor shall clean up all debris (including all old piping and valves that where not approved by Chief Engineer that is taken out) and dispose of it as per Provincial Regulations.

**3.1.11** Contractor shall paint new piping and damaged areas primer 1st coat Amercoat 5105 (3 mil dft) and finish coat Armercoat 5450 (3 mil dft ) to be as per manufacture application procedures.

**3.1.12** Contractor to supply all new valves which are to be Lloyd's approved and similar to the existing.

**3.1.13** Contractor shall recoat all new bulkhead penetrations and damaged areas 1st coat Amercoat 5105 (3 mil dft) and finish coat Armercoat 5450. (3 mil dft ) each system applied coating (3 mil dft ) to be as per manufacture application procedures.

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**3.1.14** All Quick Closing Valves on each fuel oil tank total (13) to be reconditioned and pressure tested to 690 Kpa. Contractor to quote a unit price to recondition/pressure test to 690 Kpa per valve for adjustment purposes by PWGSC 1379.

**3.1.15** Contractor has to as per preamble make sure that prior to any hotwork to be carried out that the Chief Engineer is notified, the area where hotwork is to be carried out and adjacent areas affect by this hotwork is certified by a chemist. Proper fire watches as per preamble.

**3.1.16** Contractor prior to replacing penetrations on fuel oil tanks must contact Chief Engineer and must make sure tank is empty and gas freed for hot work. Contractor to bid on a total of (13) 50DNmm bulkhead fitting all fuel oil tanks

as mention in capacity plan and replacing (2) 200DN mm spool piece of piping through a compensation ring for Flume tank piping through number two port & Stbd fuel oil tanks. Contractor to quote a unit price to replace (1) installing 50DNmm and (1) 200DN mm bulkhead fitting for fuel oil tanks. The purpose of this is for adjustment purposes for PWGSC 1379.

**3.1.17** Contractor shall identify all piping for all systems prior to removal to make sure the piping is replaced and put back correctly. The method must be agreed upon by the Chief Engineer; example the Contractor may draw a simple sketch. When method is agreed upon by the Chief Engineer, the Contractor is to provide the Chief Engineer with a copy.

**3.1.18** Contractor bid on removing and disposing 100 m3 of fuel oil and quote a unit price to remove and dispose per 1 m3 for adjustment purposes.

## 3.2 Fuel Oil Piping in Tunnel (Aft of Frame 28)

**3.2.1** Contractor shall unbolt all required deck plating in Tunnel between Fr. 5 & 28 and store and re-installed after work is completed.

**3.2.2** Contractor shall unbolt all N50 flanges and valves between bulkhead penetrations in Tunnel between Fr. 5 & 28 and dispose of all piping as per Provincial Regulations. Contractor shall store all valves deemed by Lloyd's or the Chief Engineer to be reusable.

**3.2.3** Contractor shall cut out (4) DN50 penetrations in Stbd longitude bulkhead after frame 28 into Purifier Room and tank penetrations in Fuel Oil tanks #5 Port & Stbd, #6 Port & Stbd. Contractor to bid per 1 bulkhead fitting for adjustment purposes by PWGSC 1379 action.

**3.2.4** Contractor shall fabricate new penetrations for all removed bulkhead and tank penetrations, similar to the ones removed, and install in the locations of the old penetrations.

**3.2.5** Contractor shall install new (piping, flanges, nuts, bolts and new gasket material that is suitable for fuel oil) following the same route as the removed piping.

**3.2.6** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.2.7** Contractor shall have all removed valves inspected to ensure they are in good condition and are working correctly. Any valves not meeting Lloyds or the Chief Engineers approval are to be replaced PWGSC 1379 action.

**3.2.8** Contractor shall reinstall all valves, both existing and new as per the removed system.

**3.2.9** Contractor shall reinstall any removed deck plating to the satisfaction of the Chief Engineer.

## 3.3 Fuel Oil Piping in Engine Room (Frames 28 to 44)

**3.3.1** Contractor shall unbolt all required deck plating outboard sides of engines in Engine Room between Fr. 28 & 44 and store and re-install after job is finished.

**3.3.2** Contractor shall identify all piping for all systems as per section 3.1.17 prior to removal. Contractor to unbolt and remove the Bilge & Ballast piping from Fr. 28 to 44 on the out board sides of the main engines in way of Fuel Oil piping and store after draining and locking out the systems.

**3.3.3** Contractor shall unbolt all DN50 flanges and valves between bulkhead penetrations and dispose of all piping. Contractor shall store all valves deemed by Lloyd's or the Chief Engineer to be reusable.

**3.3.4** Contractor shall cut out (9) DN50 and (1) DN75 penetrations in bulkhead at frame 28 entering Fuel Purifier Room and (5) DN50 penetrations in bulkhead at frame 44. Contractor shall cut out tank penetrations in Fuel Oil tanks #3 Port & Stbd and #4 Port & Stbd.

**3.3.5** Contractor shall fabricate new penetrations for all removed bulkhead and tank penetrations, similar to the ones removed, and install in the locations of the old penetrations.

**3.3.6** Contractor shall install new piping and flanges following the same route as the removed piping.

**3.3.7** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.3.8** Contractor shall have all removed valves inspected to ensure they are in good condition and are working correctly. Any valves not meeting Lloyds or the Chief Engineers approval are to be replaced PWGSC 1379 action.

**3.3.9** Contractor shall reinstall all valves, both existing and new as per the removed system.

**3.3.10** Contractor shall reinstall Bilge & Ballast piping and deck plating, to the satisfaction of the Chief Engineer.

## 3.4 Fuel Oil Piping in Pipe Tunnel (Fwd of Frame 44)

**3.4.1** Contractor shall unbolt all required deck plating in the Transducer Compartment and store.

**3.4.2** Contractor shall identify all piping for all systems as per section 3.1.17 prior to removal. Contractor shall unbolt all DN50 flanges and valves between bulkhead penetrations and fuel oil tanks #1 P&S, #2 P&S and Flume tank filling line and dispose of all piping. Contractor shall store all valves deemed by Lloyd's or the Chief Engineer to be reusable.

**3.4.3** Contractor shall identify all piping for all systems as per section 3.1.17 prior to removal. Contractor shall unbolt and remove DN200 piping and valves from the Flume Tank Fr. 58, outboard fuel tanks #1 Port & Stbd and dispose of as per provincial regulations.

**3.4.4** Contractor shall cut out tank penetrations in Fuel Oil tanks #1 Port & Stbd, #2 Port & Stbd and 200DN mm spool piece of piping through and including the compensation ring for Flume tank piping through number #2 Port & Stbd fuel oil tanks note a guidance drawing included. Note on stbd Flume tank piping in order to replace piping the extended spindle and two brackets for the extended spindle have to be removed and re-installed after the piping has been replaced.

**3.4.5** Contractor shall fabricate new penetrations for all removed bulkhead and tank penetrations, similar to the ones removed, and install in the locations of the old penetrations.

**3.4.7** Contractor shall install new piping and flanges following the same route as the removed piping.

**3.4.8** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.4.9** Contractor shall have all removed valves that are not identified to be replaced inspected to ensure they are in good condition and are working correctly. Any valves not meeting Lloyds or the Chief Engineers approval are to be replaced PWGSC 1379 action.

**3.4.10** Contractor shall reinstall all valves, both existing and new as per the removed system. Contractor to replace (2) 200DNmm flume tank dump valves with (2) new owner supplied valves.

**3.4.11** Contractor shall reinstall deck plating, to the satisfaction of the Chief Engineer.

## 3.5 Piping, Valves, and Fuel oil Transfer Pumps location Purifier Room

**3.5.1** Contractor shall identify all piping for all systems as per section 3.1.17 prior to removal. Contractor shall unbolt all flanges and valves between bulkhead penetrations, pumps and dispose of all DN50 piping, (25) DN50 valves and (2) DN75 valves.

**3.5.2** Pumps are not to be removed by the Contractor but shall be covered and protected from damage.

**3.5.3** All pipe spools greater than DN50 that contain DN50 pipe shall have the old DN50 pipe replaced with new DN50 pipe to return the spool to its original dimensions.

**3.5.6** Contractor shall install new piping, repaired piping spools and flanges following the same route as the removed piping.

**3.5.7** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.5.8** Contractor shall have all other valves not disposed of inspected to ensure they are in good condition and are working correctly. Any valves not meeting Lloyds or the Chief Engineers approval are to be replaced PWGSC 1379 action.

**3.5.9** Contractor shall supply new and reinstall (25) DN50 valves (50mm,150# flanged cast steel ball valves, cast steel body, stainless steel ball and stem, ptfe seat Nace MR-0175, fire safe, complete with lever handle. Flange face to flange face is 178mm. BONOMI 762000-2 or equivalent) and (2) DN75 valves

(75mm,150# flanged cast steel ball valves, cast steel body, stainless steel ball and stem, ptfe seat Nace MR-0175, fire safe, complete with lever handle. Flange face to flange face is 203mm. BONOMI 762000-3 or equivalent) Lloyd's approved as per the removed from system. Identified in section **3.5.1.**

### 3.6 Interferences

**3.6.1** 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 to be completed to satisfaction of the Chief Engineer.
**4.1.2.** Visual inspection of all welding 100%.
**4.1.3.** Welds 10% MPI testing completed by approved testing personnel.
**4.1.4.** The Contractor is responsible for all air quality testing to ensure hot work and entry is permitted.
**4.1.5.** The Contractor shall issue and post hot work permits and shall maintain a fire watch.
**4.1.6.** Area where work was carried out to be inspected to ensure all debris (piping etc) has been removed.

### 4.2 Testing

**i.** Contractor after installing new piping and prior installation of quick closing valves must prove to Chief Engineer that each pipe that is connected to the fuel oil manifold is the same as the identified tank.
**ii.** Hydrostatic test to be carried out on all new piping, valves and fittings to 517 kpa to be witness by Lloyd's Surveyor and Chief Engineer.
**iii.** Hydrostatic test of all quick closing valves to be witness by Chief Engineer at 690 Kpa.
**iv.** Welding 100% visual by Lloyd's and Chief Engineer.
**v.** Welds to 10% MPI by approved testing personnel.
**vi.** All watertight penetrations shall be proven to be watertight and witnessed and signed off by Class.
**vii.** Areas where hot work is to be carried out is to be certified by a Chemist or a qualified person to be determined by Chief Engineer.

**1.4 Certification**

2.4.3 Welders must be CWB Certified
2.4.4 Chemist must be Certified
2.4.5 Technicians for NDT testing must be Certified

**Part 5: DELIVERABLES:**

**Drawings/Reports**

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.

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

**5.1 Spares**

No spares required

**5.2 Training**

No training required

**5.3 Manuals**

**N/A**

| VLE Spec Item: H-10 | Specification | TCMS Field #: N/A |
|---|---|---|
| **H - 10 : Sewage Treatment Tank Replacement** | | |

## Part 1: Scope

**1.1** The intent of this specification shall be to remove the existing sewage treatment plant, black water vacuum tank and pump units listed and install a new sewage treatment plant with vacuum pump units attached. Contractor supplied marine sanitation device and accessories along with the renewal of water piping as identified.

**1.2** This item shall be completed in conjunction with the following:

**1.2.1** H-16 Galley Equipment
**1.2.2** HD-10 Hull Repairs

## Part 2: References

### 2.1 Guidance Drawings/Nameplate Data

| | | |
|---|---|---|
| **2.1.1** | General Arrangement Focs'le | Dwg. AO- 590-70 |
| **2.1.2** | Sanitary System | Dwg. 590-38 |
| **2.1.3** | Transducer compartment | Dwg. 590-56 |
| **2.1.4** | Electrical 1 line 460 | Dwg. 590-ED2 |
| **2.1.5** | Sewerage Treatment Super Trident | Manual No.`18 |
| **2.1.6** | Wartsila Water System | Dwg. GO98163 |
| **2.1.7** | Super Trident | Dwg. RTC20-1A-800 |
| **2.1.8** | Super Trident Power Circuit | Dwg. ES12300 |
| **2.1.9** | Super Trident Installation Wiring | Dwg. ES12330 |
| **2.1.10** | Super Trident Legend Plate | Dwg. ES12340 |
| **2.1.11** | Super Trident Power Circuit Dia. | Dwg. ES12100 |
| **2.1.12** | Super Trident installation wiring | Dwg. ES12130 |
| **2.1.13** | Super Trident installation legend plate | Dwg. ES 12140 |
| **2.1.14** | Effluent Overflow Tank | Dwg. 55071B-01 |
| **2.1.15** | Hamworthy Sewage Treatment | Dwg. TO406030A |

**2.1.16 Contractor to supply one new Super Trident Hamworthy ST2A CR (complete with two ejector pumps and two discharge pump units) Sewage Treatment Tank unit, with a spare ejector pump and a spare discharge pump and one Effluent Overflow Tank as per reference drawing 55071B-01, no substitution.**

**2.1.17 Contact information:**
**Roger McNeil**
**Managing Director**
**Marine and Offshore Canada**
**3853543 Canada Inc.**
**9 Keefer Rd.**
**St. Catharines, Ontario, Canada, L2M 6K4**
**Office 905-688-4922, cell 905-650-3160.**

**Casey MacDonald**
**Technical Manager**
**Office 905-688-4922, Cell 905-650-2547, fax 905-688-9028**

### 2.2 Standards

**2.2.1** Fleet Safety and Security Manual (DFO/5737)
**2.2.2** IACS No. 47 – Shipbuilding and Repair Quality Standard
**2.2.3** TP127 – Ship's Electrical Standards
**2.2.4** 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 General

**3.1.1** Contractor shall supply all equipment, enclosures, ventilation, staging, chain falls, craneage, 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, of an adequate safe working load for the expected duties. Any brackets or other welded attachments required in the performance of this specification shall be welded into place by CWB-certified welders certified to welding Std. W47.1, Div. 1 and 2.

**3.1.2** The Contractor shall be responsible to arrange for Lloyd's Surveyor when completing this specification item.

**3.1.3** Contractor prior to starting any work has to inform the Chief Engineer.

**3.1.4** Prior to any hot work taking place, the Contractor shall ensure that the area of work and any adjacent space is certified as gas free and suitable for hot work as per the preamble per Provincial Regulations.

**3.1.5** The Contractor shall be responsible to protect the interior of the vessel from physical damage and contamination by generated smoke. This shall include the provision of suitable extraction and supply fans as well as suitable coverings for decks, decking, deckheads, bulkheads, and outfit as required to limit additional damages.

**3.1.6** The Contractor shall be responsible to ensure that all areas have been thoroughly cleaned and free of any debris resulting from welding prior to the acceptance of this specification item.

**3.1.7** The Contractor shall provide the services of a Hamworthy Field Service Representative (FSR) to schedule and conduct the commissioning and trials of the new marine sanitation system after final installation. The Hamworthy FSR shall be obtained through Marine and Offshore Canada, St. Catharine's, ON contact information as provided above.

**3.1.8** Contractor shall include in their bid an allowance of $15,000 for expenses of a Hamworthy Field Service Representative (FSR) This cost is to include cost per day, accommodations, meals, and transportation. Any necessary adjustments will be through 1379 action upon presentation of invoices.

## 3.2 Removals

**3.2.1** The Contractor shall include for all temporary and permanent removals for the completion of this specification item. All permanent removals are to be disposed of by the Contractor unless otherwise directed by the Owner as per Provincial Regulations.

**3.2.2** The Contractor shall be responsible for all electrical isolations which are required for this specification item. All electrical isolations are to comply with the lockout / tagout procedures as identified in the preamble.

**3.2.3** The Contractor shall be responsible for the removal of all raw sewage contained in the system for the purpose of decommissioning the existing vacuum collection system and sewage treatment plant. The Contractor will dispose of all sewage removed from the system as noted in accordance with all Provincial and Municipal regulations.

**3.2.4** The Contractor shall remove and dispose of the existing sewage treatment plant. This shall include the removal of the discharge pump, control panel, piping, and bedding. All associated sewage collection piping shall be removed back to the first flange after point of entry into the sewage compartment. All discharge piping shall be removed to the inboard connection of the shipside valves. All overboard valves are to remain closed and locked out for the duration of this specification item until such time as commissioning of the system takes place.

**3.2.5** The Contractor shall remove any electrical cabling which has been deemed redundant once all equipment has been removed.

**3.2.6** The Contractor shall remove and dispose of the existing vacuum collection system. This shall include but not limited to the removal of the vacuum pumps, collection tank, sewage transfer pump, control panel, piping, and bedding. All associated vacuum collection piping shall be removed back to the first flange after point of entry into the sewage compartment. All piping connecting the vacuum collection system to the sewage treatment plant and overboard discharges will be removed and disposed of.

**3.2.7** All component removals shall be completed through the access door and stairs into the compartment and through the water tight door then up to the main deck. The Contractor shall ensure that no raw sewage will come into contact with any surfaces outside the sewage compartment during removals. Any surfaces which have been contaminated will be cleaned and effectively sterilized immediately at the Contractor's expense.

**3.2.8** The Contractor is to ensure that all components to be removed from the original system are suitably reduced in size in order to be removed through the route indicated. All dimensional date supplied is for guidance only and must be confirmed by the Contractor.

## 3.3 Installation

**3.3.1** The Contractor shall fabricate and install new seats of suitably sized steel sections necessary to mount the new marine sanitation device and associated equipment as per the OEM installation drawings and recommendations. All seating arrangements shall be suitably sized to the operational requirements of the vessel.

**3.3.2** **Marine Sanitation Device**

**3.3.1.1** The Contractor shall be responsible to dismantle the new marine sanitation device as per the manufacturer's instructions to permit the movement of all components into the sewage compartment. The route to be followed is to be the same as that used for removals.

**3.3.1.2** Reassembly of the marine sanitation device and attachment to the new seating arrangement shall be as per the manufacturer's instructions. All hardware required for the mounting of the new unit shall be Contractor supplied.

**3.3.1.3** The Contractor shall supply and install all piping, piping supports, flexible joints, valves, gauges, and instrumentation to provide a fully functional collection and treatment system. The new unit shall be vented to the main deck to meet regulatory requirements. The existing vent piping shall be used for this requirement.

**3.3.1.4** The Contractor shall run new feeder and control cables of adequate gauge and length to suit the new control panel. Cabling which is required to connect the control panel to the system components shall be Contractor supplied.

**3.3.1.5** The Contractor shall ensure that the new marine sanitation device is located in a position near the original installation in the sewage compartment and in a manner that does not impede access to any of the system inspection ports, piping, and access covers. The final location of the marine sanitation device shall be in a position that does not impede access to any existing tank entry points in the sewage compartment.

**3.3.3** **Vacuum System**

**3.3.3.1** The Contractor shall supply and install the new Super Trident Hamworthy ST2A CR (complete with two ejector pumps and two discharge pump units) Sewage Treatment Tank.

**3.3.3.2** The Contractor shall supply, arrange, and install all necessary piping, valves, flexible joints, piping supports, gauges, and all electrical wiring and electrical components for

the proper integration and operation of the new vacuum collection equipment into the existing infrastructure of the vessel as per manufacturer's instructions.

**3.3.3.3** The Contractor shall install pressure taps in the vacuum system for the mounting of the following Contractor supplied equipment:

**3.3.2.3.1** Vacuum gauge, dial type

**3.3.2.3.2** Vacuum sensor to permit monitoring by the Alarm and Monitoring System.

**3.3.3.4** The Contractor installed pressure taps, gauges, and sensors shall be located such as they are not in a high traffic area leaving them susceptible to damage. Gauges shall be mounted in a fashion making them readily visible and readable.

### 3.3.4 Effluent Overflow Tank

**3.3.4.1** The Contractor shall supply and install a new effluent overflow tank as per drawing 55071B-01.

**3.3.4.2** The Contractor shall supply, arrange, and install all necessary piping, valves, flexible joints, piping supports, gauges, and all electrical wiring and electrical components for the proper integration and operation of the effluent overflow tank with the newly installed marine sanitation system. The Tank will have automatic pump control via a relay logic system with high and low level control switches.

**3.3.4.3** The Contractor shall include the supply and installation of a side mount level switch, cabling and connections, required and integration to the vessel's Alarm and Monitoring System for an additional float switch high level alarm.

**3.3.4.4** The Contractor shall coat the internals of the tank with a two component, high build epoxy similar to that of the marine sanitation device.

**3.3.4.5** The Contractor shall coat the exterior of the tank with two coats of Amercoat Red Oxide Primer followed by two topcoats of Amercoat 5450 White on all surfaces for a final DFT of 3.5 mils. All coatings shall be Contractor supplied.

## 3.4 Electrical Requirements

**3.4.1** The Contractor shall use the existing cabling and 460v, 30amp 3ph. supply located at panel P5 auxiliary machinery space circuits 13, 15 & 17 . The Contractor shall perform insulation testing on the existing cabling and verify its condition prior to the connection of the new Control Panel. Replacement of the disconnect breaker at the switchboard and / or cabling shall be determined by the Chief Engineer and Technical Authority. If replacement is deemed necessary, this will be addressed by 1379 action upon the presentation of invoices.

**3.4.2** The Contractor will have access to the existing cabling and 460v,15amp 3ph.disconnect in panel P5 circuits 14,16 & 18 , auxiliary machinery space if required. The Contractor shall perform insulation testing on the existing cabling and verify its condition prior to the connection of the new Control Panel. Replacement of the disconnect breaker at the MCC and / or cabling shall be determined by the Chief Engineer and Technical Authority. If replacement is deemed necessary, this will be addressed by 1379 action upon the presentation of invoices.

**3.4.3** The Contractor will have access to an additional 3-460v, supplies if required- located in the panel P5 auxiliary machinery space. The Contractor shall perform insulation testing on the

existing cabling and verify its condition prior to the connection of the any new equipment. Replacement of the disconnect breaker at the MCC and / or cabling shall be determined by the Chief Engineer and Technical Authority. If replacement is deemed necessary, this will be addressed by 1379 action upon the presentation of invoices.

**3.4.4** For the above and below cabling requirements and purpose of adjustments, the Contractor shall include a quote for cost per meter of cabling supply and installation.

**3.4.5** The Contractor shall have available 2 existing runs from the sewage compartment to the MCR for the purpose of connecting the new vacuum sensor and effluent tank level switch to the existing Alarm and Monitoring System. The present arrangement utilizes 2 existing alarms- Black water high level Lub-sew-plt- da-21 & black water low vacuum Lub-bw-vac-da-52.

**3.4.6** The Contractor shall allow for the supply and installation of two (2) runs of sensor wire, each of approximately 20 meters in length with transits .All wire shall be run in existing cable ways and transits and be secured with approved cable ties at intervals of 1.0 meter. The wire to be supplied shall be as per the installation requirements dictated by the manufacturer. Cable runs shall be terminated beneath the console in the MCR .

## 3.5 Collection Piping

**3.5.1** The Contractor shall renew all valves as fitted in the piping with new Contractor supplied 150# ball type valves suitable for sewage.

**3.5.2** The Contractor shall not use 90° elbows in the replacement of the piping nor will the Contractor use any piping section that has been fabricated by the repair facility such as “wyes” or “tees”. Provision shall be made to make all piping runs as straight as possible while limiting sharp bends.

## 3.6 Location

| | | |
|---|---|---|
| **3.6.1** | Sewage Compartment Transducer Compartment | Fr. 52– 58 |
| **3.6.2** | Engine Control Room | Fr. 44 – 52 |
| **3.6.3** | Forward Machinery Space | Fr 75-82 |

## 3.7 Interferences

**3.7.1** The Contractor shall be 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 subject to witness by the Chief Engineer or delegate, the Hamworthy FSR, and the attending Lloyd's Surveyor.

## 4.2 Testing

**4.2.1** The commissioning of the new marine sanitation device shall be done under the direction of the Hamworthy FSR and in accordance with the manufacturer's recommended practices.

**4.2.2** All new and reinstalled piping shall be pressure tested after installation to ensure no leaks are present. Any required repairs to the installed piping will be the responsibility of the Contractor.

**4.2.3** All pumps / motors shall be checked for correct phasing. Any necessary changes will be the responsibility of the Contractor.

**4.2.4** The new alarm points shall be verified for correct operation.

## 4.3 Certification

**4.3.1** Class Type Approval Certificates identifying compliance with MARPOL Resolution MEPC 159(55).

**4.3.2** International Sewage Pollution Prevention Certificate

# Part 5: Deliverables

## 5.1 Drawings/Reports

**5.1.1** The Contractor shall provide the Chief Engineer with three type written reports of the Contractors work in both electronic and hardcopy formats outlining the details of the inspection and any alterations / repairs made prior to the acceptance of this item. Any and all reports made by the Hamworthy FSR are to be included in this final report.

**5.1.2** The Contractor shall update all affected "As Fitted" drawings affected by this work. These drawings shall be provided in both electronic and hardcopy format. Electronic copies shall be supplied in AutoCAD format – latest edition.

**5.1.3** The Contractor shall ensure that the following documents are included in the final report for this specification item:

**5.1.3.1** Sewage Disposal Certificates

## 5.2 Spares

**5.2.1** All spares which have been supplied with this item and have not been used in the installation shall be returned to the Owner prior to the acceptance of this item.

## 5.3 Training

**5.3.1** The Contractor shall supply the services of a Hamworthy FSR to provide instructions to ship's personnel in the correct operation and maintenance procedures of the marine sanitation device. The training shall consist of a system familiarization package, maintenance requirements, and operational training for the vacuum collection, treatment, and monitoring systems.

**5.3.2** The training shall incorporate one eight (8) hour day following the commissioning and testing of the system for a total of five (5) Engine Room personnel.

## 5.4 Manuals

**5.4.1** The Contractor shall ensure that all operation, maintenance, and installation manuals supplied with the system are submitted to the Owner prior to the acceptance of this item.

| Spec item #: H-11 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**H - 11 : Avgas Dispenser Unit Replacement**

**Part: 1 SCOPE:**

**1.1** The intent of this specification shall be to remove existing Avgas Fuel dispenser and associate piping and relocate it with a new avgas fuel dispenser complete with cabinet to be installed on the Upper Deck Aft on the stbd side.

**1.2** Contractor has to also put a fueling access hatch in the Foc'scle deck on the aft end stbd helicopter landing deck. This hatch will be flush with the deck.

**1.3** This work shall be carried out in Conjunction with the following: H-27 Aviation Avgas Damper Renewal and HD- 18 Stbd Miranda Davit Installation

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1** 102-08-01 Avgas Fuel Dispenser Cabinet.

**2.1.2** 102-08-02 Helicopter Refueling System Access Hatch

**2.2 Standards**

**2.2.1**

**2.3 Regulations**

**2.3.1** Contractor to follow Transport Canada and Lloyd's 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.

**2.4.2** Owner will supply new avgas fuel dispencer.

**Part: 3 TECHNICAL DESCRIPTION**

**3.1 General**

**3.1.1** Contractor prior to starting any work must contact the Chief Engineer.

**3.1.2** Contractor must drain all piping back to the drain sump tank and prove that no liquid is left in the system prior to dismantling.

**3.1.3** Contractor must empty avgas storage tank and drain sump tank and gas free both. Contractor must also gas free avgas cofferdam. Each compartment by a chemist or a qualified person.

**3.1.4** Contractor bid on removing and disposing 10 m3 of AVGAS and quote a unit price to remove/dispose per 1m3 of AVGAS for adjustment purposes

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

**3.1.5.1** 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; Protective material shall be used to prevent the spread of sparks, protecting electrical cables and other services.

**3.1.5.2** 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.

**3.1.6** Confined Space Entry: 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".

**3.1.6.1** Any entry into confined spaces during the contract period shall be conducted in accordance with the Provincial Regulations.

**3.1.6.2** The contractor shall comply with the work requirements as outlined in the Canada Labor Code and applicable Provincial Regulations.

**3.1.7** Contractor prior to any welding taking place has to submit to Lloyd’s Surveyor a welding procedure which has to be approved by Lloyd’s before any welding is started.

**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** .

**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-12 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**H – 12 : Flooring & Sub Floors**

**Part: 1 SCOPE:**

**1.1** The intent of this specification shall be contractor to replace all flooring with new as described in this specification. Contractor shall remove and dispose the flooring and the cove base from hallways as described in this specification. This work shall be carried out in Conjunction with the following work
Specifications,

**a)** H-12 Paneling
**b)** H-22 Fire Lines Replacement
**c)** H-24 Domestic Freshwater Piping Replacement

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1** Deck Covering. Drawing # 590-92.
**2.1.2** Life Saving equipment Plan .Drawing # 590-83-1.
**2.1.3** Application specification for Dex –O-Tex flooring products and Terrazzo M (Fine).

**2.2 Standards**

**2.2.1** N/A

**2.3 Regulations**

**2.3.1** All deck covering material must be incombustible and approved by Lloyds with Fire Protection Regulations and Standards applicable to this vessel.
**2.3.2** Contractor supplied carpet tiles for cabin decks are to be Lloyds approved.

**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

**3.1.1** Contractor shall inform Chief Engineer prior to starting any work on the Decks.

**3.1.2** Contractor shall supply all material required for the new flooring replacement and refinishing. **No substitutions**.

**3.1.3** The flooring required is approximate only, Contractor to verify actual measurement prior to starting work. The Contractor will quote per m2 of materials, per m2 of preparation, and per 1 m for cove base (vinyl/dex-o-tex) for each area described for adjustment purposes by PWGSC 1379 action.

**3.1.4** Contractor shall enclose flooring areas being worked on so that no debris dust or flumes may pass to any other compartment of the vessel while this work is been carried out.

**3.1.5** Contractor shall supply proper ventilation to work area being worked on from outside the vessel and Contractor shall exhaust air from the area being worked on to the outside atmosphere.

**3.1.6** Contractor shall supply all material required for the new flooring replacement and resurfaced Survivors Lounge.

**3.1.7** Contractor shall remove and dispose the existing flooring and cove base to the bare metal from the areas listed below. The deck area to be prepared and new flooring and cove base to be installed by contractor.

**3.1.8** Chief Engineer to inspect the decks after they are cleaned and after application of each coat of flooring.

**3.1.9** All decks shall be prepared according to deck coating manufactures specifications.

**3.1.10 Forecastle Deck.**

**3.1.10.1** Contractor shall remove, dispose and replace the existing flooring and cove base on the hall ways on the Forecastle Deck forward of the main hallway.

**3.1.10.2** The total amount of flooring to be replaced is 8.36 m2 of flooring and 12.22 linear meters of 101.6 mm cove base.

**3.1.10.3** Contractor shall remove all the flooring material to the bare metal.

**3.1.10.4** Contractor shall clean all decks to SSPC-SP-6 as per manufactures specifications.

**3.1.10.5** Contractor shall apply one coat of Amerlock 2 Epoxy Primer to the complete metal deck.

**3.1.10.6** Contractor shall apply one layer of Dex O Tex Quick Set Underlayment as per manufacture instructions at 6.35 mm thick over the Epoxy Primed deck.

**3.1.10.7** Contractor shall install seamless waterproof flooring add apply a coat of delete Dex O Tex Terazzo M Fine Finish delete Flooring system with integral cove base as per Manufactures Application Instructions.

**3.1.11 Upper Deck (main passage way decks)**

**3.1.11.1** Contractor shall remove, dispose and replace the existing flooring and 101.6 mm cove base in the alleyways described below on the Upper Deck.

**3.1.11.2** The total amount of flooring and 101.6 mm cove base to be replaced on the upper deck is, 79.90m2 of flooring and 124.97 linear meters of 101.6 mm cove base. Areas to be done are:

3.1.11.2.1 From where you come in Upper Deck Stbd Side Quarter Master Station right back to the Officer's Lounge approximate flooring area 37.16 square meters and 7.62 linear meters of 101.6 mm cove base.

3.1.11.2.2 Forward passage way from passage way next to Quarter Master Station forward around the Survivors Lounge on both sides up to the Smoke room next to the Forward passage way. Approximate flooring area 42.74square meters and 62.48 linear meters of 101.6 mm cove base.

**3.1.11.3** Contractor shall remove existing flooring and 101.6 mm cove base to the metal deck.

**3.1.11.4** Contractor shall clean all decks to SSPC-SP-6.

**3.1.11.5** Contractor shall apply one coat of Amerlock 2 Epoxy Primer to the complete metal decks.

**3.1.11.6** Contractor shall apply one layer of Dex O Tex Quick Set Underlayment as per manufacture instructions at 6.35 mm thick over the Epoxy Primed deck.

**3.1.11.7** Contractor shall install seamless waterproof flooring add apply a coat of Dex O Tex Terazzo M Fine Finish Flooring system with integral cove base as per Manufactures Application Instructions.

**3.1.12 Upper Deck (Survivors Lounge)** listed below is to have the deck and cove base prepared and a refinish coat applied as per manufactures specifications.

a) Contractor shall sand deck to remove the finish and glaze from deck and cove base.
b) Contractor shall clean decks as per manufactures instructions.
c) Contractor shall apply one coat of TM Bondcoat @ 5 mils DFT and allow leave dry as per manufactures specifications.
d) Contractor shall apply Dex O Tex Terazzo M Fine throughout deck and cove base as per manufactures applications.
e) Deck area is 17.37 square meters and the 16.76 linear meters of 101.6 mm cove base.

**3.1.13 Main Deck ( Stairway landing)**

**3.1.13.1** Contractor shall remove and dispose of existing flooring and 101.6 mm cove base on the deck by stairs going to Upper Deck.

**3.1.13.2** **Note**: This Floorings are a **Fire Rated** Dex O Tex.

**3.1.13.3** Contractor shall remove and dispose of the existing flooring and 101.6 mm cove base from the deck landing going to the upper deck and replace with new Fire Rated Flooring.

**3.1.13.4** The total area of decking and 101.6 mm cove base to be replaced is 5.57 square meters of decking and 10.67 linear meters of 101.6 mm cove base.

**3.1.13.5** Contractor shall remove and dispose of the existing decking and 101.6 mm cove base to the bare metal.

**3.1.13.6** Contractor shall clean all decks to SSPC-SP-6.

**3.1.13.7** Contractor shall apply one coat of Amerlock 2 Epoxy Primer to the Complete metal deck.

**3.1.13.8** Contractor shall apply one layer of DEX O Tex Decklite **A-60 Fire Rated** Decking @ 35 mm thick as per Manufactures Application Instructions.

**3.1.13.9** Contractor shall install seamless waterproof flooring add apply a coat of delete Dex O Tex Terazzo M Fine Finish delete Flooring system with integral cove base as per Manufactures Application Instructions.

**3.1.14 Clerks Cabin & Stewards Cabin.**

**3.1.14.1** Contractor shall remove the items prior to starting work from the Clerks Cabin and Stewards Cabin. The items are to be stored in a safe and secure place. The items that are to be removed from each cabin are the bunk, closet and desks.

**3.1.14.2** The total area of flooring on the clerks and stewards cabin is 18.58 square meters of flooring. There is a total of 27.43 linear meters of 101.6 mm black Vinyl base in the two cabins.

**3.1.14.3** Contractor shall remove the carpet and 101.6 mm vinyl base and the flooring to the bare metal.

**3.1.14.4** Contractor shall clean the decks in the cabins to SSPC-SP-6.

**3.1.14.5** Contractor shall apply one coat of Amerlock 2 Epoxy Primer to the complete metal deck.

**3.1.14.6** Contractor shall apply one layer of Dex O Tex A-70 @ 76 mm (3 inches) thick or as required to build up deck to existing level. Prior to removing the existing flooring, Contractor to measure the hight of the existing deck and confirm this information with Chief Engineer prior to commencing work. Leave dry as to manufactures instructions.

**3.1.14.7** Contractor shall apply a sealer coat of T/M Bond Coat to seal the Dex O Tex A-70 coating.

**3.1.14.8** Contractor shall supply and install new carpet tiles for the two cabins. The total area of flooring on the cabins is 18.58 square meters of carpet tiles and 27.43 linear meters of 101.6 mm black vinyl base.

**3.1.14.9** The carpet tiles are to as listed below or equivalant. The carpet tiles are to Lloyds approved.

Fiber Count: 100 % Nylon
Style : 1380102500
Colour : # : 6393
Tiles : 50 cm x50 cm
Run : 1P0282T

**3.1.14.10** The carpet tile adhesive must be compatible for the sealer applied on the Dex O Tex surface.

**3.1.14.11** Contractor shall install the furniture that was removed from the two cabins listed in section 3.1.16.1.

**3.2 Location**

**3.2.1** As per deck covering drawings listed in Reference Section 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**

**4.1.1** Chief Engineer to inspect the flooring.

**4.2 Testing**

**4.3 Certification**

**4.3.1** All flooring to be certified Lloyd's approved.

**Part: 5 DELIVERABLES:**

**5.1 Drawings/Reports**

**5.1.1** Contractor shall provide Chief Engineer with three type written hard copies and one electronic copy of a report of all work carried out, complete with certification of all the material supplied.

**5.2 Spares**

**N/A**

**5.3 Training**

**N/A**

**5.4 Manuals**

**N/A**

| Spec item #: H - 13 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**H - 13 : Bilge Cleaning**

# Part 1: SCOPE:

1.1 The intent of this item shall be for the contractor to clean the tank tops, bilges, piping, machinery seats, and frames below the machinery space deck plates and to keep them clean for the duration of this refit (Vessel Life Extension).

# Part 2: REFERENCES:

## 2.1 Guidance Drawings/Nameplate Data

Transducer Compartment Arrangement

| | |
|---|---|
| Tank Tops FRS. 18 – 52 | 590-11 |
| Tank Tops FRS. 58 – 82 | 590-11 |
| Engine Room Layout | 590-59 |
| Structural Sections, AFT – FR. 20 | 590-02 1 of 2 |
| Structural Sections, FRS. 22 – 65 | 590-02 2 of 2 |
| Structural Sections, FRS. 67 – 99 | 590-03 |

## 2.2 Standards

**2.2.1**

## 2.3 Regulations

**2.3.1** 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 to the point of connection.

# Part 3: TECHNICAL DESCRIPTION:

## 3.1 General

3.1.1 The contractor shall clean the vessel's engine room, shaft tunnel, and steering flat, and transducer tunnel bilges of all debris and fluids. Fluids may include bilge water, fuels and oils, etc.

3.1.2 The top areas of these bilges are listed below.

Main Engine Room: 134 m2

Shaft Tunnel: 25 m2

Pipe Tunnel/sonar compartment: 56 m2

Steering Flat: 21 m2

The contractor shall submit a bid on cleaning per square meter for adjustment purposes.

3.1.3 Contractor to bid on removing and disposing 10 m3 of liquids from the bilge and quote a unit price to remove and dispose per 1m3 liquids as per Provincial Regulations. The Contractor shall provide the unit cost per m2 for cleaning additional areas.

3.1.4 The Contractor shall be required to lift and replace deck plates and gratings. All debris and liquids shall be removed by means of high pressure water spray, degreasing solvent, and vacuum hose service. Areas that are hard to access with a vacuum hose shall be thoroughly washed out with high pressure spray to an area that is accessible. The above areas shall be thoroughly cleaned to the finished surface. Any debris taken up from the bilges is to be removed ashore daily.

3.1.5 Any chemicals used for cleaning are to be non-flammable and the vapors nontoxic.

A copy of the WHMIS MSDS is to be provided to the Chief Engineer before the work commences.

3.1.6 Contractor is to keep over spray to a minimum from areas and equipment above the deck plates such overspray shall be wiped clean upon completion of all work and when spraying underneath the deck plates care is to be taken from spraying any electrical connections and sensors. This work shall carry out to the satisfaction of the Chief Engineer.

3.1.7 All liquid and debris remaining as a result of the cleaning shall be removed from the vessel. Ship's systems and equipment shall not be used to dispose of any liquids and sludge. All bilges and bilge wells shall be shown to be clean upon completion of all work and shall be kept clean for the duration of the refit (vessel life extension). Bilge float alarms in the wells shall be proven operational.

3.1.8 The contractor shall supply all material and equipment to perform the specified work, including the services of the vacuum truck.

3.1.9 Disposal of liquids and debris shall be in accordance with Provincial Regulations.

**3.5 Location:**

3.5.1. Main Engine Room
3.5.2. Shaft Tunnel
3.5.3. Pipe Tunnel/sonar compartment
3.5.4. Steering Flat

**3.6 Interferences**

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

## Part 4: PROOF OF PERFORMANCE:

**4.1 Inspection & Testing**

**4.2** The work is to be completed to the satisfaction of the attending owner's representative.

**4.3** A final inspection of the bilges will be complete at the end of the refit and the bilges must be clean to the satisfaction of the attending owner's representative.

### 4.2 Testing

4.2.1

### 4.3 Certification

N/A

## Part 5: DELIVERABLES:

### 5.1 Drawings/Reports

The contractor shall submit report outlining the work performed and the condition as found and after cleaning. This report shall include photographs or video from before and after the cleaning. This report shall be on company letter head. There shall be 3 type written copies as well as an electronic copy in either Microsoft Word or PDF format.

### 5.2 Spares

**N/A**

### 5.3 Training

**N/A**

### 5.4 Manuals

**N/A**

| Spec item #: H-14 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**H - 14 : Paneling**

**Part: 1 SCOPE:**

**1.1** The intent of this specification shall be the contractor to remove and dispose the following sections of wall panels and joining strips, and replace with new contractor supplied B Class Panel Bulkheads and joining strips.

**1.2** This work shall be carried out in Conjunction with the following:

a) Specification # H-12 Flooring and Sub Floors
b) Specification # H-22 Fire Line Replacement.
c) Specification # H-24 Domestic Hot and Cold Water Piping Replacement.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1** Lifesaving equipment Plan. Drawing # 590-83-1.
**2.1.2** Deck Covering. Drawing # 590-92.
**2.1.3** The Panels are M 51 Decorative Foil B Class and are supplied by Joiners System. Contact:

Zack Papachristou
Joiner Systems Inc.
Email:zpapachristou@joinersystems.com
t: (514) 636-5555
f: (514) 636-5410

Or
Alain DeCelles
Joiner Systems International
1925 – 52 Avenue
Lachine, QC H8T 3C3
Tel: 514-636-5555
Fax: 514-636-5410
Email: adecelles@joinersystems.com

**2.1.4** Locations of the Panels that need to be replaced are on the Forecastle Deck and the Upper Deck.

## 2.2 Standards

**2.2.1** N/A

## 2.3 Regulations

**2.3.1** Lloyds Register Rules for Paneling on board vessel.

**2.3.2** The Contractor must comply with latest edition of all Provincial Safety Regulations as they pertain to this specification.

## 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

**3.1.1** Contractor shall inform Chief Engineer prior to starting work on the Panels.

**3.1.2** Contractor must lock out tag out all electrical systems with this specification prior to starting.

**3.1.3** Contractor to note that this specification item needs to be done in conjunction with H-12 Flooring and Sub Flooring spec because the bottom of the paneling is below the contour of the hallway flooring. In order to get the paneling out the flooring has to be removed first. Then Paneling replaced then flooring installed.

**3.1.4** Contractor shall supply and install no substitutions.

a) 33 new B Class M 51 Decorative Foil Panels.
b) 33 Panel Joiners Strips for the B Class M 51 Decorative Foil Panels.
c) 3 outside corners for the B Class M 51 Decorative Foil Panels.
d) 2 inside corners for the B Class M 51 Decorative Foil Strips.

**3.1.5** Contractor shall supply and install new B Class M 51Decorative Foil panels that are to be 50 mm thick and approximately 600 mm wide and to be of the suitable height.(Panels are 2250 mm in height).

**3.1.6** The Panels will be joined in place with joining strips as per manufactures recommendations for the M 51 Decorative Foil B Class Panel. The panel joiner strips are 60 millimeter wide and be of suitable height.

**3.1.7** The outside corners are 80 mm x 80 mm as per manufactures recommendations for the M51 Decorative Foil B Class Panel, and the inside corners are 25 mm x 25 mm.

**3.1.8** Contractor shall quote on per additional panel and joiner strip to remove/dispose existing wall panel, supply and install per additional new wall panel and strip that can be adjusted up or down by 1379 action.

**3.1.9** The Panels are slotted into a lower and upper track. The Upper Track is mounted directly to the existing ceiling, while the lower track is affixed the floors.

**3.1.10** All gaps around the panels and tracking are to be filled with a 3 M fire stop caulking or equivalent and must be approved by Lloyds.

**3.1.11** The panels are to be secured in place with sheet metal screws through the tracking into the panel.

**3.1.12** Contractor shall supply and install new adhesive IMO Exit Signs and Life Boat signs as per existing signs. The IMO signs are to be installed on the new panels be same as existing signs. The wall panels with the signs are located on the Forecastle Deck and the Upper Deck.

**3.2 Forecastle Deck.**

**3.2.1** Contractor shall remove existing Joiner strips (quantity 12) on paneling and replace with new contractor supplied joiner strip. The joiner strip shall match the existing panels. The joiner strip is located in the stairwell from the Forecastle Deck to Upper Deck.

**3.3 Upper Deck Laundry Room Area**

**3.3.1** Contractor shall remove the following items before removing the existing panels and reinstall them after installing new panels. The handrails from the panels in the alleyway from the First Aid Room to the Smoke Room, the emergency light, the door hold back for the laundry room door and approximately two electrical plug outlets.

**3.3.2** Contractor shall remove the existing Panels on the Upper Deck from the First Aid Room along the hall by the Laundry Room to the Smoke Room.

**3.3.3** Contractor shall supply and install the 18 panels, 16 Panel joiner strips and 2 outside corners. Contractor will have to cut some panels to get them the correct size and for the electrical plug outlets. All cut panels are to keep their B Class rating and Lloyd's approval.

**3.3.4** Contractor shall supply and install new 178mm x 533mm self - adhesive polyester Directional Exit sign. The sign is a BDY 114658 or equivalent as per sign on existing panels. These signs were referenced from the Brady Safety, facility and equipment catalogue.

**3.4 Upper Deck Alleyway by Quarter Master Station**

**3.4.1** Panels looking forward from the Port outside door to the Starboard outside door.

**3.4.2** Contractor shall isolate the fire pull station box, accommodation fan shutdown, and remove them from the bulkhead Panels, the muster list stations and all other items that has to be removed from the bulkheads. The stainless steel frame and door closure indicator will have to be removed.

**3.4.3** Contractor shall remove the existing panels looking forward from the Port Out side Door to the Starboard Out side Door.

**3.4.4** Contractor shall supply and install new M51 Decorative Foil B Class Panels and the joiner strips and inside corners for the M51 Decorative Foil Panel. There are 9 panels, 7 joiner strips and 2 inside corner that are 25 mm x 25 mm and of the suitable height.

**3.4.5** Contractor shall have an access hatch panel for the sound powered Telephone junction box. Contractor will have to cut some panels to get to fit correctly. All cut panels and access hatches are to keep their B Class rating and Lloyd's approval.

**3.4.6** Contractor shall install the fire alarm pull station, the accommodation fan emergency shutdown, the clock and all other items that were removed.

**3.4.7** Contractor shall supply and install new ISO Life Boat Station signs and exit signs. The adhesive signs are to the same as signs on the existing panels.

**3.5 Upper Deck Alleyway by Q/M station looking at the aft Panels**

**3.5.1** Contractor shall remove the handrails and the emergency light.

**3.5.2** Contractor shall remove the existing wall panels from the Door to the hydraulics room to the corner of alleyway.

**3.5.3** Contractor shall supply and install new M51 Decorative Foil B Class Panels. Contractor will have to cut some panels for them to fit correctly. The cut panels must keep their B Class and Lloyd's approval.

**3.5.4** Contractor shall supply and install 6 panels, 8 joiner strips and one corner piece for this section.

**3.5.5** Contractor shall cut an access hatch in one panel 330mm wide x 1575mm high. The access hatch is to be a fabricated from a wall panel and framed out with a joiner strips as per existing access hatch. The access hatch shall keep its B Class rating and Lloyd's approval.

**3.5.6** Contractor shall install emergency lighting and hand rails and all other items that were removed.

**3.5.7** Contractor shall supply and install new 152mm x 152 mm IMO Life Boat Station Sign, BO2.11 and directional arrow signs 152mm x 152 mm sign BDY 59277 and a Polyester Directional Exit Sign BDY 114658 or equivalent.

**3.5.8** Chief Engineer and Lloyds to inspect all the panels when the work is complete.

**3.6 Location**

**3.6.1** Upper Deck Frames 49-52

**3.7 Interferences**

**3.7.1** 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** Chief Engineer and Lloyds Surveyor to Inspect the Panels.

### 4.2 Testing N/A

### 4.3 Certification

**4.3.1** Contractor shall supply Paneling Lloyds Approved Certificate for Class B.

## Part: 5 DELIVERABLES:

### 5.1 Drawings/Reports

**5.1.1** Contractor shall supply Chief Engineer with three type written copies and one electronic copy of a report of all work carried out.

### 5.2 Spares

Contractor must supply the following items as spares and include it in the cost,

a) 10 Panels B Class M51 Decorative Foil

b) 10 Panel Joiner Strips for the M51 Decorative Foil Panels

c) 4 outside corners for the M51 Decorative Foil Panels

d) 4 inside corners for the M51 Decorative Foil Panels

### 5.3 Training

**N/A**

### 5.4 Manuals **N/A**

| Spec item #: H-15 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**H - 15 : Furniture and Cabinets**

**Part: 1 SCOPE:**

**1.1** The intent of this specification shall be to replace worn out and damaged Furniture and Cabinets on the vessel as outlined in the technical specification.

**1.2** This work shall be carried out in Conjunction with the following: H-12 Flooring & Sub floors, H-14 Paneling and H-26 Domestic Freshwater Piping.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1**

**2.2 Standards**

**2.2.1** All furnature shall be constructed from fire ratedmarine plywood as per CAN/ULC-S102 or equivalent.

**2.3 Regulations**

**2.3.1** All furnature constructed must meet Maritime Occupational Heath and Safety Regulations, Part 3, section 32-35, 39-40

**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** A total of twenty cabins will be addressed, with varying degrees of furniture replacement in each. As such it is necessary to match as closely as possible existing laminate colors so that ships decor is consistent throughout.

**3.2** Furniture items that will be addressed are; desks, sleeping bunks, bathroom vanities, entertainment unit in crews lounge, laundry room cabinets and divider console in the officer's mess.

**3.3 A list of furniture items, quantities and location of each are as follows:**

**3.3.1 Fourteen (14) Desks**

**3.3.1.1** Two (2) 2540mm long x 762 mm depth desks with three 533mm wide drawer pedestals. Bridge Deck (Captain and Chief Engineer Cabin).

**3.3.1.2** Two (2) 2337mm long x 762 mm depth desks with three 533mm wide drawer pedestals Bridge Deck (Chief Officer), Foc'sle Deck (Senior Engineer).

**3.3.1.3** Two (2) 1778mm long x 610 mm depth desks with three 533mm wide drawer pedestals. Foc'sle Deck (2nd Program Officer and Second Engineer).

**3.3.1.4** Seven (7) 1626mm x 610 mm depth desks with one (1) 406mm wide and one (1) 610mm wide drawer pedestals. Upper Deck (Bosun, Seaman #1, Second Cook, Seaman 32, Leading Seaman #2 and Seaman Spare), Main Deck ( Steward).

**3.3.1.5** One (1) 3302mm long x 610 mm depth desk with three 533mm wide pedestals. (Cooks cabin).

**3.3.2 Five (5) vanities 635mm – 991mm long x 572 mm depth (Custom Fabrication and installation will be required).**

**3.3.2.1 Foc'sle Deck** (2nd Program Officer and Second Engineers).
**3.3.2.2 Upper Deck** (Seaman # 1 and Seaman Spare).
**3.3.2.3 Main Deck** (Oiler).

**3.3.3 Seven (7) bunks 1981mm x 889mm.**

**3.3.3.1 Foc'sle Deck** (Senior Engineer Cabin and 2nd Program Officer).
**3.3.3.2 Upper Deck** (Bosun, Seaman #1, Chief Cook and Seaman #2.
**3.3.3.3 Main Deck Aft** (Port Aft cabin).

**3.3.4** Laundry room Cabinetry. As per existing picture. Unit consists of a desk unit 1219mm wide x 559mm deep x 914mm high with surrounding storage cabinets at 254mm deep. With the whole unit being approximately 2134mm x 2134mm.


**3.3.5** Built in storage entertainment unit (crew's forward lounge) as per existing unit or supplied drawing. Approximate size 2845mm long 610mm deep 914mm high.

**3.3.6** Center console unit (officers lounge) as per existing unit or supplied drawing. Approximate size 366mm long x 838mm wide x 914mm high.

**3.4 General requirements**

**3.4.1** To a greater degree the above items are of a nonstandard nature. As a result they will have to be custom built for their specific location. The exception to this are the seven bunks which are identical in size but may have to be oriented in a left or right position due to their locations throughout the ship.

**3.4.2** All furniture shall be constructed of a fire rated laminate bonded to a high quality 19 mm ( ¾ inch) marine plywood. All exterior surfaces are to be covered with laminate.

**3.4.3** In some cases where bulkheads are angled or decks are cambered, special allowances will have to be made to allow furniture to fit specific locations. Supplying oversize panels, fillers, and bases that can be scribed to fit irregularities in the deck, as well as the use of templates will make this possible.

**3.4.4** A matching T Edge is to be used on all exterior edges of the furniture. This is to be trimmed and rounded so that there are no sharp edges.

**3.5 A description and requirements of each furniture item are given below**

**3.5.1 Bunks**

**3.5.1.1** Each bunk is to be fitted with two drawers approximately 635mm wide by 203mm high by 508mm deep.

**3.5.1.2** Each drawer to mounted with heavy duty full extension runners and a center mounted heavy duty self latching pull, to be approved.

**3.5.1.3** All drawers to be constructed of 13mm inch birch or Baltic birch plywood (or approved equivalent) with a minimum of two coats of clear finish.

**3.5.1.4** All edges of drawer boxes to be rounded and sanded smooth or edge taped.

**3.5.1.5** Final assembly of the bunk will permit the orientation of the sideboard in either a left or right cabin layout on the vessel.

**3.5.2 Desks**

**3.5.2.1** All desks to consist of a desk top that is laminated on the top and on the underside with a fire rated backer.

**3.5.2.2** Each will have two to three pedestals of varying width, depending on the length of the desk. Location of pedastals as per existing.

**3.5.2.3** Each drawer pedestal is to be fitted with three drawers, one sized for file hanging and two smaller pencil drawers.

**3.5.2.4** Drawers are to be fitted with heavy duty full extension runners with a center mounted heavy duty self latching pull.

**3.5.2.5** All drawers to be constructed of 13mm birch or Baltic birch plywood and finished in the same manner as the bunk drawers. All edges of drawer fronts and desks are to be trimmed with matching T edge. Approximate sizes of desks are listed above.

**3.5.2.6** Book or binder shelves are required in the captain, chief engineers, chief officer and senior engineer cabins. These are between seven and eight feet long depending on their location and angle of adjacent bulkhead.

**3.5.2.7** Two are required in the captain and chief engineer's cabin and one in the chief officer and senior engineer's cabin. It is important that these shelves be made to accommodate large binders, as such a clear interior depth of 318mm is required.

**3.5.2.8** All book shelves are to be fitted with a removable batten and bottom lip to secure books. Dividers at two to three foot intervals are also necessary on these book shelves. Book shelves are to be constructed of the same material as the adjacent desks (fire rated laminate bonded to marine plywood).

### 3.5.3 Vanities

**3.5.3.1** Vanities are of varying sizes and are oriented between walls. As such they need to be custom built and fitted to match existing openings. Fillers and backsplash trims will be required for this purpose.

**3.5.3.2** Interiors of cabinets will have to be cut or drilled to accommodate piping and sinks.

**3.5.3.3** Two doors are required on each vanity each with positive self latching closures.

**3.5.3.4** An American Standard Colony steel enamel coated oval basin (483 mm x 432 mm ) in white and single handle American Standard faucets fitted with a pop up drain plug are to be supplied with each vanity.

**3.5.3.5** Each vanity is to be constructed of fire rated laminate bonded to 19mm marine plywood.

### 3.5.4 Laundry room cabinetry

**3.5.4.1** Laundry room cabinets to be constructed of 16mm white melamine interior with exterior doors and end panels constructed of 19mm Plywood with plastic laminate and T edge.

**3.5.4.2** All doors are to be hinged with 35 mm European hinges. Base cabinets are a combination of drawers and doors using the same hardware and finishes as other cabinetry already specified.

**3.5.4.3** This cabinetry will be as fitted.

### 3.5.5 Crews Lounge and officers lounge entertainment units

**3.5.5.1** These units are to be replaced with units of similar size.

**3.5.5.2** See attached drawings for general size of units. Actual layout of new cabinetry, drawers, doors, open areas for components and TV's will be decided in consultation with ships crew.

**3.5.5.3** These cabinets use the same materials and hardware as previously specified and are to be consistent with other finishes throughout the ship.

## Part: 4 PROOF OF PERFORMANCE:

**4.1 Inspection**

**4.1.1** Chief Engineer to inspection all replaced furniture and cabinets.

**4.1.2** All wood work must be of a professional quality.

**4.2 Testing**

**4.2.1** All drawers must work properly with no restrictions.

**4.3 Certification**

N/A

**Part: 5 DELIVERABLES:**

**5.1 Drawings/Reports**

**5.1.1** Contractor to supply to Chief Engineer three type copies and one electronic copy of all work carried out and list of all material used and certificates for all fire rated material used.

**5.2 Spares**

**N/A**

**5.3 Training**

**N/A**

**5.4 Manuals**

**N/A**

| Spec item #: H-16 | SPECIFICATION | TCMSB Field #: N/A |
|---|---|---|
| **H - 16 : Galley Equipment Replacement** | | |

**Part: 1 SCOPE:**

**1.1** The intent of this specification shall be to remove, dispose as per provincial regulations and replace Galley equipment and components as indicated in Tables 1 and 2 within the specification.

**1.2** This specification is to be carried out in conjunction with H-05 Fixed Smothering System, H-17 Galley Flooring, H-22 Fire Lines Replacement, H-24 Domestic Freshwater Piping Replacement, H-25 Galley Cold Rooms Insulation, H-26 Galley Cold Rooms Refrigeration,HD-07 Drains & Scupper Lines, HD-17 Port Miranda Davit Installation, HD-18 Stbd Miranda Davit Installation and L-08 P&S Miranda Davit Electrical.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1** New Proposed Galley Counter Layout.

2.1.2 Reference Drawings. MSI Drawing number 2629-01-00

**2.2 Standards**

**2.2.1** TP 127 – Ship's Electrical Standards

**2.2.2** TP 11469 – Guide to Structural Fire Protection

**2.2.3** TP 439 – Structural Fire Protection Standards

**2.2.4** Fleet Safety and Security Manual (DFO/5737)

**2.3 Regulations**

**2.3.1** Canada Shipping Act 2001 – Hull Construction Regulations

**2.3.2** Marine Occupational Health and Safety Regulations (SOR/2010-120)

**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**

3.1.1 Contractor prior to starting any work has to contact Chief Engineer.

3.1.2 Route Contractor shall follow for taking out and installing new components to and from the galley is through the door opening (813mm wide x 1930mm) to the passageway to the cold room then down this passageway to a hatch opening (1118mm x 1118mm) that opens to the Upper Deck. Note the Contractor has to cut the hatch opening and the door opening from Galley to the cold room passageway. Contractor will have to make sure prior to cutting any bulkhead material out there is no interference items (wiring or any systems that can be damage) that can be damaged. Note approximately 102mm aft of the door frame opening there is a wire tray. Contractor if cutting out this area the electrical wire has to be protected for hot work (cutting out or welding in new material) after all components have been replaced. Contractor to note all measurements are approximate only and must be verify by Contractor.

**3.1.3** After complete strip-out of galley equipment and components listed in Table 1, the Contractor shall perform an inspection to determine the overall condition of steel work, electrical cabling, piping systems, etc, that are exposed noting missing or damaged components. A serialized condition report recording all deficiencies found and recommended repairs or replacements shall be submitted to the Technical Authority.

3.1.4 The Contractor shall supply all equipment, enclosures, ventilation, staging, chain falls, craneage, 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, of an adequate safe working load for the expected duties. Any brackets or other welded attachments required in the performance of this specification shall be welded into place by CWB-certified welders certified to welding Std. W47.1, Div. 1 and 2.

3.1.5 Contractor shall notify Chief Engineer prior to any hot work taking place, the Contractor shall ensure that the area of work and any adjacent space is certified as gas free and suitable for hot work as per the preamble to follow Provincial Regulations.

3.1.6 The Contractor shall be responsible to protect the vessel from damage due to environmental factors such as cold temperatures and water while the steel repair is ongoing. All still water in the work area shall be heat protected or isolated. The area undergoing repair is to be effectively tarped and insulated to prevent damages. Any damages resulting from the performance of this specification item will be repaired at the Contractor’s expense.

3.1.7 The Contractor shall be responsible to protect the interior of the vessel from physical damage and contamination by generated smoke. This shall include the provision of

suitable extraction fans as well as suitable coverings for decks, decking, deckheads, bulkheads, and outfit as required to limit additional damages.

3.1.8 The Contractor shall be responsible to ensure that all areas have been thoroughly cleaned and free of any debris resulting from welding prior to the acceptance of this specification item.

3.1.9 The Contractor shall ensure that the galley fixed fire extinguishing system has been deactivated prior to commencing work on this specification item to prevent accidental discharge and to reactivate the system upon completion of the installations.

**3.1.10**

Table 1: Description of Existing Equipment Identified for Removal

| **Item** | **Equipment** | **Model #** | **Serial #** | **Electrical capacity** | **Applicable Dimensions-inches** |
|---|---|---|---|---|---|
| 1 | Garland Galley Range #1 | 10-17R | 35028 | 460 volt AC<br>18.8/26.3/38.5 kw, 3 phase | 36”L X 36” W X 29.5” H |
| 2 | Garland Galley Range # 2 | 10-18RV | 35027 | 460 volt AC<br>18.8/26.3/38.5 kw, 3 phase | 36”L X 36” W X 29.5” H |
| 3 | Garland Deep Fat Fryer | Model # 10-31SIV | 35029 | 460V 16 KW<br>3 phase | |
| 4 | Moffat Convection Oven | Model # E32MS | 344475 | 27.8A 240 AC 6.6 Kw<br>3 phase | |
| 5 | Foster Reach in Refrigerator | Model MH-25-U | 63221 | 115V 60Hz 1Ph. | 48” l X 28.25”w X 72” h |
| 6 | Menumaster Microwave oven in | Model # FS11 MFG # P1302104M | 9805292934<br>FCC ID APJ9Q605104 | Frequency 2450 MHz; 120 volt 60 Hz; Pwr in | |

| | | | | | |
|---|---|---|---|---|---|
| | Galley | | | 2100 w | |
| 7 | Quest Metal Hot food well | Wks: Model # RET | 2005 | Volts 240 1ph. 60 Hz 4600 watts | 71.5”l X 34”w X 30”h 35 Inches H from the deck |
| 8 | Cake Mixer | KB – 502 | | Volts 115 60 Hz 1 Ph | |

**3.1.11** Cable Identification and Inspection

Contractor shall trace to source and identify all power, feed, control and signal cabling, coming to or originating from the Galley. Contractor shall ensure that all cables are clearly identified as to their purpose and voltage. Redundant cables shall be stripped out to their source to satisfaction of Lloyd’s Surveyor, Chief Engineer and TA.

The existing Power Supply 440 Volt cables shall be checked and insulation tested, if ok they shall be reused, if not, the cables shall be replaced. Cost of new cables if required shall be adjusted by PWGSC 1379 action.

**3.1.12**

Table 2: Description of Recommended or Equivalent Equipment to be Supplied and Installed by Contractor

| **Item** | **Equipment** | **Model #** | **Dimensions in inches** |
|---|---|---|---|
| 1 | Garland Heavy Duty Boil Top Range | 36E Series | 36 W x 41D x 36 ½ H |
| 2 | Garland Heavy Duty Griddle Top | 36E Series | 36W x 41D x 36 ½ H |
| 3 | Garland Heavy Duty Range Fryer | 36E Series | 20W x 41D x 36 ½ H |

| | | | |
|---|---|---|---|
| 4 | Garland Convection Oven and Stand | MCOE5 | 28W x 32D x 25 |
| 5 | Delfield Refrigerator | 615XL | 48 3/4 x 33 1/4 x 72 H |
| 6 | Amana Microwave | Model # RCS10TS | |
| 7 | MKE Steam Table | HFT 33AW | 34 1/8 x 71L x 35 ½ H |
| 8 | Globe 30 Quart Mixer | | Upright floor model |
| 9 | Cleveland Steam Kettle | KET-3-T | Note: this item is a new installation not a replacement |

### 3.1.13 General requirements

**3.1.11.1** Contractor prior to installing any new equipment must remove and dispose existing Galley flooring as per Galley Flooring spec prior to the installation of new flooring. Contractor must size up the new replacement equipment's footprint to make sure the mounting arrangement to the deck is correct. If any modification have to be made it will be done by PWGSC 1379 action. After this work is done the Galley Flooring must be installed and then the equipment, after waiting the recommend Manufacture curing time for the flooring.

**3.1.11.2** The Contractor shall supply, install and set to work all new equipment, components and systems for a completely new galley. The final selection of equipment and materials including detailed drawings of arrangements shall be submitted to Technical Authority before implementation.

**3.1.11.3** Contractor shall provide Manufacture warranty for a period of one year on all new components installed to Owner. Contractor to follow Manufacture recommendation for installation and to keep this warranty.

**3.1.11.4** The Contractor shall be solely responsible for all modifications including piping, electrical, HVAC trunking, etc to integrate new equipment and components as necessary into existing systems.

**3.1.14 Sanitary Considerations.**

**3.1.12.1** All appliances shall be stainless steel construction and shall be secured by mounting kits, as necessary.

**3.1.12.2** Please refer to drawings. Final exact measurements will have to be done by the contractor.

**3.1.12.3** For appearance and sanitation, all new linings shall be stainless steel sheathing, minimum 18 gauge. Stainless steel linings shall be continuous and seamless. Butt seams are to be joined with an overlapping strip. Seams and edges are to be sealed with a sealant approved for use in food preparation areas.

**3.1.12.4** Any cut outs for electrical outlets and other receptacles shall be installed with new stainless steel faceplates.

**3.2 Location**

**3.2.1 Galley and pantry**

**3.3 Interferences**

3.3.1 Contractor shall re install all other interferences and miscellaneous items previously removed before the start of work. All items returned to galley shall be securely stowed.

**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** The Contractor shall provide proof of performance with respect to all work.

**4.1.3** Proof of performance shall also include all inspection check points specifically detailed below.

**4.1.3.1** Verification of correct adjustment and operational condition of emergency shutoffs and back-ups.

**4.1.3.2** Verification of correct adjustment, alignment and operational condition of securing arrangements, connection of the components to associated systems, safety, control and monitoring devices.

**4.1.3.3** Inspection of components and their installation.

**4.2 Testing**

**4.2.1** The Contractor shall perform tests to verify that all requirements of the Specification are met. Prior to testing, the Contractor shall visually inspect all components for quality of workmanship, conformity to this specification and the intrinsic safety of equipment operation or testing apparatus.

**4.2.2** Contractor shall provide warranty for a period of one year on all components installed. Contractor to provide Field Service Representatives from Authorized Dealer to provide: startup and commissioning of the system, and to provide training as detailed below. Demonstration of equipment, component and operational functionality.

**4.3 Certification**

**4.3.1** The Contractor shall obtain and provide to the Technical Authority all required technical Certifications as specified in the applicable rules and codes. These shall include but not be limited to the following:

**4.3.1.1** Equipment and Component inspection certificates including all test reports supporting the certifications.

**4.3.1.2** System Installation inspection certificates including proof of compliance.

**4.3.1.3** All new electrical equipment shall be either CSA approved and/or UL listed.

**Part: 5 DELIVERABLES:**

**5.1 Drawings/Reports**

**5.1.1** Contractor to update all reference drawings listed within section 2.1.2. Drawings will be revised to the next revision level and denoted as “As Fitted” status.

**5.1.2** Supplied drawings that are vector based drawings shall be updated and delivered in a vector based format. All new drawings are to be delivered in vector based format. Vector based drawings format shall be an AutoCAD™ 2004 format.

**5.1.3** Supplied drawings that are in a printed format shall be updated, scanned and delivered in a PDF format.

**5.2 Spares**

**5.2.1.** Contractor shall provide manufacturer recommended spares for supplied equipment. All costs associated with general spares shall be inclusive of the contract price.

**5.2.2.** Contractor to provide a list of manufacturer recommended spares for a fifteen year lifespan. List to include part numbers, lead times and local and international distributors and service centers.

**5.3 Training**

5.3.1 The Contractor shall provide one (1) training course to be held onboard after final installation. This course shall be conducted by the Supplier's technical representative and shall cover:

**5.3.1.1** all of the items contained in the operating and maintenance instructions,

**5.3.1.2** Demonstrations of routine maintenance operations

**5.3.1.3** Course duration shall be four (4) hours.

**5.4 Manuals**

**5.4.1.** Contractor to provide manufacturer recommended operational and maintenance manuals. Four (4) paper copies of each document to be provided.

**5.4.2.** Alternatively, (2) paper copies along with a single electronic copy may be provided. The electronic copy shall be in PDF format.

| Spec item #: H-17 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**H - 17 : Galley Flooring**

**Part: 1 *SCOPE:**

**1.1** The intent of this specification shall be contractor remove and dispose existing flooring from galley deck and hallway deck by cold rooms and deck by stairs to Officers pantry and replace with contractor supplied new non-skid quarry tile.

**1.2** This work shall be carried out in Conjunction with the following work specification # H-16 Galley Equipment. HD-17 Port Miranda, HD-18 Stbd Miranda Davit, H- 25 Cold Room Insulation Replacement and H-24 Galley Cold Rooms Refrigeration, H - 24 Domestic Freshwater Piping Replacement, H-22 Fire Lines Replacement and L-08 P & S Miranda Davit Electrical.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1** Deck Covering. Drawing 590-92.

**2.1.2** Application as per manufactures Specifications for flooring products.

**2.2 Standards**

**2.2.1** N/A.

**2.3 Regulations**

**2.3.1** All deck covering material must be incombustible as approved by Lloyds in accordance with the Fire Protection Regulations and Standards applicable to this vessel.

**2.3.2** Contractor shall comply with the latest edition of all 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 General

**3.2** Contractor shall inform Chief Engineer prior to work commence on the Galley Deck.

**3.3** Contractor to confirm with the Chief Engineer that the Transformer for the dishwasher in the Officers pantry that is located behind the stairs to the Officers pantry is Isolated, Locked Out and Tagged and the electric heater located by the stairwell to the Officers pantry is isolated, locked out and tagged as per Provincial Regulations.

**3.4** Contractor shall remove the transformer from behind the stairwell to the Officers pantry and the electric base board heater located by stairwell to the Officers pantry and store them in a safe and secure location until flooring work is complete and ready to be re-installed.

**3.5** Contractor shall supply and install 60.4 $m^2$ of non – skid quarry tiles and 85.3 m of base plate tile.

**3.6** Contractor shall quote on the unit cost per additional square metre of finished non –skid quarry tile and grout for to supply and install that can be adjusted up or down by 1379 action

**3.7** Contractor shall quote on the unit cost of linear foot of finished base plate tile and grout for to supply and install that can be adjusted up or down by 1379 action.

**3.8** Contractor in conjunction with work specification H-16 Galley Equipment remove the equipment from the galley.

**3.9** Contractor shall supply ventilation from outside the ship to the area being worked on, and air extraction from the area being worked on to outside the ship.

**3.10** Contractor shall isolate the areas being worked on from other areas of the ship to keep dust from entering other areas.

**3.11** Contractor shall remove existing flooring to the bare steel in the galley, hallway by cold rooms and deck to Officers pantry.

**3.12** Contractor shall remove from ship the old flooring material and debris that was removed from the deck and dipose of it as per Provincial Regulations.

**3.13** Contractor shall clean all decks to SSPC-SP-6.

**3.14** Contractor shall apply one coat of Amerlock 2 Epoxy Primer to all the decks.

**3.15** Contractor shall apply one layer of Dex O Tex **Decklite A-60 Fire Rating** Decking @ 35 mm thick as per Manufactures Application Instructions.

**3.16** Contractor shall supply and install Finish Flooring Non Skid Quarry Tile and Base Plate tiles as per manufactures recommendations.

**3.17** Non –skid quarry tiles are 152.4 mm x 152.4 mm (6x6 inch). The tile is to be **AC 355 Concoarse Grey** or equivalent.

**3.18** Base tiles are to be 127 mm (5 inches) high and 152.4 mm (6 inches) long to match the non –skid quarry tile.

**3.19** Grout is to be a **Charcoal Grey 929** or equivalent.

**3.20** Contractor shall supply and install grout. The grout to have a sealer coat applied as per manufactures instructions.

**3.21** Contractor shall install the Transformer for the dishwasher in the Officers pantry and the electrical baseboard heater by stairwell to Officers pantry.

**3.22** Chief Engineer to inspect the Quarry Tile Decking and the Base Tile.

**3.23 Location**

Main Deck (Frames 21-30)

**3.24 Interferences**

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

**Part: 4 PROOF OF PERFORMANCE:**

**4.1 Inspection** Chief Engineer and Lloyd's surveyor to inspect the flooring.

**4.2 Testing N/A**

**4.3 Certification**

Contractor must provide Lloyds Approval Certificate for flooring materials that they meet A60 Fire Rating to the Chief Engineer.

**Part: 5 DELIVERABLES:**

**5.1 Drawings/Reports**

**5.2** Contractor shall supply Chief Engineer with three type written copies and electronic copy of a report of all work carried out complete with the certification of all new equipment and materials.

**5.3 Spares**

**N/A**

**5.4 Training**

**N/A**

**5.5 Manuals**

**N/A**

| Spec item #: H-18 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**H – 18 : Engine Room Supply Fans**

**Part: 1 SCOPE:**

1.1 The intent of this specification is replacement of the port and starboard engine room supply fan units SF1, SF2 and Silencer SF1, SF2 with new. All units must be supplied by Original Equipment Manufacturer OEM Tri-Metal Fabricator no substitutions details of the units described below.

1.2 This work shall be carried out in Conjunction with the following specifications: H-19 HVAC Units, Fans & Motors and H-20 Ventilation Trunking & Louvers.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

2.1.1 This procedure to be read in conjunction with Barclay Associates drawing No. 102-06-01.

2.1.2 Allow 227kg for motor and 227kg for the silencer.

2.1.3 Access opening is 1664 mm x 1118mm, coaming height 610mm and depth of longitudinal bulkhead above opening 343mm.

2.1.4 Total length of fan unit 2540mm.

2.1.5 Fan unit SF1 and SF2 are:

**2.1.5.1** Tri-Metal Model 384/8 Direct Drive 20/9 HP 1750/875 RPM 480/3/60 Two Speed TEFC IEEE 45 Motor, CFM 25000

2.1.6 Silencer SF1 and SF2 model FWP-38

2.1.7 Tri-Metal Fabricators contact information:

**Contact name: Craig Ono**

**TRI-METAL FABRICATORS**
**19150 21st Avenue**
**Surrey, B.C. V3S 3M3**
**(t) 604-531-5518 ext. 233 Cell 604-626-8997(f) 604-531-5526**
**www.trimetalfabricators.com**

**2.2 Standards**

2.2.1 The Contractor is to be currently certified by the Canadian Welding Bureau in accordance with the CSA Standard W47.1-1983 "Certification of Companies for Fusion Welding of Steel Structures," Division 1, 2.1 or 2.2. All personnel performing welding shall be approved by the Canadian Welding Bureau. All welding shall be conducted in accordance with TP 615 1, CCG Standard for Welding of Ferrous Metals.

2.2.2 Electrical material and installation shall be in accordance with 1996 revision of TP127. Proof of certification to be supplied to PWGSC and C.C.G. representatives prior to the commencing of work.

**2.3 Regulations**

2.3.1 All the work described in this specification shall be completed to Lloyd's and 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 General**

3.1.1 Contractor is to remove both port and stbd supply fan units through the port side of the vessel, with the port unit being removed first.

3.1.2 Contractor prior to any work starting has to notify the Chief Engineer.

3.1.3 Contractor to run up each fan unit and carry out a 30 minute vibration analysis on each fan unit prior to removal.

3.1.4 Contractor prior to starting any work must lock out tag out all electrical power to both port and stbd supply fan units as per Provincial regulations.

3.1.5 Contractor prior to any hot work must have area certify for hot work by a Chemist or qualified person. Any hot work must be carried as per Provincial regulations.

3.1.6 Contractor to remove the wire mesh access door on the port side supply fan unit only and cut down the longitudinal bulkhead coaming for access on both Port and Stbd sides.

3.1.7 Contractor to cut a 3.50 metre x 375mm access slot in the Nav. Bridge Deck as per reference drawing #102-06-01.

3.1.8 Contractor must fabricate rigging lifting equipment as per drawing # 102-06-01. A 2000 lb chain hoist is to be used to remove the components. The hoist is to be mounted on the fabricated lifting beam installed over the slot in the Nav. Bridge Deck.

3.1.9 Contractor shall fit and weld 76mm x 76mm x 6.35mm steel angles to the trunking on the underside of the fan units. These angles are to support the fan units when they are released from the silencer and provide an exact height location for the new fan units. Access to the underside of the fan units is from the engine room through means of an access ladders.

3.1.10 Remove electric cabling from both electrical motors and the fan unit casing. So units are able to be removed.

3.1.11 Contractor shall disconnect the fusible linkage and remove the fan unit lid.

3.1.12 Contractor to remove the bolts and lift off the top coaming off silencer unit.

3.1.13 Contractor to disconnect the fan unit from the silencer (which is bolted together note the bolts are seized) and stow on the temporary support angles as shown on reference drawing # 102-06-01.

3.1.14 Contractor shall support silencer unit from fabricate rigging lifting equipment and then disconnect silencer unit which has a support ring welded to the Bridge Deck.

3.1.15 Contractor shall remove the stiffeners on the bulkhead between the Bridge Deck and the Nav. Bridge Deck, to allow the silencer to pass.

3.1.16 Contractor using the chain hoist, on its lifting beam above the Nav. Bridge Deck, lift the silencer up the Vent trunk, through the opening in the longitudinal bulkhead, and set down on the Bridge Deck.

3.1.17 Contractor shall remove the port house side ventilation jalousie, skid the silencer to the opening and remove it through the house side using dockside cranes.

3.1.18 Contractor Rig the fan unit and remove ashore using similar method as for silencer.

3.1.19 Contractor shall fabricate and fit a temporary steel platform over the port side vent trunk to facilitate access and removal of the starboard unit.

3.1.20 Contractor to remove the stbd fan and silencer unit similar to the port unit, out through the same pathway.

3.1.21 Contractor must cut support rings that are supplied with silencer, to fit into the compartment that it's going to be located in for installation into that fan unit space.

3.1.22 Contractor must weld new support ring that is supplied with the silencer in the proper location on the silencer this welding must be done on both sides of the support ring and be Lloyd's approved prior to welding and installation. All welded affected areas to be coated with two coats of primer.

3.1.23 The two new units are to be installed using the reverse of this procedure, the only different is that the stbd silencer and fan unit are assembled on top of the temporary steel plate covering the hold for the port fan unit. Contractor is to keep in mind when the silencer and fan unit is being assembled the electrical wiring has to line up with the fan unit housing. Note there is not very much clearance to move fan unit when assembled it's approximately 76mm. Contractor then the attached the assemble unit to chain hoist and install it into the stbd opening, bring it down to rest on the location angles detailed in drawing # 102-06-01.

3.1.24 Contractor shall then weld the support ring to the bridge deck.

3.1.25 Contractor hook up the electrical wiring as per TP127 regulations.

3.1.26 Contractor to hook up lubrication flex and steel lines for each motor. There should be two lines per motor, lines connected to remote grease nipples with a junction box mounted at the longitudinal bulkhead access opening P&S. System to be "Pro/Mark Industrials" or similar. Contractor shall install a 6.35mm through bulkhead fitting for tubing rated for 138 bar this will be supplied for both stbd and port fan units.

3.1.27 The temporary steel plate is removed for the port supply fan unit and the unit is assembled just outside the compartment.

3.1.28 Port supply fan unit and silencer to be installed the same as the stbd one.

3.1.29 Contractor to restore all electric cabling, deck fittings and fusible linkages are to be restored as formally.

3.1.30 Contractor to install all new stiffeners and plate removed for access are to be replaced new Lloyd's grade A steel or equivalent to be approved by Lloyd's.

3.1.31 Contractor to dismantle chain hoist lifting frame and take it out of the compartment and given to the Chief Engineer. The install new plate type as mention previously to seal 3.50 metre x 375mm access slot in the Nav. Bridge Deck.

3.1.32 Contractor must remove the supply fans supporting and location angle iron as referenced in drawing# 102-06-01.

3.1.33 Contractor after installation is to run up each fan unit and carry out a 30 minute vibration analysis on each fan unit. If there is any irregularly in the vibration analysis this must be corrected by Contractor at no cost to Owner.

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

3.1.35 Contractor to dispose of the removed fans and silencers that have been replaced as per Provincial Regulations.

**3.2 Interferences**

N/A

## 4 PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. All welding to be 100% visual inspected by Chief Engineer and Lloyd's Surveyor.

**4.2 Testing**

4.2.1 After installation off the supply fans they must be ran up continuous for 30 minutes unit and a vibration analysis carry out on each fan unit.

**4.3 Certification**

4.3.1 All welding has to be Lloyd's certified.

## 5 DELIVERABLES:

**5.1** Drawings/Reports

5.1.1 Contractor to supply a detailed report (three written copies and one electronic copy) to Chief Engineer.

## 5.2 Spares

**N/A**

## 5.3 Training

**N/A**

## 5.4 Manuals

**N/A**

| Spec item #: H - 19 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **H – 19 : HVAC Units, Fans & Motors** | | |

**Part: 1 SCOPE:**

**1.1** This specification describes the technical scope of work to be completed by a ship repair facility (Contractor) with respect to replacement of Air handling Units (AHU) #1, 2 and 3. And a list of fan units complete with motors to be replaced as a unit. Described in the technical description. All units must be supplied by Original Equipment Manufacturer OEM Tri-Metal Fabricator no substitutions details of the units described below.

**1.2** This work shall be carried out in Conjunction with the following specification: H-20 Ventilation Trunking & Louvers.

**1.3** The overall execution of this work outlines the delineation of responsibility, such that while the Contractor may understand the broad objectives of the system, they are also equipped with a baseline scope of work.

**1.4** This specification shall be considered in conjunction with the associated drawings as listed in Section 2 of this document. The outline specification and drawings are intended to be complementary; should any technical or other requirement(s) related to new and / or relocated equipment be indicated in either but not all of these documents, such requirement(s) shall be considered as part of the Contractor's scope of work.

**1.5** Dimensions supplied in this scope of work are approximate and are to be verified against specifications provided by the manufacturer for the replacement air conditioning and heating units.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings / Documents**

2.1.1 General Arrangement Drawing 590-70 (2 sheets)
2.1.2 Structural Arrangement 590-04 (2 sheets)
2.1.3 Superstructure – Structural Plan 590-12 (sheet 2)
2.1.4 Ventilation Arrangement – Bridge and For'c'sle Deck 5-111-2
2.1.5 Insulation Plan 590-77 (3 sheets)
2.1.6 Unit specification sheets
2.1.7 Tri-Metal material as described in the specification.
**2.1.8 Tri-Metal Fabricators contact information:**

**Contact name: Craig Ono**

**TRI-METAL FABRICATORS**
**19150 21st Avenue**
**Surrey, B.C. V3S 3M3**
**(t) 604-531-5518 ext. 233 Cell 604-626-8997(f) 604-531-5526**
**www.trimetalfabricators.com**

**2.2 Standards**

**2.2.1**

**2.3 Regulations**

**2.3.1 Lloyd's Classification**

**2.4 Owner Furnished Equipment**

**2.4.1** Contractor supply all motors, fan units, heaters, dampers, damper control units and humidifiers as listed in this specification.

**2.4.2** 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**

The scope of work as listed below is intended to be a broad overview and proposed sequence of project tasks under the responsibility of the Contractor. While every effort has been made to capture the scope of impact on existing vessel arrangements, it is the Contractors responsibility to carry out their own familiarization of the vessel with respect to work to be completed.

In the course of planning or execution of the work, the Contractor is welcome to make suggestions for means of accelerating the completion of the work, provided that such means are acceptable to Canadian Coast Guard (CCG) and Lloyd's Register (LR) Surveyor.

Contractor is to ensure all spaces affected and adjacent spaces where applicable are certified for hot work prior to the commencement of work and for the duration of the work scope. 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. Contractor shall post a copy of all certificates at the entrance to the affected spaces.

Protective material shall be used to prevent the spread of sparks; protecting electrical cables and other services. Fire sentries shall be provided in each space and in all adjacent spaces if welding, grinding, or 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 their designated area for at least thirty (30) minutes after any hot work has been completed.

Contractor to have Chief Engineer inspect all fan unit complete with motor and fan after removal. Chief Engineer will decide which units will be kept for spares the ones not kept for spares will be dispose by contractor as per provincial regulations.

If contractor needs clarification on any parts listed in this specification they can contact Craig Ono of Tri- Metal Fabricators, contact information above.

Note contractor must carry out a vibration analysis on all fan units in this specification prior to replacing them.

Contractor to dispose of the removed equipment and material that have been replaced in this specification as per Provincial Regulations.

The primary tasks to be completed by the Contractor are outlined as in the following sections:

3.1.1 **AHU-1 Navigation Bridge Deck**

Tri-Metal Model 13BI DWDI Custom Air Handling unit, contractor to:

3.1.1.1 Replace existing motor with new 1.0 HP (.746 KW) 1750 RPM 460/3/60 IEEE45 Premium Efficiency TEFC Motor.

3.1.1.2 Replace existing fan bearings with new SKF SNL507 1207 EKTN9 HA207 (2)FRB 8.5/72

3.1.1.3 Replace existing Fan drive with new Motor - 2VP32 X 7/8 Sheave Fan – 2AK39H x 1 3/16

3.1.1.4 Replace existing v-belts with new.

3.1.1.5 Replace existing filter frames with (2) new Camfil Farr Type 44 Stainless Steel 25 X 20 x 2

3.1.1.6 Replace existing mixed air damper actuators with (2) new Belimo AFB24-MFT Actuators and Mixed Air Thermostat - Honeywell T991A1012/U Modulating Temperature Controller, 0 - 100 F. 20' copper element.

3.1.1.7 Replace existing mixing dampers with new Ruskin SD36SS (T316SS) 36” x 24 Control Damper and Ruskin SD36SS (T316SS) 30” x 8 Control Damper.

3.1.1.8 Replace existing DH-1 Electric heat and electro-mechanical controls with new DH-2 9 KW 3 Stage 16x 16 Electric Duct Heater with sealed tubular elements. 3 Stage Remote Controls Panel with integrated low voltage anti-condensate circuit.

3.1.2 **AHU-2 Bridge Deck and Foc’sle Deck**

Tri-Metal Model 16 BI DWDI Custom Air Handling Unit, contractor to:

3.1.2.1 Replace existing motor with high efficiency motor 1 ½ HP (1.119 KW) 1750 RPM 460/3/60 IEEE45 Premium Efficiency TEFC Motor.

3.1.2.2 Replace existing fan bearings with SKF SNL509 1209 EKTN9 HA209 (2)FRB5.5/85

3.1.2.3 Replace Fan Drive with new Fan Drive Motor - 2VP36 X 7/8 Sheave Fan – 2AK41H x 1 7/16.

3.1.2.4 Replace v-belt with new.

3.1.2.5 Replacing existing filter frame with new (2) Camfil Farr Type 44 Stainless Steel 25 X 20 x 2.

3.1.2.6 Replace existing damper actuator and mixed are thermostat with new Mixed air damper actuators – (2) Belimo AFB24-MFT Actuators, Mixed Air Thermostat - Honeywell T991A1012/U Modulating Temperature Controller, 0 - 100 F. 20' copper element.

3.1.2.7 Replace existing mixing dampers with new Ruskin SD36SS (T316SS) 36” x 24 Control Damper and Ruskin SD36SS (T316SS) 30” x 8 Control Damper.

3.1.2.8 Replace existing DH-2 Electric heat and electro-mechanical controls with new DH-2 24 KW 3 Stage 24 x 24 Electric Duct Heater with sealed tubular elements. 3 Stage Remote Controls Panel with integrated low voltage anti-condensate circuit.

3.1.2.9 Replace existing Humidifier with new Humidifier suitable for 3200 CFM.

3.1.3 **AHU-3 Upper Deck and Main Deck**

Tri-Metal Model 24AF DWDI Custom Air Handling Unit, contractor to:

3.1.3.1 Replace existing motor with 15 HP (11.186 KW) 1750 RPM 460/3/60 IEEE45 Premium Efficiency TEFC Motor.
3.1.3.2 Replace existing fan bearings with new SKF SNL513 1213 EKTN9 H213 (2) FRB 14/120.
3.1.3.3 Replace v-belt with new.
3.1.3.4 Replacing existing filter frame with (6) new Camfil Farr Type 44 Stainless Steel 24 X 24 x 2.
3.1.3.5 Replace existing damper actuator and mixed are thermostat with new Mixed air damper actuators – (2) Belimo AFB24-MFT Actuators, Mixed Air Thermostat - Honeywell T991A1012/U Modulating Temperature Controller, 0 - 100 F. 20' copper element.
3.1.3.6 Replace existing mixing dampers with (2) Ruskin new SD36SS (T316SS) 36” x 84 Control Dampers.
3.1.3.7 Replace existing DH-3 Electric heat and electro-mechanical controls with new DH-3 100 KW 8 Stage 24 x 24 Electric Duct Heater with sealed tubular elements and (8) Stage Remote Controls Panel with integrated low voltage anti-condensate circuit.
3.1.3.8 Replace existing Humidifier with new Humidifier suitable for 12000 CFM.

**3.1.4 <u>SF4 - Emergency Generator Supply</u>**

Contractor to replace existing fan unit complete with new:

3.1.4.1 Tri-Metal Model 194 Direct Drive Axial Fan
3200 CFM @ .85” SP – 20 Degree Pitch

.75 HP (.56 KW) 1750 RPM IEEE45 Premium Efficiency TEFC Motor

Cast aluminum manually adjustable pitch impeller

Mild steel hot dipped galvanized casing

**3.1.5 <u>SF5 - Harbor Generator Supply</u>**

Contractor to replace existing fan unit complete with new:

3.1.5.1 Tri-Metal Model 244 Direct Drive Axial Fan
5000 CFM @ 2.0” SP – 16 Degree Pitch

2.0 HP (1.492 KW) 1750 RPM IEEE45 Premium Efficiency TEFC Motor

Cast aluminum manually adjustable pitch impeller

Mild steel hot dipped galvanized casing

**3.1.6 <u>SF6 - Bow Thruster Supply</u>**

Contractor to replace existing fan unit complete with new:

3.1.6.1 Tri-Metal Model 154 Direct Drive Axial Fan
1400 CFM @ .60" SP – 20 Degree Pitch

1/3 HP (.25 KW) 1750 RPM IEEE45 Premium Efficiency TEFC Motor

Cast aluminum manually adjustable pitch impeller

Mild steel hot dipped galvanized casing

**3.1.7 <u>EF1 - Washroom Exhaust Navigational Bridge</u>**

Contractor to replace existing fan unit complete with new:

3.1.7.1 Broan-Nutone Model 692 Ductless Bathroom Exhaust Fan or equal.

**3.1.8 <u>EF2- Starboard Washroom Exhaust Bridge/ Foc'sle</u>**

Contractor to replace existing fan unit complete with new:

3.1.8.1 Tri-Metal Model 082 Direct Drive Axial Fan
420 CFM (Balanced air volume)

1/6 HP 3450 RPM 120/1/60 TEFC Motor

Cast aluminum fixed pitch impeller

Mild steel hot dipped galvanized casing

**3.1.9 <u>EF3 - Port Washroom Exhaust Bridge/ Foc'sle</u>**

Contractor to replace existing fan unit complete with new:

3.1.9.1 Tri-Metal Model 082 Direct Drive Axial Fan
420 CFM (Balanced air volume)

1/6 HP 3450 RPM 120/1/60 TEFC Motor

Cast aluminum fixed pitch impeller

Mild steel hot dipped galvanized casing.

**3.1.10 <u>EF4- Starboard Washroom Exhaust Upper/Main</u>**

Contractor to replace existing fan unit complete with new:

3.1.10.1 Tri-Metal Model 082 Direct Drive Axial Fan
Two stage assembly

690 CFM (Balanced air volume)

1/6 HP 3450 RPM 120/1/60 TEFC Motor

Cast aluminum fixed pitch impeller

Mild steel hot dipped galvanized casing.

**3.1.11 <u>EF5 - Port Washroom Exhaust Upper/Main</u>**

Contractor to replace existing fan unit complete with new:

3.1.11.1 Tri-Metal Model 082 Direct Drive Axial Fan
600 CFM (Balanced air volume)

1/6 HP 3450 RPM 120/1/60 TEFC Motor

Cast aluminum fixed pitch impeller

Mild steel hot dipped galvanized casing

**3.1.12 <u>EF6 - Port Washroom Exhaust Main</u>**

Contractor to replace existing fan unit complete with new:

3.1.12.1 Tri-Metal Model 082 Direct Drive Axial Fan
300 CFM (Balanced air volume)

1/6 HP 3450 RPM 120/1/60 TEFC Motor

Cast aluminum fixed pitch impeller

Mild steel hot dipped galvanized casing

**3.1.13 <u>EF7 - Galley Exhaust</u>**

Contractor to replace existing fan unit complete with new:

3.1.13.1 Tri-Metal Model 194 Direct Drive Axial Fan
3600 CFM @ .85" SP – 22 Degree Pitch

1.0 HP (.746 KW) 1750 RPM IEEE45 Premium Efficiency TEFC Motor.

Cast aluminum manually adjustable pitch impeller.

Mild steel hot dipped galvanized casing.

**3.1.14 <u>EF8 - Purifier Exhaust</u>**

Contractor to replace existing fan unit complete with new:

3.1.14.1 Tri-Metal Model 082 Direct Drive Axial Fan
500 CFM (Balanced air volume)

1/6 HP 3450 RPM 120/1/60 TEFC Motor

Cast aluminum fixed pitch impeller.

Mild steel hot dipped galvanized casing.

**3.1.15 <u>EF9 - Washroom and Change Room</u>**

Contractor to replace existing fan unit complete with new:

3.1.15.1 Tri-Metal Model 082 Direct Drive Axial Fan
530 CFM (Balanced air volume)

1/6 HP 3450 RPM 120/1/60 TEFC Motor

Cast aluminum fixed pitch impeller

Mild steel hot dipped galvanized casing

**3.1.16** All work to be inspected and tested as described in **Part 4** to the satisfaction of attending LR Surveyor and Chief Engineer.

**3.2 Location**

**3.2.1** Various location throughout vessel reference Tri-Metal drawings total (12).

**3.3 Interferences**

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

**Part: 4 PROOF OF PERFORMANCE:**

**4.1 Inspection**

**4.1.1** All work to be completed to the satisfaction of the Chief Engineer and LR Surveyor.

4.1.2 100% visual inspection of all welding.

4.1.3 The Contractor shall issue and post hot work permits and shall maintain a fire sentry.

4.1.4 Upon completion of work areas to be visually inspected to ensure all debris has been removed.

**4.2 Testing**

4.2.1 All fan units described in this specification to have a vibration analysis done on them. These reading are to be compared to the reading taken on all fan units prior to replacement. The readings shall not be higher than the old fan units that came out or what is listed by manufacture. If they are higher the contractor must correct at contractor expense unless it's proven that it is no fault on contractor's installation.

**4.2.2** Welds tested 10% Magnetic Particle or as specified by LR by a certified technician.

**4.2.3** Systems to be function tested to the satisfaction of LR Surveyor and Chief Engineer.

**4.2.4** The contractor is responsible for all air quality testing to ensure hot work and entry is permitted.

**4.3 Certification**

4.3.1 Welders must be Canadian Welding Board certified.

4.3.2 Chemist must be certified.

4.3.3 Technicians for Non-destructive Testing must be certified.

4.3.4 Contractor to provide welding procedures to LR for approval, welding procedures have to be approved by Lloyd's prior to commencement of work.

**Part: 5 Deliverables**

**5.1 Drawings/Reports**

5.1.1 Contractor to supply three written copies and one electronic copy of all work completed including permits carried out and test carried out.

**5.2 Spares**

**5.2.1 N/A**

**5.3 Training**

**5.3.1 N/A**

**5.4 Manuels**

**5.4.1** Contractor to supply three sets of manuals for each operations and parts for all new items supplied from Tri-Metal Fabricators listed in this specification.

| Spec item : H-20 | **SPECIFICATION** | |
|---|---|---|
| **H - 20 : Trunking & Dampers** | | |

**Part 1: SCOPE**

**1.1** The intent of this specification shall be to remove and dispose all ductwork and its accessories which has been tagged unusable and replace or clean these items as needed to provide adequate ventilation throughout this vessel.

**1.2** This specification is to be carried out in conjunction with H-19 AVIATION GAS DAMPERS & H-22 HVAC UNITS FANS & MOTORS

**Part 2: REFERENCES**

**2.1 Guidance Drawings/ Nameplate Data**

1. **Tri-Metal drawings (9 drawings in total).**

**2.2 Standards**

**2.2.1** All welding to be carried out by Canadian Welding Bureau (CWB) certify welders, welding to be in accordance with CWB W47.1 & W59.

**2.3 Regulations**

**2.3.1** Contractor to follow all Provincial Regulations as they pertain to this spec item. Hotwork, disposal of old dampers and materials.

**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 complete this specified work.

**2.4.2**

**Part 3: TECHNICAL DESCRIPTION**

**3.1 General**

All new and disturbed or welded: ductwork and dampers referred to in this spec shall be painted for steel areas 1st coat Amercoat 5105 (3 mil dft) and finish coat Armercoat 5450. (3 mil dft ) each system applied coating (3 mil dft ) to be as per manufacture application procedures. Any galvanized areas the coating is to be Amercoat 385 (5 mil dft). or equivalent.

Repaired ductwork to be clean of rust by hand tool cleaning to SSPC-SP2 and repainted. Contractor shall protect equipment in immediate and surrounding spaces and provide adequate ventilation to and from the area.

Contractor is to dispose of all old dampers, motors, controls and ductwork that are replaced as per Provincial Regulations.

Contractor is responsible to the actual sizes the sizes in this spec are approximate sizes only.

### 3.1.1 Engine Room

Contractor shall remove two existing steel supply dampers which are located in forward, center section Engine room that are severely rusted and replace these items with new.

**Damper size (measured from outside of duct): 765mm x 610mm**

Contractor is to thoroughly clean and repaint existing supply duct located in forward, center section Engine Room which has collected significant surface rust on inside and outside surface. Contract to bid on 35m square off ducting.

Contractor is to thoroughly clean and repaint two existing grilles (each size 790mm x 645mm) located in forward, center section Engine Room which contain surface rust.

Contractor is to replace two existing access doors (each size 460mm x 460mm) to supply duct located in forward, center section Engine Room due to significant rust buildup.

Contractor is to replace existing steel damper which is missing a handle. Damper located on forward starboard section of Engine Room.

**Damper Size (measured from outside of duct): 815mm x 310mm**

### 3.1.2 Engineers Workshop

Contractor is to replace all existing ductwork and its accessories located within this compartment. Existing ductwork has not been installed properly. Ductwork shall consist of 16 gauge duct and be welded using arc welding to allow for proper seal. Duct size 330mm x 90mm x 3000mm.

### 3.1.2 Purifier Room

Contractor is to clean and repaint existing grill and interior of duct due to severe rust buildup. Grill size 555mm x 295, duct to be cleaned 830mm x 170mm.

### 3.1.3 Emergency Generator Room

Contractor is to replace existing canvas connection (pipe size 260mm diameter width of canvas required is 250mm) with new due to the old wearing down and ripping throughout.

Contractor is to thoroughly clean and repaint existing grill located within this compartment due to severe rust buildup. Wire mesh grill size 610mm diameter.

### 3.1.4 Harbour Generator Room Forward/Aft Fire Dampers

**Forward Starboard -** Contractor is to replace current steel fire damper with new due to corrosion and rust buildup.

**Fire damper size: 700mm x 400mm**

**Aft Starboard -** Contractor is to replace fire link to existing fire damper. There is no link being used at this time.

### 3.1.5 Forward Machinery Room

Contractor is to replace two existing steel dampers and two grills located within this compartment due to the current being seized completely.

**Damper size: 350mm x 295mm each**

### 3.1.6 Kitchen/ crews Lounge

Contractor is to thoroughly clean and repaint eight existing grilles within these compartments. Grill size they are round diameter 295mm

Contractor is to replace eight existing steel dampers within these compartments due to significant dirt and rust buildup.

**Damper size: 295mm Ø**

### 3.1.7 Middle of Galley

Contractor is to replace existing steel fire damper within this area due to corrosion.

**Fire damper size: 360mm x 160mm**

### 3.1.8 Crews Lounge Bathroom

Contractor is to thoroughly clean and repaint existing grill in this compartment due to severe dirt buildup. Grill size 245mm x 145mm.

### 3.1.9 Dry Storage

Contractor is to replace existing grill in this compartment due to the current being damaged. Grill size 350mm x 300mm.

### 3.1.10 Laundry Room

Contractor is to thoroughly clean and repaint two existing grilles located within this area due to dust and lint buildup. Grill size (1) 300mm x 170mm size (2) 300mm x 195mm

Contractor is to remove two existing flex and replace with solid ridged pipe. Total size 100mm x 4877mm.

### 3.1.11 Officers Mess/ Lounge

Contractor is to thoroughly clean and repaint five existing 295mm diameter round grilles within this area.

### 3.1.12 Foc'sle Deck Accommodations

Contractor is to thoroughly clean existing grill located in this area due to severe dirt and dust buildup. Grill size 660mm x 650mm.

### 3.1.13 Air Handling Unit #3 Room

Contractor is to replace two existing steel dampers with two new 316 stainless steel dampers with bronze bushings. Contractor has to purchase new the actuators from Tri-Metal Fabricators their new upgrade. Tri- metal fabricators are the Original Equipment Manufacture (OEM) for this Air Handling unit.

**Dampers measured at: 2.2m x 880mm and 2.1m x 930mm**

Contractor is to replace six existing filter racks with new stainless steel filter racks.

### 3.1.14 Air Handling Unit #2 Room

Contractor is to replace existing motorized steel damper within this compartment with new stainless steel damper with bronze bushings. Contractor has to purchase new the actuators from Tri-Metal Fabricators their new upgrade. Tri- metal fabricators are the Original Equipment Manufacture (OEM) for this Air Handling unit. This motorized damper has been restricted from working properly due to a wall sleeve. Damper has been placed too close to the outside louver and can't open properly. Contractor is to modify wall sleeve so as to allow for proper function of damper.

**Damper size: 930mm x 670mm**

Contractor is to replace existing section of duct within this compartment due to rust buildup.

Ducting size 1.219m x 1.219m x 9.144m. Contractor to bid per 1.219m x 1.219m x 1.219m for adjustment purposes.

Contractor is to replace existing outside damper due to old not functioning properly.

**Damper size: 900mm x 600mm**

### 3.1.15 Fire Dampers (Exterior of Vessel)

Contractor is to thoroughly clean and repaint existing fire dampers.

Damper sizes: port side (2 dampers) 1.5m x 3m and stbd side (2 dampers) 1.5m x3m.

Contractor is to replace existing steel mesh located on innermost parts of louvers with new stainless steel mesh.

**Mesh size: Total for port and stbd sides is (2) x (2.88m x 2.2m)**

Contractor is to replace springs (a total of 8 springs, size of springs is 152mm) attached to these louvers due to the old corroding, breaking and detaching.

Contractor shall replace (4) fire links to these dampers.

### 3.1.16 AV Gas Dampers location at discharge of supply fan unit for Cofferdam and supply fan unit AV gas pump room

Contractor is to dismantle both damper units from the trunking and thoroughly clean and repaint these units as per paint spec to allow for proper function.

**Damper Size: both are 305mm diameter.**

**3.1.17 Emergency Generator Compartment**

Contractor is to replace existing steel fire damper due to old being severely rusted and corroded. Note all new fire dampers have to be approved by Lloyd's.

**Fire damper size: 800mm x 300mm**

**3.1.18 Forward Machinery Room**

Contractor is to modify existing fire damper linkage to allow for proper function of existing fire damper.

**Damper size: 18'' x 6.25"**

**3.1.19 Incinerator Room**

Contractor is to replace existing steel fire damper that is welded in place. Note all new fire dampers have to be approved by Lloyd's.

**Fire damper size: 560mm x 260mm**

**3.2 Location:**

**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 is to be completed to the satisfaction of the Chief Engineer and Lloyd's Surveyor.

**4.1.2** Visual inspection of all ductwork, welding and accessories %100.

**4.1.3** Welds %10 MPI testing completed by approved testing personnel.

**4.1.4** The contractor is responsible for all air quality testing to ensure hot work and entry is permitted.

**4.1.5** The contractor shall issue and post hot work permits and shall maintain a fire watch as per Provincial Regulations.

**4.1.6** Area where work was carried out is to be inspected to ensure all debris has been removed.

**4.2 Testing:**

**4.2.1** All electric fan motors, controls and heaters for Air Handling Uints and all dampers must prove to be all in good working order trunk work to be leak free.

**4.3 Certification:**

**4.3.1** Contractor shall obtain and provide to the Technical Authority all required technical certifications as specified in the applicable rules and codes in accordance with permeable section of this specification.

**4.3.2** After completion of work, the system shall be proven and certified fully operational.

**4.3.3** All welding to be carried out by Canadian Welding Bureau (CWB) certify welders, welding to be in accordance with CWB W47.1 & W59.

**Part 5: DELIVERABLES:**

**5.1 Documentation:** Contractor to supply 3 hard copies and one electronic copy to Chief Engineer of all work done including certificates for all approved work and equipment by Lloyd's.

**5.2 Manuals:** Contractor to supply three copies to Chief Engineer of all manuals for all new equipment electric motors, dampers and heaters and controls.

| Spec item #: H-21 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**H – 21 : Fan Room Deck Repair**

**Part: 1 SCOPE:**

**1.1** The intent of this specification shall be contractor to remove the cement flooring from the existing decks in # 2 A/H and # 3 A/H unit room located on the Bridge Deck and the fan room for #3 A/H unit and replace with Dex O Tex flooring.

**1.2** Contractor shall supply and install Dex O Tex flooring.

**1.3** This work shall be carried out in Conjunction with the following specifications:

- **a)** H-27 Ventilation Fans & Motors
- **b)** H-28 Ventilation Trunking Renewal
- **c)** H-30 HVAC Units & Humidifiers
- **d)** H-31 E/R Supply Fans Plenums Replacement

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

2.1.1 Bridge and Focsle Deck Interior Deck Coverings Drawing #: 590-92.
2.1.2 Ventilation Arrangement –Bridge and Forecastle Deck Drawing # 111-2
2.1.3 Bridge and Foscle Deck Interior Deck Covering Drawing # 590-92 Sheet 2

**2.2 Standards**

**2.2.1** N/A

**2.3 Regulations**

2.3.1 The flooring materials are to be Lloyds Approved.
2.3.2 Contractor must comply with the latest edition of all Provincial Regulations.
a) Contractors welders performing the work must be certified by the Canadian Welding Bureau.(CWB)

**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

**3.1.1** Contractor shall inform Chief Engineer prior to starting work on the fan room decks.

**3.1.2** Contractor shall supply adequate ventilation and extraction to the area while work is being carried out.The contractor shall supply all ventilation fans, hoses and extractors and any other equipment required.

**3.1.3** The total area of the Dex O Tex flooring to be installed is approximately 10 meter square.

**3.1.4** The colour of the Dex O Tex flooring is to be DFS -17 Terrazzo – M- Fine

3.1.5 Contractor shall quote on per additional square meter of finished Dex O Tex flooring preparation, supply and install which can be adjusted up or down by 1379 action.

**3.1.6 A.H. unit room# 2**

a) Contractor shall remove all the equipment from the # 2 fan room. If AH unit is not being removed the contractor shall work around unit.

b) Contractor shall remove and dispose the concrete flooring from the deck to the bare metal. The concrete is approximately 50.8 mm thick. The total area of # 2 A/H Room Deck is 5.25 square meters.

c) Contractor shall clean the deck to SSPC-SP-6.

d) Contractor shall prime complete bare metal deck with a coat of Amerlock 2 Epoxy Primer or equivalent.

e) Contractor shall apply a layer of Decklite Underlayment A60 (Fire Rated) or equivalent to the height of the existing deck as per manufactures recommendations.

f) Contractor shall apply Dex O Tex Terrazzo M Fine Finish or equivalent as per manufactures recommendations.

g) Contractor shall apply a sealant coat of Terrazzo M Bondcoat or equivalent sealer over the finish floor.

**3.1.7 A.H. unit room # 3.**

a) Contractor shall remove all the equipment from the room.

b) Contractor shall remove and dispose the concrete flooring from the deck to the bare metal. The concrete is approximately 50.8 mm thick. The total area of # 3 A/H Room Deck is 2.25 square meters

c) Contractor shall clean the deck to SSPC-SP-6.

d) Contractor shall apply one coat of Amerlock 2 Epoxy Primer or equivalent to the complete bare metal deck.

e) Contractor shall apply a layer of Decklite Underlayment A60 (Fire Rated) or equivalent to the height of the existing deck as per manufactures recommendations.

f) Contractor shall apply a coat of Terrazzo M Fine Finish or equivalent as per manufactures recommendations.

g) Contractor shall apply a sealant coat of Terrazzo M Bondcoat or equivalent sealer over the flooring.

**A. H. unit # 3 Fan Room Deck Section**.

a) This work must be carried out in conjunction with specification H- 27 Ventilation Fans & Motors when the supply fan unit is out the flooring is to be installed.

b) Contractor shall remove and dispose the remainder of the Dex O Tex flooring from # 3 A/H unit fan room deck. The total area of flooring is 2.25 meter square.

c) Contractor shall clean all decks to SSPC-SP-6

d) Contractor shall apply one coat of Amerlock 2 Epoxy Primer or equivalent or equivalent to the complete metal deck.

e) Contractor shall apply a layer of Decklite Underlayment A60 (Fire Rated) or equivalent to the height of the existing deck as per manufactures recommendations.

f) Contractor shall a coat of Terrazzo M Fine Finish or equivalent as per manufactures recommendations.

g) Contractor shall apply a sealant coat of Terrazzo M Bondcoat or equivalent sealer over the flooring.

**3.2 Location**

**3.2.1** Bridge Deck Frames 44-50

**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** Inspection of the flooring to be carried out by the Chief Engineer and Lloyds Surveyor.

**4.2 Testing**

**4.3 Certification**

Flooring Material to be Lloyds Approved and approval certificate supplied by

Contractor for A60 fire rating.

**Part: 5 DELIVERABLES:**

**5.1 Drawings/Reports**

**5.1.1** Contractor shall provide to the Chief Engineer three type written copies 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**

| Spec item : H-22 | **SPECIFICATION** | |
|---|---|---|
| **H - 22 : Fire Lines Replacement** | | |

**Part 1: SCOPE:**

**1.1** The intent of this specification is to replace deteriorated fire lines with new.
**1.2** Coast Guard will arrange for a NACE inspector to view specification and inspect the coatings to make sure they are applied as per manufacture's product data sheets.

**Part 2: PROCUREMENT**

**2.1 Owner Supplied**

**2.1.1.** No Owner supplied equipment required for this specification item.

**2.2 Contractor Supplied**

**2.2.1.** Contractor shall supply all materials, equipment, and parts required to perform the specified work.

**2.3 Guidance Drawings**

**2.2.1.** Bilge, Ballast & Fire System, 590-36, Rev. D.

**2.**2.2. General Arrangement, 590-70, Rev. C.

## Part 3: TECHNICAL DESCRIPTION:

**General**

**3.1.1.** Prior to commencement of the work the Contractor shall inform the Chief Engineer.

**3.1.2.** Contractor shall provide a separate means of fighting fires while the fire system is offline.

**3.1.3** Contractor shall ensure, with the help of the Chief Engineer, that the Fire system has been locked out and drained before commencement of any work.

**3.1.4** Contractor shall insure all work areas are neat and tidy before the end of the work day to ensure a safe environment.

**3.1.5** Contractor shall remove all sharp edges and grind all burrs smooth.

**3.1.6** Contractor shall repaint damaged steel areas 1st coat Amercoat 5105 (3 mil dft) and finish coat Armercoat 5450. (3 mil dft ) each system applied coating (3 mil dft ) to be as per manufacture application procedures. Any galvanized areas or piping the coating is to be Amercoat 385 (5mil dft) or equivalent.

**3.1.7** All new piping, fittings and penetrations shall be as per original system. The piping to be Sch.40 Steel, E.R.W. Galvanized after fabrication and Sch.80, Black I.W.O. fuel tanks. Piping ends to be grooved as per original. **No scheduled 40 steel pipe to be substituted by scheduled 80 with a groove machined into it.** Connecting couplings to be Victaulic couplings. All new piping fitting and valves if required to be Lloyd's approved.

**3.1.8** All welding to be completed to Lloyd's latest revision.

**3.1.9** The maximum length of pipe that can be maneuvered within the vessel is 6 feet, however 8 foot lengths of pipe can be maneuvered within the Engine Room via the access hatch on the STBD side.

**3.1.10** Contractor shall store all materials as instructed by Chief Engineer.

**3.1.11** Valves and hydrants are not to be replaced but will be reused.

**3.1.12** Contractor shall clean up all debris (including all old piping that is taken out) and dispose of it as per Provincial Regulations.

**3.1.13** Contractor shall paint new galvanized piping after grooving, coating is to be Amercoat 385 (5mil dft) or equivalent.

## 3.2 Bridge Deck

**3.2.1** Contractor shall unbolt and remove fire hydrant in Fire Station No.7 and store.

**3.2.2** Contractor shall remove all necessary ceiling, bulkhead paneling and insulation to gain proper access to all piping. Contractor to replace at Contractors expense any damaged ceiling tile, t-bar, bulkhead paneling or insulation. Contractor

shall remove and store fire extinguisher, hose and other equipment in and around Fire Station No.7.

**3.2.3** Contractor shall unbolt all couplings on fire system piping from Fire Station No.7 to deck penetration. Any bulkhead penetrations in between shall be removed, disposing of piping and couplings.

**3.2.4** Contractor shall cut out penetration in Fire Station No.7, taking care not to damage the cabinet surrounding structure and material and dispose of the existing penetration.

**3.2.5** Once fire system piping connected to deck penetration and bulkhead penetration has been removed, the Contractor shall cut out deck penetration for fire system piping, taking care not to damage the deck and surrounding structure.

**3.2.6** Contractor shall fabricate new deck and bulkhead penetrations similar to the one removed, and install in the location of the old penetrations.

**3.2.7** Contractor shall fabricate new penetration for Fire Station No.7, similar to the one removed and install in the location of the old penetration.

**3.2.8** Contract shall install new piping and couplings following the same route as the removed piping.

**3.2.9** Contractor shall reinstall fire hydrant, fire extinguisher, hose and other equipment in Fire Station No.7.

**3.2.10** Contractor shall reinstall all removed ceiling, bulkhead paneling and insulation.

## 3.3 Forecastle Deck

**3.3.1** Contractor shall unbolt and remove fire hydrants at Fire Stations No.3, 4, 8, 11, 12, Stbd Deck Fire Station and International Shore Connections, and store.

**3.3.2** Contractor shall remove all necessary ceiling, bulkhead paneling, insulation to gain proper access to all piping. Contractor to replace at Contractors expense any damaged ceiling tile, t-bar, bulkhead paneling or insulation. Contractor shall Remove and store fire extinguisher, hose and other equipment in and around Fire Station No.4 and 8.

**3.3.3** Contractor shall unbolt all couplings on fire system piping from Fire Stations No.3, 4, 8, 11, 12, and International Shore Connections to deck penetrations, bulkhead penetrations as well as other fire piping for removal, disposing of piping and couplings from the vessel.

**3.3.4** Contractor shall cut out penetration in Fire Stations No.4 and 8, taking care not to damage the cabinet surrounding structural material, and dispose of the existing penetration.

**3.3.5** Once the fire piping connected to the deck and bulkhead penetrations has been removed, Contractor shall cut out deck and bulkhead penetrations in the following locations for fire system piping, taking care not to damage the deck and surrounding structure:

**5.4.1** Deck Penetration Fire Station No.3
**5.4.2** Deck Penetration Fire Station No.4
**5.4.3** Deck Penetration Fire Station No.8
**5.4.4** Bulkhead Penetration for International Shore Connection
**5.4.5** Deck Penetration STBD Deck Fire Station
**5.4.6** Deck Penetration Fire Station No.11
**5.4.7** Deck Penetration Fire Station No.12

**3.3.6** Contractor shall fabricate new deck and bulkhead penetrations similar to the ones removed and install in the location of the old penetrations.

**3.3.7** Contract shall install new piping and couplings following the same route as the removed piping.

**3.3.8** Contractor shall reinstall fire hydrant, fire extinguisher, hose and other equipment in all Fire Stations.

**3.3.9** Contractor shall reinstall all removed ceiling, bulkhead paneling and insulation that was removed.

## 3.4 Upper Deck

**3.4.1** Contractor shall unbolt and remove fire hydrants at Fire Stations No.2, 5, 9, 10 and 23, and store.

**3.4.2** Contractor shall remove all necessary ceiling, bulkhead paneling, and insulation around Fire Stations No.2, 5, 9 and 10, as well as those covering other fire piping and store. Contractor to replace at Contractors expense any damaged ceiling tile, t-bar, bulkhead paneling or insulation. Remove and store fire extinguisher, hose and other equipment in and around Fire Stations No.2, 5, 9 and 10.

**3.4.3** Contractor shall unbolt all couplings on fire system piping from Fire Stations No.2, 5, 9, 10, and 23, to deck, and bulkhead penetrations as well as other fire piping for removal, disposing of piping and couplings from the vessel.

**3.4.4** Contractor shall unbolt all couplings on fire system piping from hawse pipes to bulkhead penetrations as well as other fire piping for removal, disposing of piping and couplings from the vessel.

**3.4.5** Contractor shall cutout penetration in Fire Stations No.2, 5, 9 and 10, taking care not to damage the cabinet surrounding structural material, and dispose of penetration.

**3.4.6** Once the fire piping connected to the deck and bulkhead penetrations has been removed, Contractor shall cut out deck and bulkhead penetrations in the following locations for fire system piping, taking care not to damage the deck, bulkheads and surrounding structure:

1. Bulkhead penetration in Bulkhead Fr.91
2. Bulkhead penetration in longitudinal Bulkhead behind Fire Station No.2
3. Deck penetration at Fr.87 in Bosun Workshop & Store
4. Bulkhead penetration in Bulkhead Fr.82
5. Deck penetration Fire Station No.5
6. Deck penetration Fire Station No.9
7. Deck penetration Fire Station No.10

**3.4.7** Contractor shall fabricate new deck and bulkhead penetrations similar to the ones removed and install in the location of the old penetrations.

**3.4.8** Contract shall install new piping and couplings following the same route as the removed piping, including that around and connecting to the hawse pipes.

**3.4.9** Contractor shall reinstall fire hydrant, fire extinguisher, hose and other equipment in all Fire Stations.

**3.4.10** Contractor shall reinstall all removed ceiling, bulkhead paneling and insulation that was removed.

## 3.5 Main Deck

**3.5.1** Contractor shall unbolt and remove fire hydrants at Fire Stations No.1, 6, 14 and 15 and store.

**3.5.2** Contractor shall remove all necessary ceiling, bulkhead paneling, insulation around Fire Stations No.1, 6, 14 and 15, as well as those covering other fire piping and store. Contractor to replace at Contractors expense any damaged ceiling tile, t-bar, bulkhead paneling or insulation. Contractor shall remove and store fire extinguisher, hose and other equipment in and around Fire Stations No.1, 6, 14 and 15.

**3.5.3** Contractor shall unbolt all couplings on fire system piping from Fire Stations No.1, 6, 14 and 15 to deck, bulkhead penetration and other fire piping for removal, disposing of piping and couplings from the vessel.

**3.5.4** Contractor shall cutout penetration in Fire Stations No.1, 6, 14 and 15, taking care not to damage the cabinet surrounding structural material, and dispose of penetration.

**3.5.5** Once the fire piping connected to the deck and bulkhead penetrations has been removed, Contractor shall cut out deck and bulkhead penetrations in the following locations for fire system piping, taking care not to damage the deck, bulkheads and surrounding structure:

1. Deck penetration Fire Station No.1
2. Bulkhead penetration in bulkhead Fr.82
3. Bulkhead penetration in bulkhead Fr.75
4. Bulkhead penetration in bulkhead Fr.52
5. Bulkhead penetration in longitudinal bulkhead Fr.35 Port side
6. Bulkhead penetration in longitudinal bulkhead Fr.35 Stbd side
7. Bulkhead penetration in bulkhead Fr.21

**3.5.6** Contractor shall fabricate new deck and bulkhead penetrations similar to the ones removed and install in the location of the old penetrations.

**3.5.7** Contract shall install new piping and couplings following the same route as the removed piping.

**3.5.8** Contractor shall reinstall fire hydrant, fire extinguisher, hose and other equipment in all Fire Stations.

**3.5.9** Contractor shall reinstall all removed ceiling, bulkhead paneling and insulation that was removed.

## 3.6 Hold

**3.6.1** Contractor shall unbolt and remove fire hydrants at Fire Stations No.13, 17, 19, 20 and 21 and store.

**3.6.2** Contractor shall remove all necessary ceiling, bulkhead paneling, insulation around Fire Stations No.13, 17, 19, 20 and 21, as well as those covering other fire piping and store. Contractor to replace at Contractors expense any damaged ceiling tile, t-bar, bulkhead paneling or insulation. Contractor shall remove and store fire extinguisher, hose and other equipment in and around Fire Stations No.13, 17, 19, 20 and 21.

**3.6.3** Contractor shall unbolt all couplings on fire system piping from Fire Stations No.13, 17, 19, 20 and 21 to deck penetrations, bulkhead penetrations as well as other fire piping for removal, disposing of piping and couplings from the vessel.

**3.6.4** Contractor shall remove all couplings and piping on fire system back to Fire Pump as confirmed by the Chief Engineer.

**3.6.5** Once the fire piping connected to the deck and bulkhead penetrations has been removed, Contractor shall cutout deck and bulkhead penetrations in the following locations for fire system piping, taking care not to damage the deck, bulkheads and surrounding structure:

1. Bulkhead penetration in bulkhead Fr.44 Stbd Side
2. Bulkhead penetration in bulkhead Fr.28 Port Side
3. Bulkhead penetration in longitudinal bulkhead Fr.27 Port side
4. Bulkhead penetration in longitudinal bulkhead Fr.27 Stbd side

**3.6.6** Contractor shall fabricate new deck and bulkhead penetrations similar to the ones removed and install in the location of the old penetrations.

**3.6.7** Contract shall install new piping and couplings following the same route as the removed piping.

**3.6.8** Contractor shall reinstall fire hydrant, fire extinguisher, hose and other equipment in all Fire Stations. Reinstall all removed ceiling, bulkhead paneling and insulation that was removed.

### 3.7 Interferences

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

**3.7.2** All watertight penetrations shall be proven to be watertight and witnessed and signed off by Class.

## Part 4: PROOF OF PERFORMANCE:

### 4.1 Inspection

**4.1.1.** All work to be completed to satisfaction of the Chief Engineer.
**4.1.2.** Visual inspection off all welding 100%.
**4.1.3.** Welds 10% MPI testing completed by approved testing personnel.
**4.1.4.** The contractor is responsible for all air quality testing to ensure hot work and entry is permitted.
**4.1.5.** The contractor shall issue and post hot work permits and shall maintain a fire watch.
**4.1.6.** Area where work was carried out to be inspected to ensure all debris has been removed.

### 4.2 Testing

**i.** Hydrostatic test to be carried out to 1.5 time's normal working pressure to be witness by Lloyd's Surveyor and Chief Engineer.
**ii.** Welding 100% visual by Lloyd's and Chief Engineer.
**iii.** Welds to 10% MPI by approved testing personnel.
**iv.** Areas where hot work is to be carried out is to be certified by a Chemist or a qualified person to be determined by Chief Engineer.

### 4.3 Certification

Welders must be CWB Certified
Chemist must be certified
Technicians for NDT testing must be Certified

## 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 hard copies and one electronic copy of a report of all work carried out.

### 5.2 Spares

No spares required

### 5.3 Training

No training required

### 5.4 Manuals

**N/A**

| Spec item : H-23 | **SPECIFICATION** | |
|---|---|---|

**H - 23 : Ballast Pipe Replacement**

**Part 1: SCOPE:**

**1.1** The intent of this specification is to replace all deteriorated ballast piping with new.

**Part 2: PROCUREMENT**

**2.1 Owner Supplied**

**2.1.1** No Owner supplied equipment required for this specification item.

**2.2 Contractor Supplied**

**2.2.1** Contractor shall supply all materials, equipment, and parts required to perform the specified work.

**2.3 Guidance Drawings**

**2.2.1** Bilge, Ballast & Fire System, 590-36, Rev. D.

**2.2.2** General Arrangement, 590-70, Rev. C.

**2.2.3** Bilge, Ballast & Fire Piping in E.R. “As Fitted”, 590-44-01

**2.2.4** Ballast & Fire Piping O.M.S. “As Fitted”, 590-45-01

## Part 3: TECHNICAL DESCRIPTION:

**General**

**3.1.1.** Prior to commencement of the work the Contractor shall inform the Chief Engineer.

**3.1.2** The Contractor shall ensure, with the help of the Chief Engineer, that the Ballast system as well as any other affected systems have been locked out and drained before commencement of any work.

**3.1.3** The Contractor shall ensure all work areas are neat and tidy before the end of the work day to ensure a safe environment.

**3.1.4** The Contractor shall remove all sharp edges and grind all burrs smooth.

**3.1.5** The Contractor shall repaint damaged areas as per client specs.

**3.1.6** All new piping, fittings and penetrations shall be as per original system. Piping to be Sch.40 Steel, E.R.W. Galvanized after fabrication (the ends of the piping have to have a machine rolled groove in the piping as per original. **Sch 80 black with a groove machine cut for Victaulic fitting is not acceptable**) and Sch.80, Black I.W.O. fuel tanks. Connecting couplings to be Victaulic couplings, Lloyds approved. Note Contractor must

**3.1.9** All welding to be completed to Lloyd's latest revision.

**3.1.10** The maximum length of pipe that can be maneuvered within the vessel is 6 feet, however 8 foot lengths of pipe can be maneuvered within the Engine Room via the access hatch on the STBD side.

**3.1.11** Contractor shall store all materials as instructed by Chief Engineer.

**3.1.12** Contractor shall clean up all debris, all old piping, fittings and dispose of it as per provincial regulations.

**3.1.13** Contractor shall paint new galvanized piping not including the grooved end section with two coats of (Amercoat 385 epoxy each coat to 5mil dft), but before installation.

**3.1.14** Contractor shall recoat all new steel bulkheads outside tanks with one coat Amercoat 5105 @ 2mils dft and two coats @ 2mils dft Amercoat 5450 tank penetrations. Inside ballast tanks it has to be 2 coats Intershield ENA 300 @ 5-6 DFT per coat or equivalent product as per client specification.

## 3.2 Ballast Piping in Corridor (Aft of Frame 28)

**3.2.1** Contractor shall unbolt all required deck plating in corridor, between Fr. 5 & 28 and store.

**3.2.2** Contractor shall unbolt all couplings and valves between bulkhead penetrations and dispose of all piping. The Contractor shall store all valves that are deemed adequate for reuse.

**3.2.3** Contractor shall cut out penetrations in bulkheads -4, 5, 28, and tank penetrations in Water Ballast tank #5. Contractor remove old piping in tank.

**3.2.4** Contractor shall fabricate new penetrations for all removed bulkhead and tank penetrations, similar to the ones removed, and install in the locations of the old penetrations. Contractor install new piping and fittings in tank the same location as the old piping fittings removed.

**3.2.5** Contractor shall install new piping and new couplings complete with rubber insert following the same route as the removed piping.

**3.2.6** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.2.7** Contractor shall have all removed valves inspected to ensure they are in good condition and are working correctly. Any valves not meeting Lloyds or the

Chief Engineers approval are to be replaced by PWGSC 1379 action. Contractor shall reinstall all valves as per the removed system.

**3.2.8** Contractor shall reinstall any removed deck plating to the satisfaction of the Chief Engineer.

## 3.3 Ballast Piping in Engine Room (Frames 28 to 44)

**3.3.1** Contractor shall unbolt all required deck plating outboard of the Port Main Engine, between Fr. 28 & 44 and store.

**3.3.2** Contractor shall unbolt all couplings and valves between bulkhead penetrations and dispose of all piping. The Contractor shall store all valves that are deemed adequate for reuse.

**3.3.3** Contractor shall cut out penetrations in bulkheads 44, and tank penetrations in #4 Port & Stbd. Contractor remove old piping in each tank.

**3.3.4** Contractor shall fabricate new penetrations for all removed bulkhead and tank penetrations, similar to the ones removed, and install in the locations of the old penetrations. Contractor install new piping in each tank the same location as the old piping removed.

**3.3.5** Contractor shall install new piping and new couplings complete with rubber insert following the same route as the removed piping.

**3.3.6** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.3.7** Contractor shall have all removed valves inspected to ensure they are in good condition and are working correctly. Any valves not meeting Lloyds, or the Chief Engineers approval, are to be replaced by PWGSC 1379 action.

**3.3.8** Contractor shall reinstall all valves, both existing and new, as per the removed system.

**3.3.9** Contractor shall reinstall any removed deck plating to the satisfaction of the Chief Engineer.

## 3.4 Ballast Piping in Pipe Tunnel (Fwd of Frame 44)

**3.4.1** Contractor shall unbolt all required deck plating in the Transducer Compartment and store.

**3.4.2** Contractor shall unbolt all couplings and valves between bulkhead penetrations and dispose of all piping. The Contractor shall store all valves that are deemed adequate for reuse.

**3.4.3** Contractor shall cut out tank penetrations in Water Ballast tanks #2 Port & Stbd and #1 Port & Stbd. Contractor remove old piping in each tank.

**3.4.4** Contractor shall fabricate new penetrations for all removed bulkhead and tank penetrations, similar to the ones removed, and install in the locations of the old penetrations. Contractor install new piping in each tank the same location as the old piping removed.

**3.4.5** Contractor shall install new piping and new couplings complete with rubber insert following the same route as the removed piping.

**3.4.6** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.4.7** Contractor shall have all removed valves inspected to ensure they are in good condition and are working correctly. Any valves not meeting Lloyds, or the Chief Engineers approval, are to be replaced by PWGSC 1379 action.

**3.4.8** Contractor shall reinstall all valves, both existing and new, as per the removed system.

**3.4.9** Contractor shall reinstall any removed deck plating to the satisfaction of the Chief Engineer.

### 3.5 Interferences

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

**3.5.2** All watertight penetrations shall be proven to be watertight and witnessed and signed off by Class.

## Part 4: PROOF OF PERFORMANCE:

### 4.1 Inspection

**4.1.1.** All work to be completed to satisfaction of the Chief Engineer.
**4.1.2.** Visual inspection of all welding 100%.
**4.1.3.** Welds 10% MPI testing completed by approved testing personnel.

**4.1.4.** The Contractor is responsible for all air quality testing to ensure hot work and confined space entry is permitted.

**4.1.5.** The Contractor shall issue and post hot work permits and shall maintain a fire watch.

**4.1.6.** Area where work was carried out to be inspected to ensure all debris has been removed.

## 4.2 Testing

**i.** Hydrostatic test to be carried out on all fabricated new piping to (4 bar) to be witness by Lloyd's Surveyor and Chief Engineer.

**ii.** All new piping to be proven that it's correctly hooked up to the identified location. If any changes have to be make it is at the Contractor's expense.

**iii.** Welding 100% visual by Lloyd's and Chief Engineer.

**iv.** Welds to 10% MPI by approved testing personnel

**v.** Areas where hot work is to be carried out is to be certified by a Chemist or a qualified person to be determined by Chief Engineer.

### 4.3 Certification

4.3.1 Welders must be CWB Certified.

4.3.2 Chemist must be certified.

4.3.3 Technicians for NDT testing must be certified.

4.3.4 Certification off all material, piping and fitting.

## 5 Documentation/Reports

**5.1.** Contractor to supply three hard copy reports and one electronic report to Chief Engineer. Reports to include all work carried out for this specification, all certifications noted above all test and approvals by Lloyd's and Chief Engineer.

| Spec item #: H-24 | **SPECIFICATION** | |
|---|---|---|
| **H - 24 : Domestic Fresh Water Piping** | | |

**Part: 1 SCOPE:**

**1.1** The intent of this specification is to replace all deteriorated Hot &Cold Fresh Water piping with new.

**1.2** This work shall be carried out in conjunction with the following specification items H-12 Flooring and Sub floors, H-14 Paneling, H-15 Furniture and Cabinets, H-16 Galley Equipment, H-17 Galley Flooring, H-24 Fire Lines Replacement, HD-07 Drains & Scupper Lines, HD-17 Port Miranda Davit, HD-18 STBD Miranda Davit, ED-1 Steering Controls, ED-08 Bowthruster Controls, L-06 ICS and L-07 Master Clock.

**Part: 2 REFERENCES:**
**2.1 Guidance Drawings**

**2.1.1** Domestic Fresh Water Diagram, 590-37, Rev.9
**2.1.2** General Arrangement, 590-70, Rev.C

**2.2 Owner Furnished Equipment**

**2.2.1** 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**

**3.1.1** Prior to commencement of the work the Contractor shall inform the Chief Engineer.

**3.1.2** Contractor to lockout and tagout two domestic freshwater pumps and the power to the hot water circulating pumps and the power to the hot water tank controls and heaters, as per Provincial Regulations.

**3.1.3** Contractor to drain all water out of all hot and cold water lines prior to work starting.

**3.1.4** The Contractor shall ensure all work areas are neat and tidy before the end of the work day to ensure a safe environment.

**3.1.5** The Contractor shall remove all sharp edges and grind all burrs smooth.

**3.1.6** The Contractor shall repaint damaged areas as per client specs.

**3.1.7** All new piping, fittings and penetrations shall be as per original system. Piping is Type "K" Copper screwed or solder joints, valves body & trim to be bronze, #125 with screwed connection.

**3.1.8** All welding to be completed to Lloyd's latest revision.

**3.1.9** Contractor shall store all materials in a safe and secure site so that it is not expose to the weather elements rain, snow, and ice or damaged from moving objects.

**3.1.10** Contractor shall clean up all debris, and removed piping and valves (that has been replaced) and dispose of it as per Provincial Regulations.

**3.1.11** Contractor shall recoat all new bulkhead, deck and hull penetrations as per client specification.

**3.1.12** Contractor shall, with the help of the Chief Engineer ensure any other systems required to be removed to access the Fresh Water piping are locked out and drained before removal.

**3.1.13** Contractor to replace all valves as described in Drawing: Domestic Fresh Water Diagram, 590-37, Rev.9 for all locations and type as per drawing.

**3.1.14** Contractor to insulation all new piping with fiberglass type sizes as per drawing 590-37 Rev.9.

## 3.2 AC Compartment above Navigation Bridge Deck

**3.2.1** Contractor shall remove all required bulkhead insulation in AC compartment and store.

**3.2.2** Contractor shall cut out all Cold Fresh Water piping between hose connection for filling window washer tank on Port side, to deck penetrations on Stbd side.

**3.2.3** Contractor shall cut out all Cold Fresh Water piping from underside of deck penetration back to main supply in Navigation Bridge Deck washroom.

**3.2.4** Contractor shall cut out Cold Fresh Water deck penetrations on Stbd side.

**3.2.5** Contractor shall fabricate new deck penetration similar to the ones removed and install in the locations of the old penetrations.

**3.2.6** Contractor shall install new piping following the same route as the removed piping.

**3.2.7** Contractor shall reuse existing hose, hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.2.8** Contractor shall reinstall any removed insulation, to the satisfaction of the Chief Engineer.

**3.3 Navigation Bridge Deck**

**3.3.1** The Contractor shall remove the sink cabinet in the washroom and store.

**3.3.2** The Contractor shall remove all required deck head panels, bulkhead panels and insulation in the washroom and hallway and store.

**3.3.3** The Contractor shall cut out all Hot & Cold Fresh Water piping between bulkhead and deck penetrations and dispose.

**3.3.4** The Contractor shall cut out Hot & Cold Fresh water piping from underside of deck penetrations back to main supply on Bridge Deck.

**3.3.5** The Contractor shall unscrew pipe caps for deck penetrations and dispose.

**3.3.6** The Contractor shall unscrew hose connections on bridge wings (Port & Stbd) and dispose.

**3.3.7** The threaded pipe used as deck penetrations are to remain unless the Chief Engineer or Lloyd's Inspector instructs that they be replaced with similar type penetrations.

**3.3.8** The Contractor shall fabricate new pipe caps for existing deck penetrations similar to the ones removed and install in the locations of the old penetrations.

**3.3.9** The Contractor shall install new piping following the same route as the removed piping.

**3.3.10** The Contractor shall install new hose connections on Bridge wings.

**3.3.11** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.3.12** Contractor shall reinstall all removed deck head, bulkhead panels, insulation and sink cabinet, to the satisfaction of the Chief Engineer.

**3.4 Bridge Deck**

**3.4.1** The Contractor shall remove the sink cabinets in the washrooms of each cabin listed below and store:

a) Chief Engineer
b) Captain
c) Senior Program Officer
d) Chief Officer

**3.4.2** The Contractor shall remove required cabinets in the area of the sinks in the Chief Engineers Dayroom and Captains Dayroom and store.

**3.4.3** The Contractor shall unscrew and remove the sheet metal panels covering Fresh Water piping and store.

**3.4.4** The Contractor shall remove all required deck head panels, bulkhead panels, and insulation in the cabins listed in 3.4.1 and store. Note freshwater piping in each washroom supplies a sink, shower and a toilet.

**3.4.5** The Contractor shall cut out all Fresh Water piping between bulkhead and deck penetrations and dispose.

**3.4.6** The Contractor shall cut out Hot & Cold Fresh water piping from underside of deck penetrations back to main supply on Forecastle Deck.

**3.4.7** The Contractor shall unscrew pipe caps for deck penetrations and dispose.

**3.4.8** The threaded pipe used as deck penetrations are to remain unless the Chief Engineer or Lloyd's Inspector instructs that they be replaced with similar type penetrations.

**3.4.9** The Contractor shall fabricate new pipe caps for existing deck penetrations similar to the ones removed and install in the locations of the old penetrations.

**3.4.10** The Contractor shall install new piping following the same route as the removed piping.

**3.4.11** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.4.12** Contractor shall reinstall all removed deck head, bulkhead panels, insulation, sink cabinet and sheet metal covers to the satisfaction of the Chief Engineer.

**3.5 Forecastle Deck**

**3.5.1** The Contractor shall remove the sink cabinets in the washrooms of each cabin listed below and store:

a) 2nd Program Officer
b) 2nd Engineer
c) Jr. Program Officer
d) 2nd Officer
e) 1st Engineer
f) 1st Officer
g) Senior Engineer
h) Ship Office

**3.5.2** The Contractor shall unscrew and remove the sheet metal panels covering Fresh Water piping and store.

**3.5.3** The Contractor shall remove all required deck head panels, bulkhead panels, and insulation in the cabins listed in 3.5.1 and store. Note freshwater piping in each washroom supplies a sink, shower and a toilet.

**3.5.4** The Contractor shall cut out all Fresh Water piping between bulkhead and deck penetrations and dispose.

**3.5.5** The Contractor shall cut out Hot & Cold Fresh water piping from underside of deck penetrations back to main supply on Upper Deck.

**3.5.6** The Contractor shall unscrew pipe caps for deck penetrations and dispose.

**3.5.7** The threaded pipe used as deck penetrations are to remain unless the Chief Engineer or Lloyd's Inspector instructs that they be replaced with similar type penetrations.

**3.5.8** The Contractor shall fabricate new pipe caps for existing deck penetrations similar to the ones removed and install in the locations of the old penetrations.

**3.5.9** The Contractor shall install new piping following the same route as the removed piping.

**3.5.10** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.5.11** Contractor shall reinstall all removed deck head, bulkhead panels, insulation, sink cabinet and sheet metal covers to the satisfaction of the Chief Engineer.

## 3.6 Upper Deck

**3.6.1** The Contractor shall remove the sink cabinets in the washrooms of each cabin and any paneling to expose the piping in the spaces listed below and store:

a) Smoke Room
b) Sickbay
c) 5 crew cabins
d) Boatswain
e) Chief Cook
f) 2nd Cook
g) Survivors Lounge
h) Washroom at Fr.31
i) Humidifier
j) Hawse Pipe Wash
k) Supply to Emer. Gensets
l) Laundry
m) Pantry

**3.6.2** The Contractor shall unscrew and remove the sheet metal panels covering Fresh Water piping and store.

**3.6.3** The Contractor shall remove all required deck head panels, bulkhead panels and insulation in the spaces listed in 3.6.1 and store. Note freshwater piping in each washroom supplies a sink, shower and a toilet.

**3.6.4** The Contractor shall remove washers and dryers in the Laundry and store.

**3.6.5** The Contractor shall remover garburator in cabinet at Fr.27 in Pantry and store.

**3.6.6** The Contractor shall remove cabinet with sink on Fr.27 in Pantry and store.

**3.6.7** The Contractor shall remove Ice Maker and Dishwasher in Pantry and store.

**3.6.8** The Contractor shall cut out all Fresh Water piping between bulkhead and deck penetrations and dispose.

**3.6.9** The Contractor shall cut out Hot & Cold Fresh water piping from underside of deck penetrations back to main supply on Main Deck.

**3.6.10** The Contractor shall unscrew pipe caps for deck penetrations and dispose.

**3.6.11** The threaded pipe used as deck penetrations are to remain unless the Chief Engineer or Lloyd's Inspector instructs that they be replaced with similar type penetrations.

**3.6.12** The Contractor shall fabricate new pipe caps for existing deck penetrations similar to the ones removed and install in the locations of the old penetrations.

**3.6.13** The Contractor shall install new piping following the same route as the removed piping.

**3.6.14** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.6.15** Contractor shall reinstall all removed deck head, bulkhead panels, insulation, sink cabinet, water coolers, ice makers, coffee makers, washer, dryer, garburator, dishwasher and sheet metal covers to the satisfaction of the Chief Engineer.

## 3.7 Main Deck

**3.7.1** The Contractor shall remove the sink cabinets in the washrooms of each cabin and any paneling to expose the piping in the spaces listed below and store:

a) Clerk
b) Steward
c) Oiler
d) 5 Crew Cabins
e) Washroom at Fr.50
f) Washroom at Fr.31
g) 3 Program Officers Cabin Aft
h) Clean Locker at Fr.82
i) Water Cooler in Crew Lounge
j) Galley

**3.7.2** The Contractor shall unscrew and remove the sheet metal panels covering Fresh Water piping and store.

**3.7.3** The Contractor shall remove all required deck head panels, bulkhead panels, and insulation in the spaces listed in 3.7.1 and store. Note freshwater piping in each washroom supplies a sink, shower and a toilet.

**3.7.4** The Contractor shall remove water cooler, coffee maker, ice maker in Crew Mess and store.

**3.7.5** The Contractor shall remove cabinet in Crew Mess under coffee/ice makers and store.

**3.7.6** The Contractor shall remove garburator on Port side of Galley and store.

**3.7.7** The Contractor shall remove cabinets in Galley containing sinks and dishwasher and store

**3.7.8** The Contractor shall cut out all Fresh Water piping between bulkhead and deck penetrations and dispose.

**3.7.9** The Contractor shall cut out Hot & Cold Fresh water piping from underside of deck penetrations back to main supply in Forward Machinery Room.

**3.7.10** The Contractor shall unscrew pipe caps for deck penetrations and dispose.

**3.7.11** The threaded pipe used as deck penetrations are to remain unless the Chief Engineer or Lloyd's Inspector instructs that they be replaced with similar type penetrations.

**3.7.12** The Contractor shall fabricate new pipe caps for existing deck penetrations similar to the ones removed and install in the locations of the old penetrations.

**3.7.13** The Contractor shall install new piping following the same route as the removed piping.

**3.7.14** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.7.15** Contractor shall reinstall all removed deckhead, bulkhead panels, insulation, sink cabinet, watercooler, ice maker, coffeemaker, crew's mess cabinet, garburator, galley cabinets counter, sinks, dishwasher, stove, and sheetmetal covers to the satisfaction of the Chief Engineer.

**3.8 Forward Machinery Room**

**3.8.1** The Contractor shall cut out all Fresh Water copper piping between machinery, bulkhead and deck penetrations and dispose.

**3.8.2** The Contractor shall cut out all deck and bulkhead penetrations and dispose.

**3.8.3** The Contractor shall fabricate new penetrations for all removed bulkhead and deck penetrations similar to the ones removed and install in the locations of the old penetrations.

**3.8.4** The Contractor shall install new piping following the same route as the removed piping.

**3.8.5** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

## 3.9 Engine Room

**3.9.1** The Contractor shall cut out all Fresh Water copper piping between Main Engines Jacket Water Tanks, Genset Fresh Water Header Tanks, bulkhead and deck penetrations and dispose.

**3.9.2** The Contractor shall cut out all deck and bulkhead penetrations and dispose.

**3.9.3** The Contractor shall fabricate new penetrations for all removed bulkhead and deck penetrations, similar to the ones removed, and install in the locations of the old penetrations.

**3.9.4** The Contractor shall install new piping following the same route as the removed piping.

**3.9.5** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

## 3.10 Fuel Oil Purifier Room

**3.10.1** The Contractor shall cut out all Fresh Water copper piping between Fuel Oil Purifiers, Lube Oil Purifiers, bulkhead and deck penetrations and dispose.

**3.10.2** The Contractor shall cut out all deck and bulkhead penetrations and dispose.

**3.10.3** The Contractor shall fabricate new penetrations for all removed bulkhead and deck penetrations similar to the ones removed and install in the locations of the old penetrations.

**3.10.4** The Contractor shall install new piping following the same route as the removed piping.

**3.10.5** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

## 3.11 All Piping

**3.11.1** All piping after installation must be hydrostatically tested to 6.5 bar pressure. Any leaks or damage must be corrected by the \contractor at no cost to Owner.

**3.11.2** Contractor must prove that all piping that is marked for each compartment hot and cold, is hot and cold if there is any problem it must be corrected by Contractor at no cost to Owner.

**3.11.3** Contractor is responsible for any damage to Paneling, Ceiling tile, Tee Bar, Cabinets or any other equipment that was taken out and put back by Contractor to carry out this work. Contractor has to replace it at no cost to Owner.

**3.11.4** Contractor must depose of as per Provincial Regulations all old piping and debris that was taken out.

**3.12 Interferences**

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

**3.12.2** All watertight penetrations shall be proven to be watertight and witnessed and signed off by Lloyd's.

**Part: 4 PROOF OF PERFORMANCE:**

**4.1 Inspection**

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

**4.1.2** Visual inspection of all welding 100%.

**4.1.3** Welds 10% MPI testing completed by approved testing personnel.

**4.1.4** The Contractor is responsible for all air quality testing to ensure hot work and confined entry is permitted.

**4.1.5** The Contractor shall issue and post hot work permits and shall maintain a fire watch, as per Provincial Regulations.

**4.1.6** Area where work was carried out to be inspected to ensure all debris has been removed.

## 4.2 Testing

**4.2.1** Welding 100% visual by Lloyd's and Chief Engineer.

**4.2.2** Welds to 10% MPI by approved testing personnel.

**4.2.3** All piping has to be hydrostatically tested to 6.5bar to be witness by Chief Engineer and Lloyd's Surveyor.

**4.2.4** Areas where hot work is to be carried out are to be certified by a Chemist or a qualified person to be determined by Chief Engineer.

## 4.3 Certification

**4.3.1** Welders must be CWB Certified

**4.3.2** Chemist must be Certified

**4.3.3** Technicians for NDT testing must be Certified

| Spec item #: H-25 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**H - 25 : Galley Cold Rooms Insulation**

**Part: 1 SCOPE:**

**1.1** The intent of this specification is to replace the panels and doors in the walk in freezer and cooler rooms due to bowing of insulation which has caused moisture infiltration.

**Part: 2 REFERENCES:**

**2.1 Area of repair:**

2.1.1 Main Deck, Walk In Freezer Room
Area of Repair: approx. 16 m²

Covering: Stainless Steel Panels

2.1.2 Main Deck, Walk In Cooler Room
Area of Repair: approx. 12 m²

Covering: Stainless Steel Panels

**2.2 Owner Furnished Equipment**

**2.2.1** 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**

**3.1.1 Cooler Room**

**3.1.1.1** Contractor to remove the 2 fan evaporator coil for the walk in cooler room to allow the insulated panels to be removed. Save evaporator for reinstallation. Remove all electrics, pipes and associated fittings to allow for panel removal. See Picture #1, Section 3.2.1

**3.1.1.2** Contractor to dismantle, remove, and dispose of existing insulated panels and door for the cooler room.

**3.1.1.3** Contractor to supply and install new walk in cooler box panels to fit the space with dimensions shown in Figure 3.3.1. Note: All dimensions are to be confirmed by contractor before work is to be carried out. Work to be carried out as per manufacturer's recommend.

**3.1.1.4** New walk in cooler panels and doors are to be minimum 10 cm thick c/w foamed in place polyurethane cam lock panels with tongue and groove end profile. Stainless Steel interior and exterior smooth finishes, no floor required. Cooler room to come complete with standard solid hinged doors finish to match with wall finish in and out. Doors to come complete with polished chrome spring loaded self-closing hinges, magnetic gaskets, radial strike & latch, door closer, Interior release mushroom button and step sweep sill as well as SS exterior kick plate. Door swing to be confirmed after contract award.

**3.1.1.5** Cooler room panels and cooler door are to be capable to hold temperature of the room at 1 degree Celsius.

**3.1.1.6** Trim: As recommended for an exterior by the manufacturer.

**3.1.1.7** Lights to be removed and installed by a certified electrician.

**3.1.1.8** Reinstall existing evaporator, tie in any required piping and refrigeration components to existing refrigeration system to complete a fully functioning cooler. Supply any new piping, fittings and associated components that may be required to get system up and running.

**3.1.1.9** Startup and commission refrigeration system.

### 3.1.2 Walk in Freezer Room

**3.1.2.1** Contractor shall remove the 3 fan evaporator coil for the walk in freezer room to allow the insulated panels to be removed. Save evaporator for reinstallation. Remove all electrics, pipes and associated fittings to allow for panel removal. Picture #1, Section 3.2.2

**3.1.2.2** Contractor shall dismantle,remove, and dispose of the existing insulated panels and door for the freezer room.

**3.1.2.3** Contractor shall supply and install new walk in freezer box panels to fit the space with dimensions shown in Figure 3.3.2. Note: All dimensions are to be confirmed by contractor before work is to be carried out.

**3.1.2.4** New walk in freezer panels and doors are to be minimum 10 cm thick c/w foamed in place polyurethane cam lock panels with tongue and groove end profile. Stainless Steel interior and exterior smooth finishes, no floor required. Freezer room to come complete with standard solid hinged doors finish to match with wall finish in and out. Doors to come complete with polished

chrome spring loaded self-closing hinges, magnetic gaskets, radial strike & latch, door closer, Interior release mushroom button and step sweep sill as well as SS exterior kick plate. Door swing to be confirmed after contract award.

**3.1.2.5** Freezer room panels and door are to be capable to hold temperature of the room at -20 Celsius.

**3.1.2.6** Trim: As recommended for an exterior environment adjacent to the ocean, by the manufacturer.

**3.1.2.7** Lights: To be removed and reinstalled by a certified electrician.

**3.1.2.8** Reinstall existing evaporator, tie in any required piping and refrigeration components to existing refrigeration system to complete a fully functioning freezer. Supply any new piping, fittings and associated components that may be required to get system up and running.

**3.1.2.9** Startup and commission refrigeration system.

## 3.2 Location: Reference 2.1

### 3.2.1 Picture #1

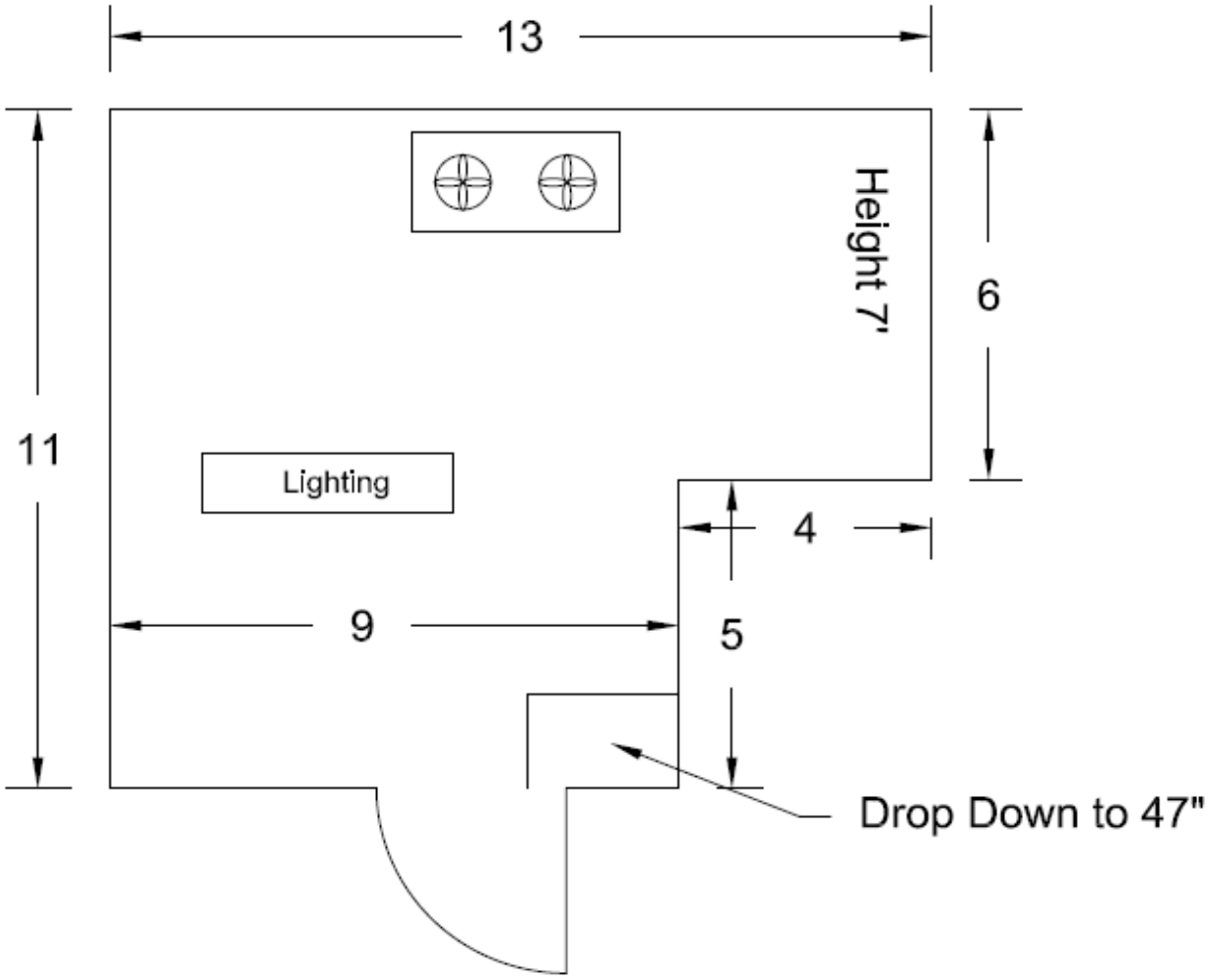

**Cooler Room Evaporator Coil (To Remain)**

**3.2.2 Picture #2**

**Freezer Room Evaporator Coil (To Remain)**

## 3.3 Figures

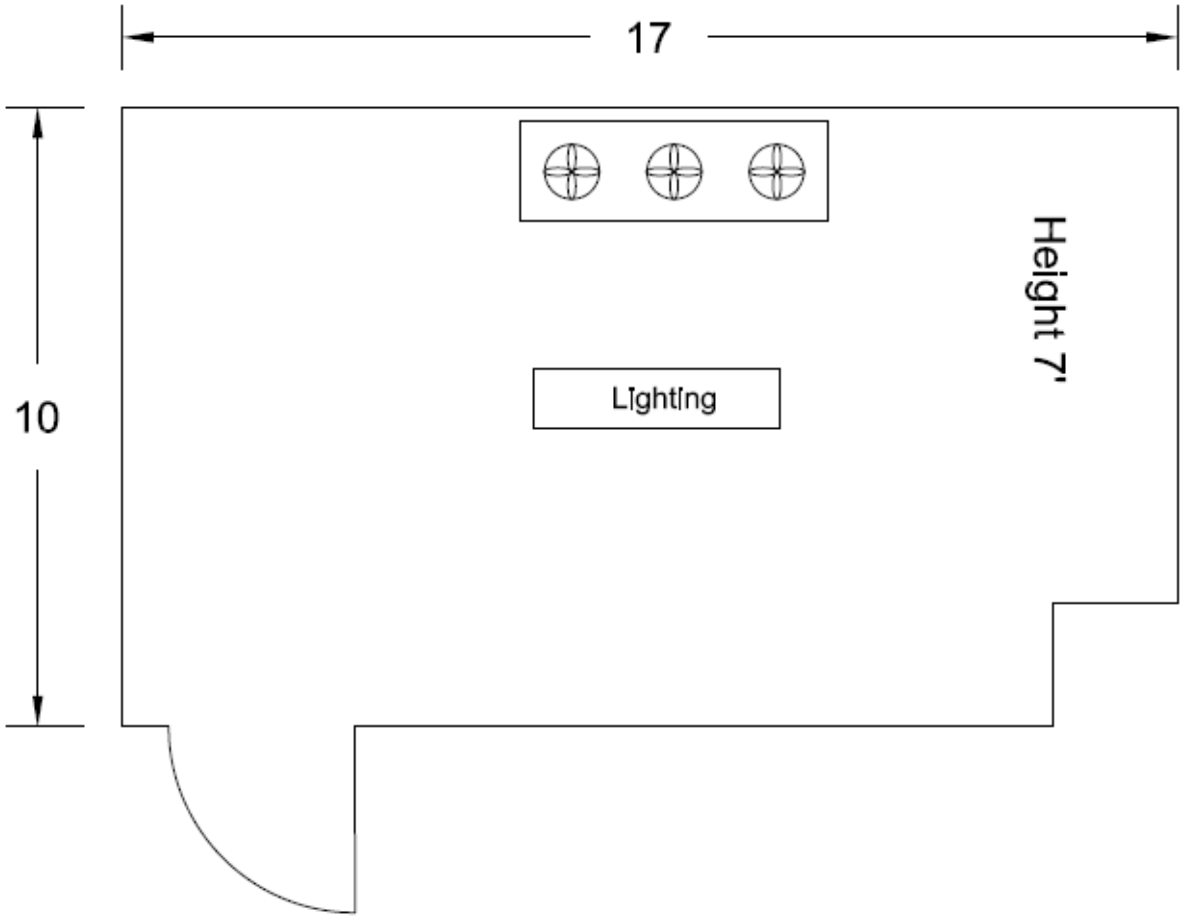
**3.3.1** Figure #1




Drawing note: All dimensions are rough and must be confirmed by contractor Drawing is N.T.S

**Walk In Cooler Room Dimensional Data (To Be Confirmed by Contractor)**

**3.3.2** Figure #2




Drawing note: All dimensions are rough and must be confirmed by contractor Drawing is N.T.S

**Walk In Freezer Room Dimensional Data (To Be Confirmed by Contractor)**

**Part: 4 PROOF OF PERFORMANCE:**

**4.1** Inspection:

4.1.1 Upon completion of the assembly of the panels the systems and doors are to be reassembled and prove to be in good working order to Chief Engineer.

**4.2** Testing:

4.2.1 That the refrigeration system is working for the both the cooler room and the freezer room that the refrigeration system can bring the temperature down to 1 degree Celsius in Cooler room and -20 Celsius in the freezer room and that insulating panels and doors seal and insulate the compartments as designed.

**Part: 5 Deliverables**

**5.1 Reporting**

5.1.1 Contractor shall supply three hard copies and one electronic copy of all work carried out including the testing of the refrigeration system.

5.1.2 Contractor to supply certificates for paneling for both cooler and freezer room and the doors for both locations.

| Spec item #: H-26 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**H - 26 : Galley Cold Rooms Refrigeration**

**Part: 1 SCOPE:**

**1.1** The intent of this specification is to replace one existing compressor and one condenser along with the associated valves and fittings to the indoor coils.

**Part: 2 REFERENCES:**

**2.1 Area of repair:**

2.1.1 Engine Room Stbd side aft

**2.2 Owner Furnished Equipment**

**2.2.1** 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**

**3.1.1** Reclaim refrigerant from refrigeration system.

**3.1.2** Decommission, remove, and dispose of existing compressor, condenser and motor. Condenser is Dunham Bush Model # HBC-5084-2-9.Capacity for the condenser is 7.5RT, 2 port head with left hand connection and a capacity of 400psi shell side and 300psi tube side. Compressor is Carlyle Model# 5F30-S664, the compressor rated at approximately 12RT@40°F saturated suction and 105°F saturated discharge utilizing R-404A refrigerant. Motor for compressor rated at 15hp at 1775 rpm and must have electrical characteristic 460/3/60. Decommissioning to include all associated piping, valves, instruments and associated work required to accommodate the new replacement equipment. Refer to picture #3 (compressor) and picture #4 (condenser). Contractor shall dispose of compressor, condenser, motor, piping as per Provincial Regulations.

3.1.3 Supply and install new compressor capable of the same output of the existing unit. Supply and install new compressor motor to match compressor manufacturer specifications. The new compressor and motor shall be fully compatible with the existing system and controls.

3.1.4 Supply and install new condenser suitable for sea water capable of the same output of the existing unit. The new condenser shall be fully compatible with the existing system and controls.

3.1.5 Supply and install all new associated piping, valves, instruments and associated work required to accommodate the new replacement equipment. Existing piping form pack to evaporator to remain.

3.1.6 Freight and rigging charges are to be included with the bid price.

3.1.7 The units shall be reinforced as necessary to permit it to be handled, shipped, and rigged in such a way as to prevent damage to internal and external components. Delivery of all material to the site is the responsibility of the contractor.

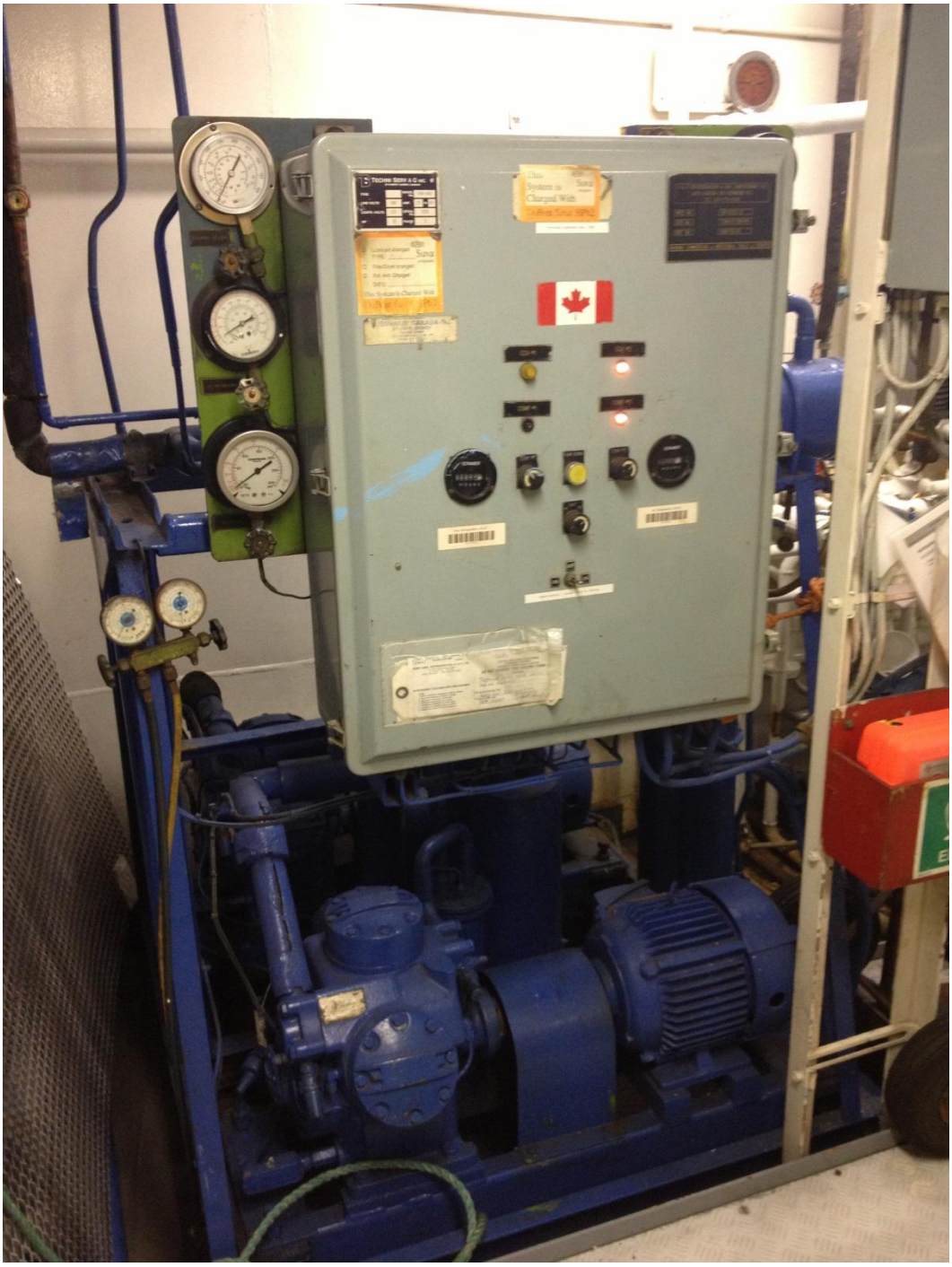
3.1.8 Preform nitrogen pressure test on system to ensure operation.

3.1.9 Recharge with new R404A refrigerant to bring the system up to operation levels.

3.1.10 Carry out system start up and commissioning as recommended by the equipment manufacturer after installation is complete and provide training to the Chief Engineer.

## 3.2 Location

### 3.2.1 **Picture #1**



**Refrigeration Package (FWD Compressor and motor to be replaced as seen in picture)**

3.2.2 **Picture #2**

**Refrigeration Package (Aft Condenser to be replaced as seen in picture)**

**Part: 4 PROOF OF PERFORMANCE:**

**4.2** Inspection

4.2.1 Upon completion of the assembly of the panels the systems are to be reassembled and placed in working order.

**4.3** Testing

4.3.1 After installation the refrigeration rooms will be brought down to their normal working temperatures Cooler: 1 degree Celsius, Freezer -20 degree Celsius.

**4.4** Certification

4.4.1 That the refrigerate type is ozone friendly.

Part: 5 **DELIVERABLES:**

**5.2 Drawings/Reports**

5.2.1 Contractor to supply a detailed report (three hard copies and one electronic copy) to Chief Engineer.

**5.3 Spares**

**N/A**

**5.4 Training**

**N/A**

**5.5 Manuals**

**N/A**

| Spec item : H-27 | **SPECIFICATION** | |
|---|---|---|

**H - 27 : Aviation Gas Damper Renewal**

**1.1 SCOPE:**

**1.1** The intent of this specification shall be to crop out old aviation fuel pump room louver and the aviation fuel cofferdam louver and replace with two new owner supplied Lloyd's approved shutdown louvers. To be installed in the same location as old louvers.

**1.2.** The ventilation trunking is for the aviation fuel pump room and the aviation fuel cofferdam. This is one common trunk separated into two separate vent sections by a divider plate with each section containing a shutdown louver.

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

Please see attached pictures and sketch.

**2.2 Standards**

2.2.1Welders and company must be Canadian Welding Bureau certified.

**2.3 Regulations**

**2.3.1** 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 to complete this specified work.

**2.4.2** Owner will supply two new Lloyd's approved shutdown louvers.

**Part 3: TECHNICAL DESCRIPTION:**

**3.1 General**

**3.1.1.** Contractor prior to starting any work must contact the Chief Engineer.

**3.1.2.** Contractor shall gas free the cofferdam and the pump room below the ventilation trunk prior to any hot work or access to this space. These spaces shall be certified for hot work and entry by a certified chemist.

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

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; Protective material shall be used to prevent the spread of sparks, protecting electrical cables and other services;

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.

**3.1.4.** Confined Space Entry: 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 Provincial Regulations.

The contractor shall comply with the work requirements as outlined in the Canada Labor Code and applicable Provincial Regulations.

**3.1.5.** Contractor shall protect from the hot work the stainless steel cabinet on the port side of the trunk and the cooling water tank attached to the aft section of the trunking.

**3.1.6.** Contractor prior to any welding taking place has to submit to Lloyd’s Surveyor a welding procedure which has to be approved by Lloyd’s before any welding is started.

**3.1.7. C**ontractor shall remove the tubing to both shut mechanisms for the louvers. Contractor shall re-install this tubing and secure it to the new trunk to its as fitted specifications and condition.

**3.1.8**. **C**ontractor shall cut out the two existing old louvers, dispose of these louvers, and install two new owner supplied louvers in the same location as old louvers, as per approved Lloyd’s welding procedure.

**3.1.9** Temporary Shelter must be made if the side shell damper opening is going to be left unattended. Contractor shall erect a temporary shelter over the side shell opening. The shelter shall be erected to provide suitable shelter from rain, snow and wind in way of the specific area under construction. This shelter is to be kept in place until all steel work is completed. The materials in the temporary shelter are to be non-combustible.

**3.1.10.** Once louvers are installed, all welds and heat affect areas are to be hand tooled and coated with primer and two topcoats of marine epoxy, to be witness by Chief Engineer. The exterior coating is to match the current vessel paint type and color (White).

**3.1.11.** All coatings and solvents must be supplied with acceptable WHIMS data sheets and correctly marked. Contractor is responsible to remove all containers of paint and solvents from the work place daily.

**3.1.12.** All welding is to be in accordance with CSA W47.1 & W59.

**3.1.13.** Contractor shall arrange for inspection of all welds:

- 100% visual
- 20% MPI
- All inspections witness by Chief Engineer and Lloyd's Surveyor

**3.1.14.** All work shall be to the satisfaction of the Chief Engineer and a Lloyd's Surveyor.

**3.2 <u>Location:</u>**
**3.2.1.** Aft section of stern on Upper deck.

**3.3 Interferences**

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

**4 PROOF OF PERFORMANCE:**

Weld Inspection and Testing.

**4.1.1.** Contractor shall perform tests to verify that all requirements of the specification are met.

**4.1.2.** The steel work is to be completed to the satisfaction of the attending Lloyd's Surveyor and the Chief Engineer.

**4.1.3.** The completed steel work is to be 100% visually inspected after welding is completed by Lloyd's Surveyor and the Chief Engineer.

**4.1.4.** There is to be a 20% MPI testing completed welds by approved testing personnel.

**4.1.5.** Contractor shall perform function test on two new installed fire dampers they must be operating as designed.

**4.1.6.** This testing is to be carried out in the presence of the attending Lloyd's Surveyor and Chief Engineer.

**4.1.7.** All costs associated with the inspection to be included in the contractor's price for known steel work.

**4.1.8.** All cost for Lloyd's Surveyor will be will be paid by the owner.

**4.1.9.** Contractor is to be responsible to contact Lloyd's Register for all inspections. The contractor is responsible for all air quality testing to ensure hot work and confined entry is permitted.

**4.1.10.** Contractor shall issue and post hot work permits and shall maintain a fire watch. After acceptance of the test on the weld seams by the Lloyd's Surveyor and Chief Engineer, the area is to be inspected to ensure all debris has been removed.

**4.1.11.** Contractor shall supply all necessary materials, fittings blanks and labor for respective tests.

**4.2. Certification:**

**4.2.1.** Contractor shall obtain and provide to the Technical Authority all required technical Certifications as specified in the applicable rules and codes in accordance with Preamble Section of this specification.

**4.2.1.** After completion of work, the system shall be proven and certified fully operational.

**5.1 DELIVERABLES:**

**5.1. Documentation:**

**5.1.1** Contractor is to include the supply of a documentation package as a component of the complete project. This documentation package is to include for all material data, the weld procedures used, a record of consumables and the certificates for the welders completing the work.

**5.1.2**. In addition, the documentation package is to include a record of the hose test, the MPI reports and the visual weld inspection, as well as a copy of all hot work and enclosed space entry signed sheets.

**5.1.3.** Three typed copies and one electronic copy of the above mentioned documentation are to be supplied upon completion of the work scope.

**5.2. Drawings**: N/A

| Spec item #: H-28 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**H - 28 : Forward Machinery Space Deck Coating**

**Part 1: SCOPE:**

The intent for this specification is to remove existing coating and apply new coatings to the forward machinery space deck.

Coast Guard will arrange for a NACE inspector to view specification and inspect the coatings to make sure they are applied as per manufacture's product data sheets.

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**
590-57 Bow Thruster/Fwd machinery compartment arrangement

2.1.2 **Related specifications.**
E-05 RO Units Supply Piping
HD-03 Cathodic protection
H-22 Fire Lines Replacement

**2.2 Standards**
**2.2.1** Contractor is to follow the recommendations of on-site NACE Inspector and to stay within the guidelines of the coating manufacture recommended application procedures.

**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 to the point of connection.

**Part 3: TECHNICAL DESCRIPTION:**

**3.1 General**
**TECHNICAL DESCRIPTION:**

3.1.1. All materials and labor will be contractor supplied unless otherwise stated.

3.1.2. The Contractor shall isolate and lockout the power supply to the 460 volt Panel P-5 located on the aft bulkhead of the forward machinery space. (The breaker to this panel is located in the machinery control room). The panel itself must then be covered to prevent any ingress of material from sand blasting.

3.1.3. The entire deck and the adjacent bulkhead extending approximately 0.3 meters to 0.6 meters from the deck is to be grit-blasted to near white metal (SSPC-SP10, or SS Sa 2 1/2). Prior to grit-blasting the contractor is to cover and seal the entire deck head, and the bulkhead area that is not subject to grit-blasting, to prevent grit from coming in contact with those areas. The contractor shall bid a unit cost price per m2 to repair areas where the coating is missing.

3.1.4. Prior to grit-blasting the contractor will remove all equipment, as necessary, to effectively grit-blast the area or to apply coating material. Any equipment that the contractor does not remove will be adequately covered and sealed to prevent damage by either girt or coating material. All damaged equipment shall be replaced or repaired by the contractor at the contractor's expense.

3.1.5. Equipment to be protected includes but is not limited to:

a. Water tight door and operating mechanism,
b. Emergency fire pump and associated motor strainer box and electrical control box,
c. Hot water boilers (Calorifiers) and associated control boxes.
d. Piping in the compartment, internally and externally.
e. Matrix water makers (2) and associated equipment.
f. Domestic fresh water pressure pumps and motors.
g. Lights
h. Electrical control boxes.
i. Electrical panel boxes.
j. All cabling and transits.

3.1.6. The Contractor will take whatever measures are necessary to ensure that no damage, unnecessary cleaning, or repairs result from the preparation process or coating application.

3.1.7. The Contractor will ensure all traces of grit, scale, and dust is removed prior to application of coating.

3.1.8. Grit for blast cleaning is not permitted to enter any other compartment of the ship. The contractor is to ensure that every opening into other compartments of the vessel where grit may gain entry is suitably covered, including but not limited to:

I. Pipes
II. Tank vents

III. Ships ventilation system
IV. Entrances

3.1.9. NOTE: The equipment used to apply the coating is to meet the specifications of the coating manufacturer.

3.1.10. Contractor will supply all paint and materials. The Contractor will apply the following coatings where the deck has been grit-blasted with the following products. The Contractor will apply the coatings in the following order Intershield 300 Bronze, Intershield 300 Aluminum and finally Intershield 556 Dark Grey. The contractor shall bid on abrasive grit blasting, and recoating of 30 square meters, and quote a unit rate per square meter for adjustment purposes. There will be no substitutions unless approved by the Chief Engineer and International Paints.

3.1.11. The contractor will ensure that the application method meets the specifications of the coating manufacturer and personnel engaged in the coating application are experienced in the preparation and application.

3.1.12. The contractor shall ensure that all personnel working on this specification or other workers working in this area wear proper personal protection equipment as per provincial and federal regulations.

3.1.13. The contractor shall provide isolation of the space and ventilation ensuring all of the fumes from the coating is extracted from the ship, so as to not affect other workers on the ship.

3.1.14. The contractor shall ensure optimum temperatures and humidity for application of coatings as per manufactures recommendations.

3.1.15. The thickness determination of the new coating is to be verified and recorded at three positions on each repair area. Measuring points will be as indicated by the Owner's representative.

**3.2** Contractor’s Responsibility

3.2.1. It is the contractor’s responsibility to follow all applicable provincial and local regulations. The contractor is to adhere to all DFO-Coast Guard / PWGS work requirements and must complete the work to the satisfaction of the Chief Engineer.

3.2.2. The contractor is also responsible to provide all materials, labor, lighting, ventilation, staging and lifting capacity to complete the required tasks. The contractor is also responsible for all clean up and disposal of debris generated due to the work.

**3.3 Location:**

3.5.5. Forward machinery space.

**3.4 Interferences**

**b.** 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 & Testing**

**4.2** The work is to be completed to the satisfaction of the attending Chief Engineer and owner's representative.

**4.3 Testing**

4.2.1 NACE inspector will be required to inspect the preparation of and each of the applications of the deck coatings. It is the contractors responsibility to arrange for the NACE inspector to be present at the required times to inspect the preparation and applications.

**4.4 Certification**

N/A

**Part 5: DELIVERABLES:**

**5.1 Drawings/Reports**

The contractor shall supply copies of all Paint coating MSDS and technical data sheets.

**5.1.2**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
- Material Safety Data Sheets.

## 5.2 Spares
**N/A**

## 5.3 Training
**N/A**

## 5.4 Manuals
**N/A**

| Spec item #: H-29 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**H - 29 : Lightship Survey, Inclining and Stability Book**

**Part: 1 SCOPE:**

**1.1** The intent of this specification shall be to perform a lightship survey and inclining experiment and to produce a stability book.

**1.2** This work shall be coordinated near the completion of all VLE work items, such that all related weight changes are accounted.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1** M.V. "Leonard J. Cowley", Intact Trim and Stability Booklet, May 8 1985

**2.2 Standards**

**2.2.1** ASTM Standard F1321-92

**2.2.2** TP7301E

**2.2.3** Trim and Stability Book Production for CCG Vessels, dated Oct 2014.

**2.3 Regulations**

**2.3.1** Hull Construction 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 General

**3.1.1** The Contractor must report during the first technical progress meeting the method used to control the weight and centers movement on the vessel. The Contractor must record all weight movement within the vessel and all weight removed and added to the vessel as a result of the work

**3.1.2** Lightship Survey and Inclining Experiment

**3.1.3** The Contractor must perform a Lightship Survey and Inclining Experiment (in the presence of a Lloyds Surveyor, as applicable) near the conclusion of the work and prior to vessel delivery.

**3.1.4** The Contractor must produce an inclining experiment and must submit this for Lloyds approval. The results from the inclining experiment must form the baseline for the Trim and Stability Booklet.

**3.1.5** The Inclining experiment and lightship survey must be carried out in accordance with ASTM Standard F1321-92 and as directed by the attending Lloyds Surveyor.

**3.1.6**

## 3.2 Trim and Stability Booklet

**3.1.7** The Contractor must prepare a Trim and Stability Booklet, in metric units, for the vessel in the condition at time of return of custody to Canada. The format must conform to TP7301E and the Trim and Stability Book Production for CCG Vessels, dated Oct 2014, and must be Lloyds approved.

**3.1.8** The baseline for the Stability Booklet must be the lightship centers of gravity determined from the inclining experiment.

**3.1.9** At completion of the work, the vessel must meet all requirements of TP7301E, Stability 6, in all operating conditions without ice accretion and Stability 7 with ice accretion.

**3.1.10** The following intact conditions must be prepared as a minimum:

**3.1.11**

A. Lightship condition:
   - Vessel complete with working level of fluids in machinery, sea bays flooded, and non-consumables onboard. The light ship must not include crew and effects, cargo, buoys or consumables including

provisions and stores. Fuel, fresh water and water ballast tanks must be empty.

B. Departure Condition:
   1) Lightship condition;
   2) Provisions;
   3) Deck Stores;
   4) Engine Stores;
   5) Crew and effects;
   6) 100% consumables;
   7) Full Fuel and fresh water;
   8) Water ballast where required.
   9) Flume tank at working level
   10) Full Aviation Gas
   11) Port and starboard workboats (743's) secured in davits

C. Arrival Condition:
   1) Lightship condition;
   2) Provisions;
   3) Deck Stores;
   4) Engine Stores;
   5) Crew and effects;
   6) 10% consumables;
   7) 10% fuel;
   8) 10% fresh water;
   9) Water ballast where required.
   10) Flume tank at working level
   11) Full Sludge Tank
   12) 10% Aviation Gas
   13) Port and Starboard Workboats (743's) secured in davits

D. Arrival Condition with Accumulated Ice

E. Departure Condition with Helicopter

F. Arrival Condition with Helicopter

G. Arrival Condition with Flume Tank Full

H. Departure Condition with Flume Tank Full

I. Worst Operating Condition;

J. Any condition likely to be encountered by the vessel in operation in which the distribution and quantity of consumables, cargo, fuel, and water produce lower values of GZ and/or GM than conditions B to I listed above.

**3.1.12** All conditions must include righting lever curves and areas under the curves. All data, whether measured or derived must be provided to the Technical Authority for future use for calculating the vessel's stability.

**3.1.13** All stability analysis shall be conducted using Creative Systems Inc. General Hydrostatics (GHS).

**3.1.14**

**3.3 Location**

**3.3.1** N/A

**3.4 Interferences**

**3.4.1** N/A

**Part: 4 PROOF OF PERFORMANCE:**

**4.3 Inspection**

**4.3.1** The Lightship Survey and Inclining shall be observed by the Chief Engineer and witnessed by Class (Lloyds) in accordance with the applicable Regulations.

**4.4 Testing**

**4.5 Certification**

N/A

**Part: 5 DELIVERABLES:**

**5.3 Drawings/Reports**

**3.1.15** The Contractor must prepare and supply four (4) stamped Lloyds approved paper copies of the CCGS Leonard J Cowley Experiment Report, in metric units, for the modernized vessel. These reports must be delivered to the Technical Authority prior to the completion of the contract.

**3.1.16** The Contractor must supply one (1) electronic copies of the Inclining Experiment Report to the Technical Authority on individual CD-ROM media in a PDF file format. This copy must be a scanned copy of the Lloyds approved Inclining Experiment Report and must be delivered prior to the completion of the contract.

**3.1.17** The Contractor must prepare and supply four (4) stamped Lloyds approved paper copies of the CCGS Leonard J Cowley Trim and Stability Booklet, in imperial and metric units, for the modernized vessel. The format must conform to the Trim and Stability Book Production for CCG Vessels, dated Oct 2014 and Transport Canada Ship Safety Branch publication TP 7301E, Stability Standard Stab. 1. The Contractor must deliver these copies to the Technical Authority prior to the completion of the contract.

**3.1.18** The Contractor must also supply one (1) electronic copies of the Trim and Stability Booklet to the Technical Authority on individual CD-ROM media in a PDF file format. This copy must be a scanned copy of the Lloyds approved

**3.1.19** Trim and Stability Booklet and must be delivered prior to the completion of the contract.

**3.1.20** The Contractor must supply all stability program files required to generate the information within the Trim and Stability Book including all geometry, tank and compartment definition, library, macro, loading, intact stability and damaged stability run files.

**5.4 Spares**

**N/A**

**5.5 Training**

**N/A**

**5.6 Manuals**

**N/A**

| Spec item #: HD-01 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) 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.

**1.2** This work shall be carried out in Conjunction with the following:
HD-02 Underwater Hull Inspections, HD-03 Cathodic Protection, HD-04 SW Cooling Antifouling System, HD-05 Sacrifical Hull Anodes, Underwater Hull Painting, HD-08 Hull Painting Above Ice Belt, HD-09 Hull & Butt Seams, Hull Repairs, HD-11 Valves Suction & Discharge, HD-12 Sterntube Oil Change, HD-13 Water Ballast Tank #1 & 2., HD-14 #3 WB TK Changed to Fuel Oil Tank, HD-15 Bilge Keels, ED-01 Steering Controls and E-08 Bowthruster Controls.

# 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. The rest of Dry-Docking ship will be unmanned.

**.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**

| Spec item #: HD-02 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) 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

| 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** New ICCP anodes and reference electrodes. Contractor shall purchase four new anodes and two new reference electrodes from MPE Cathodic AS, Moss, Norway, www.mpecathodic.no, in accordance with the supplied drawings. It is noted that the existing anode backing plates are incompatible with the new type anodes, and they must be cut out of the hull and scrapped. The new backing plates are integral with the cofferdam and part of MPE's supply. MPE will manufacture the backing plates to suit the shell opening diameter and thickness. Cofferdams for anodes and reference electrodes shall be supplied with material certificates. The new reference electrodes require smaller shell openings, and contractor shall make and fit compensating rings per the drawing supplied with this specification.

**.5** All four anode cables shall be replaced with new. The old wiring must be removed and disposed of as per provincial regulations. The new wire will take

its place off the old wire in cable tray and bulkhead fittings these may have to be adjusted for a different size wire if different than existing. About 75 meters of cable will be required. Contractor to quote per 5 meters for adjustment purposes by PWGSC 1379 action. Cable to be approved marine standard armoured No.6 AWG single conductor. If single conductor cable is not readily available, multi conductor cable of equal or better ampacity will be accepted provided the end fittings are suitable for the terminals in the panel and the cofferdams.

**.6** The two reference electrode cables shall be replaced with new. The old wiring must be removed and disposed of as per provincial regulations. The new wire will take its place off the old wire in cable tray and bulkhead fittings these may have to be adjusted for a different size wire if different than existing. The new shall be a single conductor No. 14 AWG, shielded or armoured. About 75 meters of cable will be required Contractor to bid per 5 meters for adjustment purposes by PWGSC 1379 action. There are six bulkhead penetrations forward and two aft, which may be reused with blocking to suit if otherwise acceptable. If single conductor cable is not readily available, two conductors No.16 or No.18 will be acceptable contractor to quote per bulkhead fitting for adjustment purposes by PWGSC 1379 action.

**.7** After installation of new anodes and ref. electrodes with c/dams, all cables shall be connected in the cofferdams, and the cofferdams packed with Vaseline and secured watertight. Prior to reconnecting at the panel, FSR will do resistance and potential tests before and after refloating the vessel.

**.8** Contractor shall purchase and fit new shaft grounding brushgear, except for the slipring, which is in good condition. It shall consist of a double brush holder for grounding and a single holder for potential pick-up, complete with three silver graphite 20 X 10 mm brushes. The brush holders shall be insulated from the mounting posts. Approved suppliers are MPE Cathodic (see above), and Jastram Technologies, 22 Trider Crescent, Dartmouth NS B3B 1R6, email sales@jastramtechnologies.com. The cable from the brushgear to the millivolt meter and the grounding cable shall be renewed.

**.9** The rudder stock grounding cable is to be replaced.

**.10** For remediation of paint and dielectric shields after installation of new anodes and ref. electrodes, please refer to Specification Section HD-06 outlined in the underwater hull painting spec.

**.11** 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.

**.12** After refloating the vessel, power will be restored to the ICCP panel, and the FSR shall reconnect the anode and ref. electrode cables and do a full system test assisted by the contractor.

**.13** 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**

| Spec item #: HD-4 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|
| **HD - 4 : 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 provide 16 anodes for this specification item and all other materials required to complete this spec shall be Contractor supply including the 4 x Z-26 sacrificial anodes.

## 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** (Port & Stbd) 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. 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. The distribution box under the control panel and the existing cables to the anodes and ground return j/b's shall be removed and deposed of as scrap. All disposals carried out by the contractor must as of as per provincial environmental regulations.

**.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** New anodes. Contractor shall purchase 16 new anodes complete with mounting hardware in accordance with the drawings, as well as six (6) spare old type safety caps, from EMCS Industries Ltd., 2066 Henry Ave. West, Sidney BC V8L 5Y1, email emcsltd@ramsaygroup.com. The mounting hardware must suit the old type safety caps.

**.8** 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.

**.9** New cabling shall be installed. Cables shall be marine approved armoured single conductor No.14 AWG. Alternatives will be considered if single conductor is not readily available. There are 16 anode cables and 4 ground cables. Approximately 300 meters of cable will be required. Contractor to bid installing per 5 meters for adjustment purposes to be adjusted by PWGSC 1379 action. Cables shall be fitted with straight crimp-on ends to fit the terminal block in the panel, and stake-ons to suit the tail cables on the anodes. Any defective glands on the safety caps shall be replaced. Cables serving the fire pump sea chest to use the same bulkhead transits as the replaced cables. Damaged blocking to be replaced.

**.10** 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.

**.11** Before connecting the cables at the panel, FSR shall check the resistance and potential.

**.12** 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.

**.13** 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

**.14** 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.

**.15** 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.

**.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 |
| 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. 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

### 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 Representived (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**

**(M/E) 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:**

**2.1Guidance Drawings/Nameplate Data**

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

**Standard 2.2.1**
**2.2Regulations**

**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 six, 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 and midships under bilge keels Port & Stbd side of vessel. 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.

**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:**

**5.1Drawings/Reports**

**5.2Spares**

**N/A**

**5.3Training**

**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. 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**
**N/A**

| Spec item #: HD-07 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|
| **HD-07 Scuppers and Drains Lines** | | |

**Part: 1 SCOPE:**

**1.1** The intent of this specification is to replace all deteriorated exterior scuppers and drains piping with new.

**1.2** This work shall be carried out in conjunction with the following refit specifications|: H-12 Flooring and Sub Flooring, H-14 Paneling H-16, H-17 Galley Flooring, H-22 Fire Lines, H-24 Domestic Freshwater Piping Replacement and HD-17 Port Miranda Davit.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings**

**2.1.1** Exterior Scuppers & Drains, 590-51, Rev.0

**2.2 Owner Furnished Equipment**

**2.2.1** 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**

**3.1.1** .Prior to commencement of the work the Contractor shall inform the Chief Engineer.

**3.1.2** The Contractor shall ensure all work areas are neat and tidy before the end of the work day to ensure a safe environment.

**3.1.3** The Contractor shall remove all sharp edges and grind all burrs smooth.

**3.1.4** The Contractor shall repaint damaged areas as per client specs.

**3.1.5** All new piping, fittings and penetrations shall be as per original system. Piping is Sch.80 Black Steel.

**3.1.6** All welding to be completed to Lloyd's latest revision and be approved by Lloyd's prior to any welding starting.

**3.1.7** Contractor shall store all materials as instructed by Chief Engineer.

**3.1.8** Contractor shall clean up all debris removed in this specification including all piping and bulkhead penetrations and dispose of it as per provincial regulations.

**3.1.9** Contractor shall paint new piping as per client specification before installation.

**3.1.10** Contractor shall recoat all new bulkhead, deck and hull penetrations as per client specification.

**3.1.11** Contractor shall, with the help of the Chief Engineer ensure any other systems required to be removed to access the scuppers and drains piping are locked out and drained before removal.

## 3.2 Scupper and Drains Piping at Forecastle Deck

**3.2.1** Contractor shall remove all required deck head panels in Smoke Room, Crew Cabin, Bosun Workshop & Store, Engineers Store and store.

**3.2.2** Contractor shall unbolt, remove and store any piping spools of other systems that may hinder the removal of the scuppers and drains piping being removed.

**3.2.3** List of Scuppers & Drains to be replaced:

a. SD19
b. SD20
c. SD21
d. SD22
e. SD23
f. SD24
g. SD25
h. SD26
i. SD27
j. SD28
k. SD29
l. SD30

**3.2.4** Contractor shall cut out all Scupper & Drains piping between bulkhead, deck and hull penetrations.

**3.2.5** Contractor shall cut out all Scupper & Drains bulkhead, deck and hull penetrations.

**3.2.6** Contractor shall fabricate new penetrations for all removed bulkhead, deck, hull penetrations similar to the ones removed as detailed in Ref 2.1.1, and install in the locations of the old penetrations.

**3.2.7** Contractor shall install new piping following the same route as the removed piping.

**3.2.8** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.2.9** Contractor shall reinstall any removed piping of other systems, and deck plating, to the satisfaction of the Chief Engineer.

### 3.3 Scupper and Drains Piping at Upper Deck

**3.3.1** Contractor shall remove all required deck head panels in Crews Lounge, Change Room Water Closet, Galley, Program Offices Cabins, Gym and store.

**3.3.2** Contractor shall unbolt, remove and store any piping spools of other systems that may hinder the removal of the scuppers and drains piping being removed.

**3.3.3** List of Scuppers & Drains to be replaced:

a. SD31
b. SD32
c. SD33
d. SD34
e. SD35
f. SD36
g. SD37
h. SD38
i. SD39
j. SD40
k. SD41
l. SD42
m. SD43
n. Drain under flush hatch Fr. 32

**3.3.4** Contractor shall cut out all Scupper & Drains piping between bulkhead, deck and hull penetrations.

**3.3.5** Contractor shall cut out all Scupper & Drains bulkhead, deck and hull penetrations.

**3.3.6** Contractor shall fabricate new penetrations for all removed bulkhead, deck, hull penetrations similar to the ones removed as detailed in Ref 2.1.1, and install in the locations of the old penetrations.

**3.3.7** Contractor shall install new piping following the same route as the removed piping.

**3.3.8** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.3.9** Contractor shall reinstall any removed piping of other systems and deck plating, to the satisfaction of the Chief Engineer.

### 3.4 Scupper and Drains Piping Aft of Frame 0 (Not Noted on Dwg)

**3.4.1** Contractor shall remove all required deck head panels and insulation in the Steering Gear, and Hyd. Motor Space, and store for later re-installation.

**3.4.2** Contractor shall unbolt, remove and store any piping spools of other systems that may hinder the removal of the scuppers and drains piping being removed.

**3.4.3** List of Scuppers & Drains to be replaced:

a. Escape hatch at Fr.0 to Port side overboard
b. Port side transom – Access Water Ballast Tank #5
c. Stbd side transom

**3.4.4** Contractor shall cut out all Scupper & Drains piping between bulkhead, deck and hull penetrations.

**3.4.5** Contractor shall cut out all Scupper & Drains bulkhead, deck and hull penetrations.

**3.4.6** Contractor shall fabricate new penetrations for all removed bulkhead, deck, hull penetrations similar to the ones removed as detailed in Ref 2.1.1, and install in the locations of the old penetrations.

**3.4.7** Contractor shall install new piping following the same route as the removed piping.

**3.4.8** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.4.9** Contractor shall reinstall any removed piping of other systems and deck plating, to the satisfaction of the Chief Engineer.

### 3.5 Interferences

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

**3.5.2** All watertight penetrations shall be proven to be watertight and witnessed and signed off by Lloyd's Surveyor.

## Part: 4 PROOF OF PERFORMANCE:

### 4.1 Inspection

**4.1.1** All work to be completed to satisfaction of the Chief Engineer.
**4.1.2** Visual inspection of all welding 100%. By Lloyd's Surveyor and Chief Engineer.
**4.1.3** Welds 10% MPI testing completed by approved testing personnel.
**4.1.4** The Contractor is responsible for all air quality testing to ensure hot work and entry is permitted.
**4.1.5** The Contractor shall issue and post hot work permits and shall maintain a fire watch.
**4.1.6** Area where work was carried out to be inspected to ensure all debris has been removed.

### 4.2 Testing

**4.2.1** Welding 100% visual by Lloyd's Surveyor and Chief Engineer.
**4.2.2** Welds to 10% MPI by approved testing personnel.
**4.2.3** Areas where hot work is to be carried out is to be certified by a Chemist or a qualified person to be determined by Chief Engineer.

### 4.3 Certification

**4.3.1** Welders must be CWB Certified
**4.3.2** Chemist must be Certified
**4.3.3** Technicians for NDT testing must be Certified
**4.3.4** Certification of all steel used and piping this must be approved by Lloyd's Surveyor prior to work starting.

**Part: 5 Deliverables:**

**5.1 Reporting**

**5.1.1** Contractor supply three hard copies and one electronic copy of all work carried out including everything mention in Section 4.3.

**5.2 Training**

**5.2.1** N/A

**5.3 Spares**

**5.3.1** N/A

**5.4 Manuels**

**5.4.1** N/A

| Spec item #: HD-08 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) HD-08 : 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**

| Spec item #: HD-09 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) HD - 9 : Hull Butts and Seams** | | |

**Part 1: SCOPE:**

1.1 Note this item has to be done prior to HD-5 and HD-6 and HD-10.
**1.2** Hull plate welding butts and seams to repair.

**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** 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.

**3.2 Location**

**a.** Hull of ship.

**3.3 Interferences**

**3.3.1** N/A

**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-10 | SPECIFICATION | TCMSB Field #: N/A |
|---|---|---|

**HD – 10 : Hull Repairs**

## 1.1 Identification

1.1.1 The purpose of this specification item is to conduct repairs to the hull plate and hull structure as recommended by Lloyds Register.

1.1.2 This work is to be carried out in conjunction with H-09 Fuel Oil Piping/Valves Replacement, HD-01 Dry-Docking, HD-02 Underwater Hull Inspections, HD-03 Cathodic Protection, HD-04 SW Cooling Antifouling System, HD-05 Sacrificial Hull Anodes, HD-06 Underwater Hull Painting, HD-08 Hull Painting Above Ice Belt, HD-09 Hull Butts & Seams, HD-11Valves Suction & Discharge, HD-13 Water Ballast Tanks, HD-14 #3 WB TK Change to Fuel TK, and HD-15 Bilge Keels.

## 1.2 References

### 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.

1.2.1.2 The known plate work is estimated to require approximately 60m2 of 14mm plate, 110m2 of 8.5mm plate and 4m2 of 12.5mm plate. Contractor must arrange to have sufficient certified plate on hand with contingency for other repairs in the hull.

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 |
| 590-27 | Bow Structure | 1 |
| 590-77 | Insulation Plan | 3 |
| 590-78 | Fire Zone Plan | 1 |
| 590-79 | Capacity Plan | 1 |
| 590-80 | Steering Gear Compartment | 1 |

| | | |
|---|---|---|
| 590-91 | Painting Schedule | 2 |
| 590-96 | Docking Plan | 1 |
| 2014-VLE-01 | Leonard J. Cowley 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.

## 1.4 General Requirements

1.4.1 The following items shall be included, without exclusion, in the Contractor's price for the work as defined within this specification:

1.4.2 Contractor shall supply all material and services necessary to carry out repairs/renewals and additions.

1.4.3 Contractor shall provide cut-outs for access where required, i.e. both removal and refitting.

1.4.4 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).

1.4.5 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.

1.4.6 Handling of all materials and equipment to and from the vessel.

1.4.7 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.

1.4.8 All new steel to be grit blasted to SSPC-SP10 and coated in accordance with (Paint Specification).

1.4.9 Disturbed steelwork also to be surface prepared and coated as per specification.

1.4.10 Fire watches in way of repair and adjacent areas affected to have proper fire watches as per provincial regulations.

1.4.11 NDT requirements in accordance with CT-043-EQ-EG-001 Welding Specification

1.4.12 Pressure tests and/or hose tests. This to include any retests.

1.4.13 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). Contractor shall supply 110 m2 of 8.5 mm plating, 60m2 of 14 mm plating and 3 m2 of 12.5 mm plating. The strakes to be replaced are identified on drawing "2014-VLE-01 Leonard J Cowley – Shell Expansion –VLE Renewals". In addition to the specified area, Contractors shall quote a unit rate per square meter to supply steel plating for PWGSC adjustment purposes.

1.4.14 Contractor shall bid 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

1.4.15 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.

**1.5 General notes regarding steel renewal work**

1.5.1 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.

1.5.2 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.

1.5.3 Steel work is to be repaired or renewed as stated in this specification. The dimensions indicated can be used for estimating purposes.

1.5.4 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.

1.5.5 Where defective steelwork is removed, the resultant edges shall be ground smooth and edge prepared in accordance with welding detail necessary for subsequent renewals.

1.5.6 Where plating only is removed, the remaining edges of internals shall be ground smooth prior to the new plating being fitted.

1.5.7 Where internals only are removed, the plating in way of the removed internals shall be ground smooth prior to new internals being fitted.

1.5.8 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.

1.5.9 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.

1.5.10 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.

1.5.11 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.

1.5.12 New steel shall be fitted and faired, with due care to ensure proper alignment, i.e., moulded lines in general to be maintained. The Chief Engineer and Lloyd's surveyor shall witness "fit-up" condition prior to any production welding being carried out.

1.5.13 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.

1.5.14 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.

1.5.15 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.

1.5.16 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.

1.5.17 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.

1.5.18 Edges of all openings, holes, slots, etc., cut during renewals shall be ground smooth with no serrations remaining.

1.5.19 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.

## 1.6 Identify Final Cut Line Requirements

1.6.1 The hull repair estimates identified in this specification are based on the information found within the CCGS Leonard J. Cowley Condition Assessment Report dated February 2013 by Lloyd's Register. The final locations of the identified strakes may require adjustment.

1.6.2 Within forty-eight (48) hours of the vessel being dry-docked, the Contractor shall carry out a comparative NDT survey of the hull plating identified within this specification. This survey shall confirm the location of the strakes identified for replacement to the original Lloyd's Register Condition Assessment Report and shall include a fine-grid thickness measurement (TM) for the whole plate to establish renewal limits. Limits shall be based on exceeding 15% diminution of original as-fitted plate thicknesses. Any difference between the existing survey findings and those of the Contractor's investigation shall be presented to the CCG (Canadian Coast Guard) and PWGSC (Public Works & Government Services Canada) Contracting Authority.

1.6.3 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.

## 1.7 Welding Requirements

1.7.1 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.

1.7.2 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.

1.7.3 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.

## 1.8 Weld Inspections

1.8.1 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.

1.8.2 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.

## 1.9 Hull Plating and Structure Known Work

1.9.1 The Contractor must remove and replace with new Contractor Supplied Material, the hull plating and Flume Tank web frame identified within this specification.

1.9.2 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.

1.9.3 The Contractor is to make repairs on the areas of the hull and structure as recommended in CCGS Leonard J. Cowley Condition Assessment Report and identified on the drawing "Cowley Shell expansion – 2014 VLE". The specific repairs to be made and identified as follows:-

a. Item 1 – Shell Plate, Portside, Wind & Water Strake (3rd Aft Plate Position, fwd half);

b. Item 2 – Shell Plate, Stbdside, Wind & Water Strake (3rd Aft Plate Position, aft half);

c. Item 3 – Shell Plate, Portside, 2nd Strake (4th Aft Plate Position, fwd half);

d. Item 4 – Shell Plate, Portside and Stbdside, 1st Strake outboard of Keel (3rd Aft Plate Position, fwd half);

e. Item 5 – Shell Plate, Stbdside, Wind & Water Strake (1st and 2nd Fwd Plate Position);

f. Item 6 – Shell Plate, Stbdside, Shear Strake (3rd and 4th Fwd Plate Position);

g. Item 7 – Shell Plate, Portside, Shear Strake (4th Fwd Plate Position);

h. Item 8 – Flume Tank Web Frame #64, stbdside

## 1.10 Item 1 – Shell Plate

1.10.1 The Contractor must replace the 14 mm plating as indicated on drawing 2014-VLE, Cowley Shell Expansion–VLE Renewals. The area is bounded between frame 0 and frame 5, and from approximately 3.2 metres outboard of the vessel's centreline to 6000 Stringer. Portside.

1.10.2 The area affected by these repairs includes the structure in way of the rope storage compartment and the void beneath.

1.10.3 In rope storage compartment contractor to remove rope and any other components in this compartment and store it in a safe area protected from the environment. Contractor to also bid on removing and re-installing insulation and stainless steel perforated sheet metal that retains this insulation. The insulation to be replaced with new marine grade rock wool 50mm thick and aluminum on one side contractor bid on supplying/installing 28m squared and quote per one meter square for adjustment purposes. Contractor is to re-use the existing stainless steel perforated sheet metal.

1.10.4 Estimated plating: Qty: 1 x 3500 mm x 4000 mm x 14mm, Lloyd's Grade 'E'.

## 1.11 Item 2 – Shell Plate

1.11.1 The Contractor must replace the 14 mm plating as indicated on drawing 2014-VLE, Cowley Shell Expansion–VLE Renewals. The area is bounded between the transom and frame 0, and from approximately 3.2 metres outboard of the vessel's centreline to 6000 Stringer. Stbdside.

1.11.2 The area affected by these repairs includes the structure in way of the hydraulic motor space, pump room and voids beneath.

1.11.3 In hydraulic motor space pump room contractor to remove any components in this compartment and store it in a safe area protected from the environment. The Motor and pump unit have to be protect from hot work damage. Contractor to also bid on removing and re-installing insulation and stainless steel perforated sheet metal that retains this insulation. The insulation to be replaced with new marine grade rock wool 50mm thick and aluminum on one side contractor bid on supplying/installing 28m squared and quote per one meter square for adjustment purposes. Contractor is to re-use the existing stainless steel perforated sheet metal.

1.11.4 Estimated plating: Qty: 1 x 3500 mm x 2250 mm x 14mm, Lloyd's Grade 'E'.

## 1.12 Item 3 – Shell Plate

1.12.1 The Contractor must replace the 14 mm plating as indicated on drawing 2014-VLE, Cowley Shell Expansion–VLE Renewals. The area is bounded between frames 23 and frame 28, and from approximately the vessel's 4500 side GRDR outboard in way of the Water Ballast tank. Stbdside.

1.12.2 The area affected by these repairs includes the structure in way of the hydraulic motor space, pump room and voids beneath.

1.12.3 In hydraulic motor space pump room contractor to remove any components in this compartment and store it in a safe area protected from the environment. The Motor and pump unit have to be protect from hot work damage. Contractor to also bid on removing and re-installing insulation and stainless steel perforated sheet metal that retains this insulation. The insulation to be replaced with new marine grade rock wool 50mm thick and aluminum on one side contractor bid on supplying/installing 28metre squared and quote per one metre square (supply/install) for adjustment purposes. Contractor is to re-use the existing stainless steel perforated sheet metal.

1.12.4 Estimated plating: Qty: 1 x 3500 mm x 2250 mm x 14mm, Lloyd's Grade 'E'.

**1.13 Item 4 – Shell Plate**

1.13.1 The Contractor must replace the 14 mm plating as indicated on drawing 2014-VLE, Cowley Shell Expansion–VLE Renewals. The area is bounded between frame 0 and frame 5, and from vessel centreline to 3.2 metres outboard. Both Portside and Stbdside.

1.13.2 The area affected by these repairs includes the structure beneath the steering gear and voids.

1.13.3 Estimated plating: Qty: 2 x 3500 mm x 3200 mm x 14mm, Lloyd's Grade 'E'.

1.13.4 The Contractor must conduct the replacements in such a manner as to ensure the continued support and alignment of the steering gear system throughout the repairs.

**1.14 Item 5– Shell Plate**

1.14.1 The Contractor must replace the 8.5 mm plating as indicated on drawing 2014-VLE, Cowley Shell Expansion–VLE Renewals. The area is bounded between frame 70 and frame 91, and from the seam just below 6000 stringer to 75mm above upper deck. Stbdside.

1.14.2 The area affected by these repairs includes the structure in way of the 1 crew cabin No 2 and the recreation room.

1.14.3 Contractor to bid on stripping out cabin No 2 and re-installing items listed after work is completed , items consists of:

a. Taking out two bunks and two closets then taking down six sections of paneling each panel measures 610 mm x 2250mm and quote per panel removed and then bid on removing 8m squared insulation on the bulkhead and quote per one metre square for adjustment purposes.

b. Insulation to be replaced with new marine grade rock wool 50mm thick and aluminum on one side contractor bid on supplying/installing 8m squared and bid per one meter square for adjustment purposes.

c. Carpet in this room or similar type of flooring that can be damage is to be taken up by Contractor and re-install after the work has been completed.

d. 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.

1.14.4 Contractor to bid on stripping out the recreation room and re-installing items listed after work is completed , items consists of:

a. Taking two closets then taking down six sections of paneling each panel measures 610mm x 2250mm and then bid on removing the insulation on the bulkhead.

b. Insulation to be replaced with new marine grade rock wool 50mm thick and aluminum on one side contractor bid on supplying/installing 8m squared and quote per one meter square for the supply and installation for adjustment purposes.

c. Carpet in this room and rubber flooring that can be damage is to be taken up by Contractor and re-install after the work has been completed

d. 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.

1.14.5 Estimated plating: Qty: 1 x 13250 mm x 3750 mm x 8.5mm, Lloyd's Grade 'E'.

**1.15 Item 6– Shell Plate**

1.15.1 The Contractor must replace the 8.5 mm plating as indicated on drawing 2014-VLE, Cowley Shell Expansion–VLE Renewals. The area is bounded between frame 78 and frame 91 and from the upper deck to foc'sle deck Stbdside.

1.15.2 The area affected by these repairs includes the structure in way of the 1 crew cabin and its associated washroom, engineer's stores and the chain locker

1.15.3 Contractor to bid on stripping out crew cabin and re-installing items listed after work is completed , items consists of:

a. Taking out two bunks and two closets then taking down six sections of paneling each panel measures 610mm x 2250mm and quote per panel removed and then bid on removing 8m squared insulation on the bulkhead and bid per one meter square for adjustment purposes.

b. Insulation to be replaced with new marine grade rock wool 50mm thick and aluminum on one side contractor bid on supplying/installing 8m squared and bid per one meter square for adjustment purposes.

c. Carpet in this room or similar type of flooring that can be damage is to be taken up by Contractor and re-install after the work has been completed.

d. 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.

1.15.4 Contractor to bid on stripping out engineer's storeroom and re-installing items listed after work is completed, items consists of:

a. Taking down six sections of paneling each panel measures 610mm x 2250mm and quote per panel removed and then bid on removing 8m squared insulation on the bulkhead and quote on removing per one meter square of insulation for adjustment purposes.

b. Insulation to be replaced with new marine grade rock wool 50mm thick and aluminum on one side contractor bid on supplying/installing 8m squared and bid per one meter square for adjustment purposes.

c. Contractor take out all stores, shelving and document them and store them in a safe heated dry area until work is completed and then re- installed them.

d. 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.

1.15.5 Contractor to bid on removing and re-install anchor chain from stbd chain locker to allow repairs to be carried out for shell plate replacement.

1.15.6 Estimated plating: Qty: 1 x 8250 mm x 3500 mm x 8.5mm, Lloyd's Grade 'E'.

## 1.16 Item 7– Shell Plate

1.16.1 The Contractor must replace the 8.5 mm plating as indicated on drawing 2014-VLE, Cowley Shell Expansion–VLE Renewals. The area is located forward of frame 91, and from the upper deck to foc'sle deck. Portside.

1.16.2 The area affected by these repairs includes the structure in way of the chain locker and forepeak stores.

1.16.3 Contractor to bid on removing and re-installing anchor chain from port chain locker to allow repairs to be carried out for shell plate replacement.

1.16.4 Contractor to bid on removal and storing all items in forepeak stores this will include but not limited to rope

a. In forepeak stores contractor to remove any components in this compartment and store it in a safe area protected from the environment.

b. Contractor to also bid on removing and re-installing insulation and stainless steel perforated sheet metal that retains this insulation. The insulation to be replaced with new marine grade rock wool 50mm thick and aluminum on one side contractor bid on supplying/installing 28m squared and bid per one meter square for adjustment purposes.

c. Contractor is to re-use the existing stainless steel perforated sheet metal.

1.16.5 Estimated plating: Qty: 1 x 7250 mm x 3500 mm x 8.5mm, Lloyd's Grade 'E'

## 1.17 Item 8– Web Frame

1.17.1 The Contractor must replace the Web frame located at frame 64 in the flume tank. Stbdside.

1.17.2 The area affected by these repairs includes the structure in way of the frame and its associated hull plating.

1.17.3 Contractor to empty and gas free Flume tank prior to starting any repairs to shell plating. Note the Flume tank can be dumped to number 1 port and stbd fuel oil tanks. This specification must be carried out in conjunction with H-09 Fuel Oil Piping/Valves Replacement in this specification Flume tank piping is being replaced.

1.17.4 Estimated plating: Qty: 1 x 2500 mm x 500 mm x 12.5mm, Lloyd's Grade 'E'.

Qty: 1 x 2500 mm x 100 mm x 12.5mm, Lloyd's Grade 'E'.

## 1.18 Tank Repairs and Testing

1.18.1 Prior to conducting any cutting or welding on tanks, the tanks affected must be certified gas free and safe for welding.

1.18.2 All sounding pipes and plugs must be replaced and commissioned. Striker plates must be inspected, any deficiencies reported to the Lloyd's Class surveyor and Chief Engineer in an observation report. Any striker plate replacements are to be covered by the Additional Work procedures.

1.18.3 On completion of repairs to structure and plate on tanks, the Contractor must conduct hydrostatic tests to the satisfaction of Lloyd's Class surveyor and Chief Engineer. The

Contractor is to contact the Lloyd's Class surveyor and Chief Engineer to witness all tank testing.

**1.19 Coatings**

1.19.1 The Contractor must coordinate this specification with HD-06 Underwater Hull Painting coating specification and HD-13 Water Ballast Tank coating specification.

1.19.2

**2.0 Proof of Performance**

**2.1 Inspection points**

2.1.1 The Contractor must contact the Lloyd's Class surveyor and Chief Engineer to witness all tank testing.

**2.2 Testing/Trials**

2.2.1 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.

2.2.2 The Contractor must conduct testing on tanks affected by repair work in conjunction with the Tank Survey specification. The Contractor must contact Lloyd's Class Surveyor and Chief Engineer to witness testing for the purpose of receiving a survey credit as part of the Vessel's Continuous Periodic Inspection Program.

**2.3 Certification**

2.3.1 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.

2.3.2 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.

2.3.3 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 section **1.5 General notes regarding steel renewal work.**

2.3.4 All hot work carried out as per provincial regulations all hot work permits supply.

2.3.5 Enclosed spaces have to have the confined spaces permit copies approved by a certified chemist or qualify person.

2.3.6 The Contractor must provide copies of the NDT technician's or company's certification in reference to ISO 9712:2005 International Standards for NDT.

## 2.4 Documentation

2.4.1 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.

2.4.2 The Contractor must provide copies of all approved welding procedures in accordance with the Documentation section of the General Notes.

2.4.3 Drawing indicating location of all plate used with its corresponding mill certificate number in accordance with the Drawings section of the General Notes.

2.4.4 Contractor to supply three written and one electronic copy of all work completed in this specification also to include all certification for welders, mil certificates for all material and the location they were used, NDT Technicians and any other certifications mention in this specification.

## 2.5 Training – Not Used

| Spec item #: HD-011 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) HD - 11 : Valves Suction and Discharge** | | |

**Part 1: SCOPE:**

**1.1** The intent of this specification is to carry out an inspection and overhaul of all sea connections as tabled below for Lloyd's 5 year Survey.

**1.2** Contractor shall be responsible for scheduling and contacting the inspectors.

**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 remove all valves as per tables listed below and dismantle them for inspection by Chief Engineer and Lloyd's attending surveyors. All valves to be tagged by the contractor so they will be re-installed in their respective location after overhaul. Valve components to be cleaned up and valves to be hand lapped to their seats. New gaskets and gland packing to be used on assembly. Valves to be proven operational after re-installation, Chief Engineer or his Delegate to witness.

**.2** In addition to the work outlined in this specification, the Contractor shall pressure test S/S #2 recirculation valve (CW 9) in the attendance of a Lloyd's Surveyor. The valve shall be tested to 150 psi.

**.3** Contractor shall re-install all valves. Valves are to be left in the closed position after installation. During undocking of the vessel all valves shall be checked for leaks as the vessel is entering the water.

**.4** All work to be to the satisfaction of Lloyd's Surveyor's, and Chief Engineer.

| ENGINE ROOM SEABAY VALVES | | | | |
|---|---|---|---|---|
| I.D No | DESCRIPTION | LOCATION | SIZE | TYPE |
| B18 | SEA STRAINER SUCTION FROM SEA CHEST | PORT E/R | 250 mm | B-FLY |
| B21 | SEA STRAINER SUCTION FROM SEA CHEST | STBD. E/R | 250 mm | B-FLY |
| B19 | SEA STRAINER DISCHARGE INTO SEABAY | PORT E/R | 250 mm | B-FLY |
| B20 | SEA STRAINER DISCHARGE INTO SEABAY | STBD. E/R | 250 mm | B-FLY |
| V49 | SEA CHEST VENT STBD. | DRY STORES | 50 mm | N-R GLOBE |
| V50 | SEA CHEST VENT PORT | CREWS LOUNGE | 50 mm | N-R GLOBE |
| CW14 | PORT M/E SUCTION | PORT E/R | 150 mm | B-FLY |
| CW16 | STBD. M/E SUCTION | STBD. E/R | 150 mm | B-FLY |
| CW15 | REFRIGERATION COOLING | STBD. E/R | 38 mm | GATE |

| | | | | |
|---|---|---|---|---|
| B16 | GEN. SERVICE PUMP | PORT E/R | 100 mm | GATE SDNR |
| B17 | FIRE PUMP | PORT E/R | 100 mm | GATE SDNR |
| B36 | BILGE PUMP | STBD. E/R | 50 mm | B-FLY |
| CW13 | AIR COMPRESSOR SUCTION | PORT E/R | 38 mm | GATE |
| CW18 | S/S #1 SUCTION | STBD. E/R | 65 mm | B-FLY |
| CW17 | S/S #2 SUCTION | PORT E/R | 65 mm | B-FLY |
| CW11 | #3 S/S SEABAY SUCTION | STBD. E/R | 65 mm | B-FLY |
| DW40 | R.O. SEABAY SUCTION | PORT E/R | 38mm | GLOBE |

| FWD MACHINERY SPACE SEACHEST VALVES | | | | |
|---|---|---|---|---|
| I.D No | DESCRIPTION | LOCATION | SIZE | TYPE |
| DW31 | R.O. R/W SUCTION | FWD. M/S | 50 mm | S-L GLOBE |
| B450 | EMERG FIRE P/P SUCTION | FWD. M/S | 100 mm | S-L GLOBE |
| N.T. | SEA CHEST VENT | | 50 mm | GLOBE |

| DE-ICING VALVES |
|---|

| I.D No | DESCRIPTION | LOCATION | SIZE | TYPE |
|---|---|---|---|---|
| CA 33 | COMPRESSED AIR TO O/BOARD (M/E, #2 SS Gen., Air Comps.) | PORT E/R (FWD) | 19 mm | N-R GLOBE |
| CA 34 | COMPRESSED AIR TO O/BOARD (OWS, Refrig., Eductor, Bilge Pump) | STBD E/R (AFT) | 19 mm | N-R GLOBE |
| CA 35 | COMPRESSED AIR TO O/BOARD (M/E, #1 & #3 SS Gens.) | STBD E/R (FWD) | 19 mm | N-R GLOBE |
| CA 36 | COMPRESSED AIR TO O/BOARD (Fire & G.S. Pumps) | PORT E/R (AFT) | 19 mm | N-R GLOBE |
| CA 37 | COMPRESSED AIR TO FWD SEA CHEST | FWD. MACH SPACE | 19 mm | N-R GLOBE |
| CA 38 | COMPRESSED AIR TO SEA CHEST | FWD STBD. E/R | 19 mm | N-R GLOBE |
| CA 39 | COMPRESSED AIR TO SEA CHEST | FWD PORT E/R | 19 mm | N-R GLOBE |
| CA 52 | SEWAGE O/BOARD | HARBOUR GEN RM | 19 mm | N-R GLOBE |

| OVERBOARD DISCHARGES; EACH IS FITTED WITH A ¾“ DE-ICING VALVE | | | | |
|---|---|---|---|---|
| I.D No | DESCRIPTION | LOCATION | SIZE | TYPE |
| DW39 | R.O. OVERBOARD | FWD. M/S | | |
| CW7/80/B | M/E, S/S OVERBOARD DOUBLE FLAPPER | PORT E/R | 150mm | DOUBLE FLAPPER |
| CW1/2 | M/E, S/S OVERBOARD DOUBLE FLAPPER | STBD. E/R | 150mm | DOUBLE FLAPPER |
| B66 | FIRE/GEN SERVICE P/P’S | PORT E/R | 125mm | DOUBLE FLAPPER |

| | | | | |
|---|---|---|---|---|
| B40 | BILGE PUMP | STBD. E/R | 125mm | DOUBLE FLAPPER |
| SS4 | SEWAGE O/B | HAR/GEN RM | 50mm | FLAPPER |
| SS8 | GREY WATER O/B | PURFIER RM | 25mm | N-R GLOBE |

| RECIRC VALVES | | | | |
|---|---|---|---|---|
| I.D No | DESCRIPTION | LOCATION | SIZE | TYPE |
| CW 10 | PORT M/E RECIRC TO SEA CHEST | PORT E/R | 125 mm | GATE |
| CW 5 | STBD M/E RECIRC TO SEA CHEST | STBD. E/R | 125 mm | S-L GATE |
| CW 9 | S/S #2 RECIRC TO SEA CHEST | PORT E/R | 65 mm | GATE |
| CW 4 | S/S #1 & #3 RECIRC TO SEA CHEST | STBD. E/R | 100 mm | S-L GLOBE |

| PORT & STBD SEA CHEST VENT LINE VALVES | | | | |
|---|---|---|---|---|
| I.D No | DESCRIPTION | LOCATION | SIZE | TYPE |
| | PORT SEA CHEST VENT VALVE | CREWS LOUNGE | 50 MM | GATE |
| | STBD SEA CHEST VENT VALVE | DRYSTORES | 50 MM | GATE |

**3.2 Location**

**a.** Stated above.

**3.3 Interferences**

**3.3.1** N/A

## Part 4: PROOF OF PERFORMANCE:

### 4.1 Inspection

To be carried out by Lloyd's Surveyor, Chief Engineer

### 4.2 Testing

S/S #2 Recirculation valve shall be pressure tested to 150 psi and witness by Lloyd's Surveyor.

### 4.3 Certification

N/A

## 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

| Spec item #: HD-12 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) HD-12 : Sterntube Oil Change** | | |

**Part 1: SCOPE:**

**1.1** The intent of this spec is to renew the oil in the stern tube lubricating system including piping and header tank located port side midship's foc'sle deck.

**1.2** This work shall be carried out in Conjunction with HD-7.

**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 1600 litres of oil type Hydrex AW 68. Contractor to 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 contact the Chief Engineer prior to starting the work in this specification.

**.2** Contractor shall drain the entire lubricating system and dispose of used oil as per provincial environmental regulations.

**.3** Contractor shall remove inspection cover from the header tank and clean the tank internals with lint free rags.

**.4** Contractor shall close up the header tank after cleaning with a new gasket on the inspection cover. Before putting inspection cover on it must be inspected by Chief Engineer.

**.5** Contractor shall flush the system with new oil until all traces of water and dirt are removed.

**.6** Contractor shall fill the system with new oil through a new 10 micron filter by means of a portable filter cart.

**.7** Contractor shall purge all air from system after filling with new oil.

**.8** Contractor shall replace the stern tube filter. Filter shall be vessel supply.

**.9** Contractor shall have the Senior Engineer run up system and check for leaks.

**.10** All work in this spec shall be inspected by 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

All work to be inspected by 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 three hard copies of the reports to Chief Engineer.

### 5.2 Spares

**N/A**

### 5.3 Training

**N/A**

### 5.4 Manuals N/A

| Spec item #: HD-13 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|
| **HD - 13 : Ballast Tanks** | | |

**Part 1: SCOPE:**

**1.1** The intent of this specification item is to describe the work required for the contractor to open up the two listed water ballast tanks for removal of existing coatings (Intershield ENA 300 and coal tar) 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.

**1.2** 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:**

**2.1 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 30% For Floors / Framing |
|---|---|---|---|---|
| No. 2 Water Ballast port | Fr. 66-71 | 58.7 | 142 | 185 |
| No. 2 Water Ballast stbd | Fr. 66-71 | 58.7 | 142 | 185 |

**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** The tanks 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 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** All of the above listed tanks 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) 370 square meters (total area of the above tanks) 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 (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.

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

**3.2** Description

Work Included

**3.2.1** 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.

**3.2.2** 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.

**3.3** 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.

**3.3.1** Paint Manufacturer's Technical Bulletins:
(a) Product Data and Safety Data Sheets.
(b) Repair procedures for correcting damage to coated surfaces.

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

## 3.4 Quality Assurance

**3.4.1** 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 submitt names and work experience of skilled painters to the Chief Engineer for review prior to commencement of coating system application.

**3.4.2** 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.

**3.4.3** 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 voltate detector (Sponge Test) as specified by the Chief Engineer.

(e) Adhesion tests as specified by the Chief Engineer.

(f) Coating Batch Numbers.

## 3.5 Product Delivery, Storage, and Handling

### 3.5.1 Delivery

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.

### 3.5.2 Storage

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 7ºC to 30ºC. Store temperature sensitive products above minimum temperature as recommended by manuafcturer. 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.**

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.

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

### 3.5.3 Handling

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

**3.5.4 Protection**

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.

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.

## 4.0 PRODUCTS

### 4.1 Materials

**4.1.1** General

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

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

**4.1.1.3** The use of accelerators will not be permitted.

**4.1.2** Compatibility

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

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

## 4.2 Application Equipment

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

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

## 4.3 Protective Coating systems

**4.3.1** 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.**

## 4.4 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.

**4.4.3** 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.

## 4.5 Mixing

**4.5.1** Painting materials shall be mixed and prepared in strict accordance with the manufacturer's recommendation.

**4.5.2** Materials shall be stirred prior to and during application to produce a uniform mixture.

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

# 5.0 EXECUTION

## 5.1 Surface Preparation

### 5.1.1 Ballast Tanks

**5.1.1.1** 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.

**5.1.2** 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.**

**5.1.3** 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.**

**5.1.4** 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.

**5.1.5** The acceptable chloride ion level shall be less than 2ppm. Coating shall not be applied until this level is achieved.

**5.1.6** Weld joints which do not have a smooth ripple finish, shall be ground to a rounded contour.

## 5.2 Other Surface Preparations

**5.2.1** 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 suring 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.

**5.2.2** 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.

**5.2.2.1** 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.

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

**5.2.3** 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.

**5.2.4** 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.

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

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

**5.2.7** 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.

**5.2.8** 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 abbrasive blast.

**5.2.9** 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.

**5.2.10** 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.**

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

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

**5.2.13** 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.

## 5.3 Chloride ion Testing

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

**5.3.2** **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).

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

**5.3.4** NACE Inspector shall witness and record these tests.

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

## 5.4 WORKMANSHIP

### 5.4.1 General

**5.4.1.1** 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.

### 5.4.2 Inspection

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

### 5.4.3 Application

**5.4.3.1** 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.

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

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

**5.4.3.4** 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.

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

**5.4.3.6** 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.

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

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

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

**5.4.3.10** 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.

**5.4.3.11** 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.

**5.4.3.12** **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.**

**5.4.3.13** 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.

## 5.5 INSPECTION

**5.5.1** 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.

**5.5.2** 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.

**5.5.3** 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.

**5.5.4** 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.

## 6.0 ENVIRONMENTAL AND SAFETY REQUIREMENTS

### 6.1 General

**6.1.1** 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.

### 6.2 Final Clean-Up

**6.2.1** 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.

**6.2.2** 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.

6.2.3 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.

6.2.4 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.

6.2.5 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.

6.2.6 Contractor shall fill all the tanks with fresh water and perform a hydrostatic test on the tanks.

6.2.7 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.

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

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

**6.3Location**

**6.4Interferences**

N/A

**Part 7: PROOF OF PERFORMANCE:**

**5.1 Inspection**

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

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.

5.2 **Testing**

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

5.2.2 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.

**7.3 Certification**

**Part 8: DELIVERABLES:**

**8.1Drawings/Reports**

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

**8.2Spares**

**N/A**

**8.3Training**

**N/A**

**8.4Manuals N/A**

| Spec item : HD-14 | **SPECIFICATION** | |
|---|---|---|
| **HD - 14 : #3 Water Ballast Tank Change To F.O. Tank** | | |

## Part 1: SCOPE:

**1.1** This specification describes the technical scope of work to be completed by a ship repair facility (Contractor), with respect to converting an existing double bottom water ballast tank to a fuel oil tank on the vessel Leonard J. Cowley.

**1.2** The overall execution of this work outlines the delineation of responsibility, such that while the Contractor may understand the broad objectives of the system, they are also equipped with a baseline scope of work.

**1.3** This specification shall be considered in conjunction with the associated drawings as listed in Section 3 of this document. The outline specification and drawings are intended to be complementary; should any technical or other requirement(s) relating to new and/or relocated equipment be indicated in either but not all of these documents, such requirement(s) shall be considered as part of the Contractor's scope of work.

**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:

### 2.1Guidance Drawings/Nameplate Data

**2.1.1** Fuel Oil Piping 590-42-01

**2.1.2** Capacity Plan 590-79 (Rev. E)

**2.1.2** Bilge, Ballast, and Fire Piping in E.R. 590-44-01 (Rev. A)

### 2.2 Standards

**2.2.1**

**2.3 Regulations**

**2.3.1**

**2.4 Owner Furnished Equipment**

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

**Part 3: TECHNICAL DESCRIPTION:**

**General**

The scope of work as listed below is intended to be a broad overview and proposed sequence of project tasks under the responsibility of the Contractor. While every effort has been made to capture the scope of impact on existing vessel arrangements, it is the Contractors responsibility to carry-out their own familiarization of the vessel with respect to work to be completed.

In the course of planning or execution of the work, the Contractor is welcome to make suggestions for means of accelerating the completion of the work, provided that such means are acceptable to Canadian Coast Guard (CCG) and Lloyd's Register (LR) Surveyor. The primary tasks to be completed by the Contractor are outlined as in the following sections.

**3.1** Contractor shall notify the Chief Engineer prior to starting any work. The tank must be properly lockout & tagout is carried out.

**3.2** 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.

**3.3** The tank shall be pumped down to their lowest levels by the ship’s crew leaving approximately 2 cubic meters total residue to be disposed of by the contractor in accordance with environmental regulations. Contractor shall quote unit cost per m3

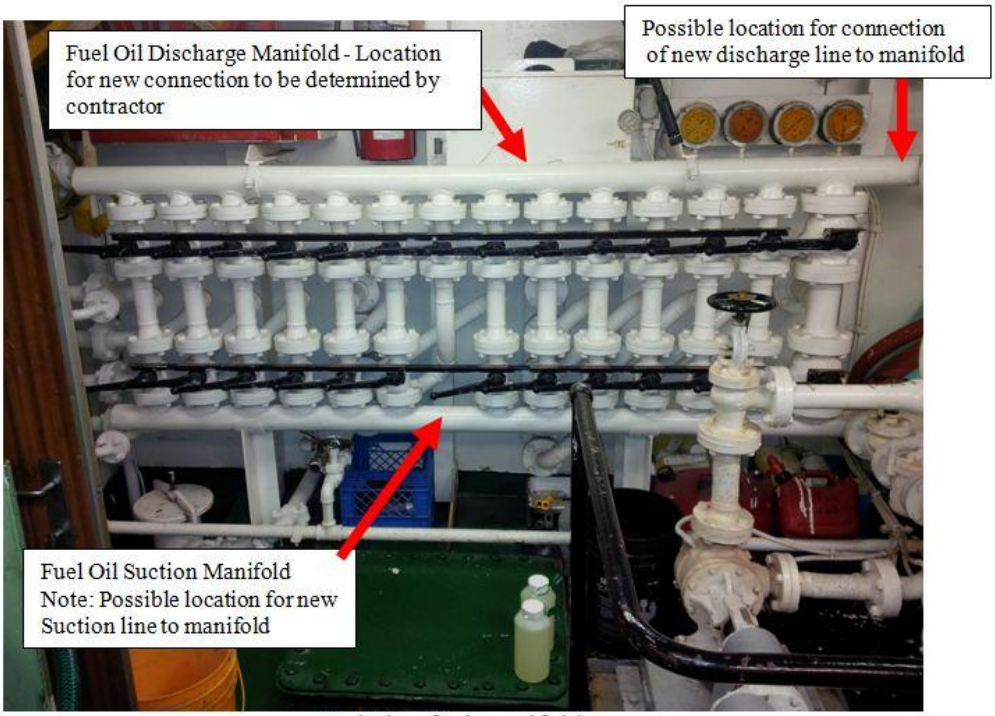
for adjustment up or down by 1379 action. The contractor shall remove all manhole covers, as detailed on Drawing #590-54 for Manhole and level transmitter locations.

**3.4** Contractor to ensure tank and piping is properly drained, cleaned and certified for hot work prior to the commencement of work and for the duration of the work scope. 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. Contractor shall post a copy of all certificates at the entrance to the affected spaces; Protective material shall be used to prevent the spread of sparks, protecting electrical cables and other services; 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.

**3.5** Contractor to disconnect and permanently blank the existing fill/suction ballast pipe for the #3 double bottom water ballast tank at the 'T' located in the engine room, port side, above the tank top. Valve currently located at this location.

**3.6** Contractor to remove existing short length (approx. 4m) of fill/suction piping (75 mm) from the 'T' down into the bottom of the tank. Crop existing tank top plate in way of penetration and insert new plate complete with penetrations for new fuel oil piping. Plate insert to be minimum 12"x12" having thickness equal to or greater than existing with minimum 4" radius corners as required. Contractor is to give consideration to and where possible utilize existing seams.

**3.7** Contractor to fit new fuel discharge/suction line complete with appropriate LR approved (or as otherwise agreed) valves (50mm diameter sch. 40 black seamless pipe, approx. 20m length) at the identical location of the tank and routed aft in the engine room, and ultimately connect to the existing discharge and suction manifolds in the fuel oil purifier room having proper connection and fitting for penetration through the water tight bulkhead at frame 28. Bulkhead penetrations are to be LR approved. Note: Contractor is to give consideration as to where on the discharge and supply manifolds the new lines are to be connected. Picture attached illustrates <u>suggested</u> locations only.




Existing fuel manifolds.

**3.8** Contractor upon completion of all pipe work shall clean/flush all new and disturbed piping. Inner Pipe diameters must be clean and free of slag.

**3.9** Contractor to bid on cutting 2 access holes, one forward and one aft in the tank having approximate dimension of 1m long (fwd - aft) x 1.5m wide (transversely) or as necessary to allow for personnel access as well as equipment/exhaust fans etc. Contractor to utilize existing seams/butts as practical when choosing location for access hole(s) and where no butts/seams are present in the vicinity of new steel, corners to have a minimum of 100mm radius. Contractor to adhere to common shipbuilding practices in accordance with IACS 47 with respect to minimum offset of various types of welds/structure. All proposed bottom shell plate cut seams/butts are to be reviewed on site by the attending Lloyd's Surveyor prior to cutting.

**3.10** Contractor to quote per one access complete (cut out and inserted access hole a minimum of 1m by 1.5m as per Lloyd's specifications) for number three ballast tank for adjustment purposes by PWGSC 1379 action."

**3.11** The purpose of the cutting out access holes to allow Contractor access to the tank to properly cleaned down to bare metal in preparation for painting.

**3.12** Contractor prior to any grit blasting must water wash at 17240Kpa the entire tank to remove the salt water and residue from the tank.

**3.13** Contractor to quote on grit blasting 100% of tank which equals 205 $m^2$ of tank surface area to a 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 m2 for adjustment by PWGSC 1379 action.

**3.14** Contractor to grit blast 100% of tank to SSPC SP-10/NACE 2 Near White Abrasive Blast clean with an angular Surface Profile of 50-75 microns (2-3 mils).

**3.15** Contractor to clean up all debris from welding, grit blasting and dispose of it as per provincial regulations.

**3.16** Contractor prior to applying coating to the tank, the inside edge of the access hole must tape for a width of 127mm. After painting is finished and cured the tape is removed so that inserts can be welded in. (The reason for the tape is so that when the inserts are welded in they won't be contamination with paint).

**3.17** Contractor to weld in all access holes inserts. After inserts have been welded in. The area around the welds are to be cleaned up and inspected and passed by Lloyd's prior to coating being applied. Coatings are applied by brush 2 to 3 coats to get a total dft of 10-12.

**3.18** Contractor to quote on applying 2 coats Intershield ENA 300 @ 5-6 DFT per coat or equivalent product that is suitable for fuel oil tanks.to entire tank (205 $m^2$ surface area) and quote per m2 for adjustment purposes by PWGSC 1379 action.

**3.19** Contractor to apply the Intershield ENA 300 or equivalent product as per manufacture application guide lines. Steel and air temperature as well as humidity to be tested and proven within optimum application guide lines to the Chief Engineer or his representative before coatings are applied.

**3.20** Prior to coatings apply all welds to be 100% visual inspected by LR Surveyor and Chief Engineer. Welds to be10% MPI tested by approved personnel.

**3.21** Contractor shall test all new and disturbed piping to 517kpa. Testing to be witness by Chief Engineer and LR Surveyor.

**3.22** Contractor after all painting is cured is to pressure tank as per Lloyd's 5 year Survey. Test to be witness by Lloyd's Surveyor and Chief Engineer.

**3.23** Contractor shall supply all necessary materials, fittings, blanks and labor for respective tests.

**3.24** Contractor to clean up all debris and depose of it as per provincial regulations.

**Location**

**3.2.1.** Engine room (Fr. 28-42) and F.O. purifier room (Fr. 21-28)

**Interferences**

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**

**4.1.7.** All work to be completed to satisfaction of the Chief Engineer.
**4.1.8.** Visual inspection of all welding 100%.
**4.1.9.** Welds 10% MPI testing completed by approved testing personnel.
**4.1.10.** The contractor is responsible for all air quality testing to ensure hot work and entry is permitted.
**4.1.11.** The contractor shall issue and post hot work permits and shall maintain a fire sentry.
**4.1.12.** Area where work was carried out to be inspected to ensure all debris has been removed.

**4.2 Testing**

**vi.** Hydrostatic test to be carried out to 1.5 time's normal working pressure to be witness by LR Surveyor and Chief Engineer.
**vii.** Welding 100% visual by LR and Chief Engineer.
**viii.** Welds to 10% MPI by a Certify Technician
**ix.** Areas where Hot work is to be carried out is to be certified by a Chemist or a qualified person to be determined by Chief Engineer.

**Certification**

Welders must be CWB Certify
Chemist must be certify
Technicians for NDT testing must be Certify

**Part 5: DELIVERABLES:**

**5.1 Drawings/Reports**

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.

**5.2** Contractor supply Chief Engineer three hard copies and one electronic copy of a report of all work carried out.

**5.3 Spares**
**N/A**

**5.4 Training**
**N/A**

**5.5 Manuals N/A**

| Spec item #: HD-15 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) HD – 15 : 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

| Spec item #: HD-16 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) HD - 16 : 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**

**2.3 Regulations**

**2.3.1** Entry into confined spaces shall be carried out in accordance with the instructions given in the Preamble of this specification.

**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** 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.

**.2** Upon completion of all work in this specification the Contractor shall remove all blanks / by-passes that were fitted to isolate the tank.

**.3** 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.

**.4** 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.

**.5** 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.

**.6** 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.

**.7** Contractor shall clean all internal surfaces of the tank.

**.8** The Contractor shall bid on supplying and coating 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). Strip coat all welds, stiffeners with Intershield ENA 300 bronze. Damaged areas to be 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 Contractor shall bid on 4.65 square meters. Coating applied to the tanks internal surfaces shall follow the recommended procedure as set out in the paints manufacture's literature.

Note ** Either bronze or aluminum, can be used as the first or second coat depending on whether a lighter or darker coat is required as the finish coat.

**.9** The tanks shall be inspected by the Chief Engineer or his delegate Engineer.

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

**.11** Sounding pipe shall be proven clear.

**.12** All float and level switches shall be cleaned.

**.13** Once dry the tank internals shall be painted with International Intergard FP Series Intergard 264 at 10 mils. The equipment used to apply the coating is to meet the specifications of the manufactures Product Data Sheet.

**.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.

## 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

| Spec item #: HD-17 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**HD - 17 : Port Miranda Davit Installation**

**Part: 1 SCOPE:**

1.1 The intent of this specification shall be to facilitate installation of a new Miranda davit launching system on the Port side of the Upper Deck.

1.2 A new 7.23 M Loa rigid hulled inflatable type work boat shall be fitted on the port side of the Upper Deck of the vessel approximately between frames 25 and 36. The boat shall be a Hurricane Zodiac 749, handled by a Schat Harding 'Miranda' 3900 davit system. The boat, davit, hydraulic power pack and all associated controls shall be supplied by the Owner. Contractor to bid on allowance of $10,000.00 for Harding Safety Canada FSR to be adjusted on proof of invoice by PWGSC 1379 action.

1.3 This work shall be carried out in conjunction with the following refit spec items: HD-18 Stbd Miranda Davit Installation, L-09 P&S Miranda Davit, H-19 Galley Flooring Replacement and H-18 Galley Equipment Replacement.

**2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

The following plans are to be used as guidance in performing the work:

1. BA Dwg No. 102-05-01 General Arrangement – Sheet 1
2. BA Dwg No. 102-05-02 General Arrangement – Sheet 2
3. BA Dwg No. 102-05-03 Construction Details – Sheet 1
4. BA Dwg No. 102-05-04 Construction Details – Sheet 2 Decks
5. Schat - Dwg # D 408261 General Arrangement of "Miranda" Davit Type MRT/3900 with BHY 5300 Winch
6. Miranda davit (MRT 3900) Installation diagram (Harding) Drawing # UK35267.
7. General arrangement MRT 3900 CCGS Cowley-21406- (Port side) Harding drawing # UK35264
8. Pictorial pipe Arrangement & fitting List- Davit Drawing number UK35159.
9. Pictorial Pipe arrangement & Fitting List- winch Drawing # UK35160.
10. Pictorial Arrangement & Fitting list – panel to pumps drawing # UK35162.
11. Schematic of 460V Electrical Wiring and Location of Electrical items on Miranda Davit Type MRT3900 (Harding) Drawing # UK29434.
12. Detail & Position of inboard supports Drawing # 35082.

13. Hydraulic Schematic Circuit diagram Drawing # UK20203.

2.2 **Standards**

2.2.1 The Contractor is to be currently certified by the Canadian Welding Bureau in accordance with the CSA Standard W47.1-1983 "Certification of Companies for Fusion Welding of Steel Structures," Division 1, 2.1 or 2.2. All personnel performing welding shall be approved by the Canadian Welding Bureau. All welding shall be conducted in accordance with TP 615 1, CCG Standard for Welding of Ferrous Metals.

2.2.2 All work on hydraulic systems shall be performed by a certified hydraulic mechanic. Proof of certification to be supplied to PW/GSC and C.C.G. representatives prior to the commencing of work.

2.2.3 In the event of any contradiction or difference in the requirements of these documents, the following order of precedence shall apply:

1. Contract Document
2. Specification
3. Contract Plans

In the event of any contradictions within any one of these documents, the contradictions shall be resolved to the Owner's satisfaction.

Equipment or specifications appearing in either this Specification or the contract plans are to be considered as if they appear in both.

**2.3 Regulations**

2.3.1 All the work described in this specification shall be completed to the satisfaction of Lloyds Register, the Technical Authority and must meet all Lloyd's regulations and requirements for the intended service after the modifications are complete. All approvals, certifications and surveys by Lloyd's in connection with the modifications shall be obtained by Owner.

## 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.

# 3 TECHNICAL DESCRIPTION

## 3.1 General

**3.1.1** Contractor prior to starting any work must contact Chief Engineer.

**3.1.2** Contractor shall remove the existing FRC and put it on owner supplied trailer, the FRC shall be stored until ready for installation fitting testing after the install of the new davits.

**3.1.3** Contractor shall remove the existing single point davit, gearbox system, located on the Port side of the boat deck, including all associated fittings and equipment, cabling and piping and dispose as per Provincial regulations.

**3.1.4** Contractor shall be removed all associated machinery seats and above deck stiffening. Existing underdeck stiffening and insert plated shall remain in place.

**3.1.5** Contractor shall ground steelwork flush and painted as per painting spec two coats primer and two coats finish which has been burned or affected by removal of equipment.

**3.2**

3.2.1 The contractor shall be responsible for:

1. Removal of existing boat davits and components to facilitate fitting of the new davit
2. Fitting of deck and underdeck stiffening, and insert plates in way of the Davit seats.
3. Fabrication and installation of an access ladder and platform at approx. Fr. 33

4. Fabrication and fitting of sidelight fairings in way of FRC launching path.

5. Fabrication and installation of seats and associated stiffening for the hydraulic power pack and controls

6. Installation and rigging of the davit and auxiliary equipment

7. Relocation of existing rails and stanchions.

8. Installation of new rails, stanchions and chains as required.

9. Supply and installation of the required electrical components and cabling. Install owner supplied hydraulic piping, hoses and fittings as required for the proper and safe operation of the system to the satisfaction of Lloyd's, CCG and Harding Canada representatives.

10. Testing of system to Owners and Lloyd's requirements.

The Contractor is to use fully qualified and competent tradesmen and supervision, and is to ensure a uniform high level of workmanship consistent with generally accepted shipbuilding standards.

## 4 STRUCTURAL MODIFICATIONS

### 4.1 Stiffening in Way of New Davits

1. New deck and underdeck stiffening to suit the davit system installation shall be fitted in accordance with Barclay Drawing Number 102-05-03, CCGS "Leonard J. Cowley" Construction Details. The Contractor shall check all dimensions on installation drawings prior to fabrication. Changes to the details indicated on the drawing shall not be made without prior consent of Harding or Barclay.

2.

New 125mm x 65 x 8.5 L headers shall be fitted under the davit feet as indicated on the drawing 205-05-03. The new headers shall extend from fr. 27 to fr. 33, and 400 mm from the side shell. New Boat Deck Brackets shall be fitted under davit feet as indicated on drawing 102-05-03. New brackets shall be constructed of 10 mm plate with 50mm flange.

3. New 12mm insert plates shall be fitted under the davit feet, approx. from 145 mm fwd. of frame 27 to 96 mm fwd. of frame 29 for the aft davit footing and approx. 96 mm aft of frame 31 to 96 mm aft of frame 33 for the forward footing. The insert plate shall start directly inboard of the shell plate and extend 500 mm inboard; the inboard edge of the plate shall extend beyond the new 125 mm X 65 X 8.5 L header by a minimum of 50 mm. The corners shall have a minimum radius of 50mm. The Contractor shall ensure proper edge preparation and weld lay-up, to avoid distortion of the existing deck plating and/or built- in stress.

4. Contractor is to supply and installed an access ladder and boarding platform, as detailed on BA drawing 102-05-04. The ladder is to be finally fitted at ship to suit FRC in stowed position.

5. The Contractor shall insure that the davit feet align with new and existing structure. New headers and brackets shall be fitted after the davit has been installed, properly aligned, and tack welded in place, to ensure a correct alignment.

6. The Contractor shall install the new davit inboard support struts located 100 mm fwd of frame 28 for the aft inboard strut and 100 mm aft of frame 23 for the forward strut, as indicated on BA drawings 102-05-03 and 102-05-04. The Contractor shall allow for trimming of the davit arm support struts to suit the camber and sheer of the ship.

7. All materials and equipment used in the modification of the vessel shall be new and free of defects and suitable for the intended purpose. All new steel to be Lloyds grade A or equivalent. All material dimensions are given in millimeters. They can be replaced with equivalent imperial sizes.

8. Deckhead and bulkhead, insulation, linings, cabling and ducts in the accommodation below the modification area shall be removed to avoid damage. After completion of all hot work all removed items are to be reinstalled to ‘as

delivered' condition. Items damaged during removal to be repaired and/or replaced with new, to the full satisfaction of the Owner at the Contractor's expense.

4.2 Electric / Hydraulic Pump Seats

New structural support seats shall be fabricated and installed for the new hydraulic power pack unit in accordance with BA drawing 102-05-03. The seat shall be fabricated from 150mm x 90 x 12.5 O.A. and scribed to suit the camber and sheer of the deck and installed such that the hydraulic power pack unit is parallel with and perpendicular to the ship's baseline. The flange of the seat shall be drilled to take the power pack holding down bolts. The position of the bolt holes should be templated off the hydraulic power pack unit itself. The final fore/aft location to be determined at ship to Owner's satisfaction.

4.3 Davit installation

Proper alignment of the davit is critical for the proper operation of the system. The Contractor shall strictly adhere to the manufacturer's instructions at all times. Extra stock shall be allowed on the davit feet to allow for trimming to suit the camber and sheer of the deck. The davit pivots and all foundations shall be parallel to the baseline.

4.4 New Control Stand

A new control stand shall be supplied by the Owner and installed at the ship in a position to suit the requirements of the Owner's representative.

4.5 Changes, Additions and Deletions

Contractor is at liberty to suggest changes, additions or deletions to the work, but such changes are not to be made without the written consent of the Owner.

The Owner shall have the right to order any alterations, additions to, or deletions from the work, and Contractor shall comply provided they are not of a major nature, and the cost, if any, is agreed upon before commencement of the work.

Such changes shall be carried out at no cost to the Owner unless the Contractor can reasonably demonstrate that additional cost is incurred, in which case the cost shall be negotiated with PWGSC/CCG. The Owner will accept delays in delivery which can be proved to have been caused by such changes. In like manner, if a change can reasonably be demonstrated by the Owner to result in a reduction of cost, a credit shall be negotiated.

4.6 Cleanliness

Cleanliness is to be observed at all times and the vessel is to be re-delivered in a clean condition without any clogged scuppers and drains or foreign matter in any system or location as a result of this work.

4.7 Lighting, Staging, etc.

The Contractor shall provide such temporary lighting, staging, power for electric or pneumatic tools, ventilation and heating for confined spaces, and similar facilities as may be required for the efficient and safe accomplishment of the work.

4.8 Safety of Access

During the progress of the work, the Contractor is to maintain in a state of good repair all gangways, walkways, ladders, railings, guard rails, and similar appliances which are necessary to the safety of persons working or on business in the area where work is in progress.

The Contractor shall ensure that a proper fire watch is maintained at all times during and as required after completion of any works per Provincial Regulations

The Contractor shall ensure that the vessel and all welding equipment are properly grounded at all times. The ground shall be located as close as possible to the Davit area.

4.9 Storage and Handling

The Contractor shall be responsible for the safe keeping of any material, equipment, or goods delivered to it by the Owner. This also includes items removed from the vessel during the course of the work, whether or not it is intended that such removed articles are

to be replaced aboard the vessel and if so directed, shall be stored under cover and safe from fire, mechanical damage, theft, or damages from the elements. The Contractor shall be responsible for unloading and loading all materials and equipment from and upon the vessel during the course of the work, and to and from such storage as may be required.

All hydraulic components are to be stored indoors in a clean, dry, environment to avoid condensation and other contaminations. When the components are ready to be installed in the system, shipping and storage blanks are to be removed, and units inspected for cleanliness.

Hydraulic pipes shall be stored under cover in a clean dry environment with caps on both ends. The Caps shall not be removed until the pipes are ready for installation in the system.

4.10 Removals

All materials permanently removed as part of the modification work shall be disposed off as per Provincial Regulations. The Contractor shall treat these materials as described herein under the heading 4.9 Storage and Handling. Loose or attached items or fluids removed for convenience of carrying out the work shall be suitably stored or disposed of at the Contractor's expense and returned onboard unless the Owner makes alternative arrangements to dispose of them.

4.11 Cranage

Cranage and other such equipment requirements shall be supplied by the Contractor at no expense to the Owner.

## 5.0 ELECTRICAL MODIFICATIONS

Refer to Specification L-09 P & S Miranda Davit Electrical

## 6.0 HYDRAULIC INSTALLATION

## 6.1 Hydraulic Materials

Hydraulic installation shall comply with the "Standards for Hydraulics" in Appendix "A", except where specified differently in the following section.

The Contractor shall be responsible for installation of all interconnecting hydraulic piping, hoses and all associated fittings between the power pack, the control console, the davit winch and hydraulic tanks in accordance with Schat Drawings provided.

All fittings to be "Swagelok" 316 stainless steel and tubing material as specified on Harding Drawings. The hydraulic hose to be Parker No-Skive 381 or equivalent with a minimum working pressure of 207bar. The Contractor to install stainless AISI 316 steel rigid pipe for main pipe runs. All joints to be made from flexible hose.

All pipe work shall be site run at ship. The Contractor shall ensure piping is adequately supported and clamped. Piping shall be run so as to avoid unnecessary interference with access ways and to avoid the risk of damage and/or chafing. Where necessary, grating or other suitable means of protection shall be fitted. Final location of all pipe runs shall be to the satisfaction of the Owner.

The Contractor shall supply approximately 320 liters of "Low Therm 22" type hydraulic oil or equivalent. The particular manufacturer or brand shall be determined by the Owner (ship's Chief Engineer).

## 6.2 Hydraulic System Testing and Flushing

The Contractor shall ensure that the pump motors are running in the correct rotation and all davit equipment must be isolated from the hydraulic circuit during hydraulic testing and flushing.

## 6.3 Pressure Test

Prior to flushing, all lines to be subjected to a hydrostatic pressure test as follows:

| | |
|---|---|
| Pressure Line | 30.0 MPa for 15 min. |
| Tank Line | 30.0 MPa for 15 min. |
| Drain Line | 3.5 MPa for 15 min. |

Any line leaking during the test must be repaired and re-tested. This will be indicated by a pressure drop during testing.

6.4 Flushing and Cleanliness

1. After installation and welding, all pipes are to be internally inspected to insure their cleanliness.

2. Upon completion of pressure test, the system shall be flushed section by section prior to connecting to hydraulic components.

3. The flushing unit shall have its own reservoir, and a 15 micron full flow filter with replaceable elements.

4. The system shall be flushed until clean, as determined by a contamination check of the flushing filter, or a test patch.

5. Upon completion of satisfactory flushing, the oil shall be removed from the system, the system connected up, and filled with clean, hydraulic oil, to the specification of that required for correct system operation **Interferences**

**7.0 MISCELLANEOUS**

7.1 Rails and Stanchions

Existing rails and stanchions on boat deck in way of new davit shall be removed. One new access gate c/w safety chains shall be fitted at the inboard side. The Contractor shall supply and install new rails and stanchions, similar to existing ones, to completely enclose the davit/zodiac area to the Owner's satisfaction. Rails and stanchions in way of the new control stand shall be modified and rerun outboard, to give protection to davit operator, to the satisfaction of Owners.

7.2 Sidelight Protection

The contractor shall fabricate and install sidelight fairing pieces in way of launching cradle path. The fairing pieces shall be constructed from 6mm plate and 20mm round bar as shown on BA drawing 102-05-04. Round bars shall have a spacing of 50mm.

## 8.0 PAINTING

8.1 All new and disturbed steelwork shall be coated in accordance with TP 12445, CCG Paint and Coating Standard.

All new plate and shapes shall be abrasive blasted to SA 2.5 Standard and coated with 2 coats of a suitable shop primer prior to fabrication. After fabrication, weld seams shall be wire brush cleaned and stripe coated with two coats of the same primer. Finish coatings shall be as per ship's current paint system.

Any existing paint work damaged by welding and/or burning shall be cleaned to Owner's satisfaction and repainted utilizing a paint system compatible with the ship's existing system.

The davit system is supplied by manufacturer with two primer coats and one finished coat only. Contractor shall apply one additional finish coat per ship's existing scheme.

At all times manufacturer's written instructions pertaining to preparation, coating thickness, method of application, conditions of application, between coat drying

times, etc. shall be strictly adhered to. Defects in paint finish and inadequate finished dry film thicknesses due to failure to properly follow manufacturer's instructions shall be rectified at the Contractor's expense.

## 9.0 RIGGING:

9.1 The fall wires and fittings shall be provided by Owner. The Contractor shall provide labour to rig the fall and boat gripes. The Contractor shall supply three (3) complete sets of boat gripes, each set consisting of 12 mm diameter wire, hooks, turnbuckles, 1/2" shackles and deck lugs. The contractor shall install the boat gripes in accordance with Harding specifications and to the satisfaction of the Owner.

## 10 PROOF OF PERFORMANCE:

10.1 Testing

The davit shall demonstrate, with a load of 3900 kg and using only one power pack, that it achieves an inhaul speed of not less than 90 fpm with each power pack; and not less than 180 fpm with both power packs on line.

The contractor shall perform trials, showing the correct operation of the davit to the satisfaction of the Owner and Lloyds. The contractor shall also test to the satisfaction of the Owner, all equipment, systems, wiring and piping that was affected by the modification.

A launching and retrieval test of Hurricane Zodiac 749 shall be carried out prior to acceptance of the installations. A representative of Harding shall conduct the testing of the boat launching system, however, the Contractor shall provide all necessary labour, weights, etc. as required to complete the tests.

Onboard 1.1 Dynamic lowering test shall be carried with a load determined from the following formula:

Lowering Test Load = Weight of Zodiac + Complement + 10% of Total Load.

Note: The complement + 10% is to be made up with sand bags.

Complement = 2 crew = 2 x 165 Lbs = 330 Lbs

Any defects determined during the course of the above tests and trials shall be corrected by the Contractor prior to acceptance of the completed installation by the Owner.

**11 Inspection:**

Free access to work, both on ship and ashore, is to be given to all authorized representatives during normal working hours and at such other times as may reasonably be requested. The Owner's representative will be authorized to condemn workmanship and materials which are not in accordance with good shipbuilding practice, or which do not comply with the requirements of the Specification and/or Contract

**a. Certification**

N/A

**12 DELIVERABLES:**

**a. Drawings/Reports**

i. Supply three written reports and one electronic report.

**b. Spares**

**N/A**

**c. Training**

**N/A**

**d. Manuals**

**N/A**

| Spec item #: HD-18 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**HD - 18 : Stbd Miranda Davit Installation**

**Part: 1 SCOPE:**

**1.1** The intent of this specification shall be to facilitate installation of a new Miranda davit launching system on the starboard side of the Upper Deck.

**1.2** A new 7.23 M Loa rigid hulled inflatable type work boat shall be fitted on the starboard side of the Upper Deck of the vessel approximately between frames 20 and 32. The boat shall be a Hurricane Zodiac 749, handled by a Schat Harding 'Miranda' 3900 davit system. The boat, davit, hydraulic power pack and all associated controls shall be supplied by the Owner. Contractor to bid on allowance of $10,000.00 for Harding Safety Canada FSR to be adjusted on proof of invoice by PWGSC 1379 action.

**1.3** This work shall be carried out in conjunction with the following refit spec items: HD-17 Port Miranda Davit Installation, H-19 Galley/Cooler room hallway flooring replacement, H-18 Galley Equipment replacement and H-30 Galley Cold Room insulation replacement and H-31 Galley Cold room's refrigeration replacement.

**2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

The following plans are to be used as guidance in performing the work:

14. BA Dwg No. 102-04-01 General Arrangement – Sheet 1
15. BA Dwg No. 102-04-02 General Arrangement – Sheet 2
16. BA Dwg No. 102-04-03 Construction Details – Sheet 1
17. BA Dwg No. 102-04-04 Construction Details – Sheet 2 Decks
18. Schat - Dwg # D 408261 General Arrangement of "Miranda" Davit Type MRT/3900 with BHY 5300 Winch
19. Miranda davit (MRT 3900) Installation diagram (Harding) Drawing # UK35267.
20. General arrangement MRT 3900 CCGS Cowley-21406- (Stbd side) Harding drawing # UK35265
21. Pictorial pipe Arrangement & fitting List- Davit Drawing number UK35159.
22. Pictorial Pipe arrangement & Fitting List- winch Drawing # UK35160.
23. Pictorial Arrangement & Fitting list – panel to pumps drawing # UK35162.
24. Schematic of 460V Electrical Wiring and Location of Electrical items on Miranda Davit Type MRT3900 (Harding) Drawing # UK29434.
25. Detail & Position of inboard supports Drawing # 35082.

26. Hydraulic Schematic Circuit diagram Drawing # UK20203.

## 2.2 Standards

- The Contractor is to be currently certified by the Canadian Welding Bureau in accordance with the CSA Standard W47.1-1983 "Certification of Companies for Fusion Welding of Steel Structures," Division 1, 2.1 or 2.2. All personnel performing welding shall be approved by the Canadian Welding Bureau. All welding shall be conducted in accordance with TP 615 1, CCG Standard for Welding of Ferrous Metals.

- All work on hydraulic systems shall be performed by a certified hydraulic mechanic. Proof of certification to be supplied to PW/GSC and C.C.G. representatives prior to the commencing of work.

2.2.3 In the event of any contradiction or difference in the requirements of these documents, the following order of precedence shall apply:

1. Contract Document
2. Specification
3. Contract Plans

In the event of any contradictions within any one of these documents, the contradictions shall be resolved to the Owner's satisfaction.

Equipment or specifications appearing in either this Specification or the contract plans are to be considered as if they appear in both.

## 3.3 Regulations

3.3.1 All the work described in this specification shall be completed to the satisfaction of Lloyds Register, the Technical Authority and must meet all Lloyd's regulations and requirements for the intended service after the modifications are complete. All approvals, certifications and surveys by Lloyd's Register Canada in connection with the modifications shall be obtained by Owner.

### 3.4 Owner Furnished Equipment

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

## TECHNICAL DESCRIPTION

### 3.3 General

**3.3.1** Contractor prior to starting any work must contact Chief Engineer.

**3.3.2** Contractor shall remove the existing FRC stowage system, located on the Starboard side of the boat deck, including all associated fittings and equipment. Cabling. The system shall be removed with care and without unnecessary damage, in a way that it can be re used or reinstalled on another vessel

**3.3.3** Contractor shall store all removed equipment in a secure location and that there is no possibility for damage.

**3.3.4** Contractor shall be removed all associated machinery seats and above deck stiffening. Existing underdeck stiffening and insert plated shall remain in place.

**3.3.5** Contractor shall ground steelwork flush and painted as per painting spec two coats primer and two coats finish which has been burned or affected by removal of equipment.

**3.1.6** The contractor shall be responsible for:

1. Removal of existing boat davits and components to facilitate fitting of the new davit
2. Fitting of deck and underdeck stiffening, and insert plates in way of the Davit seats.

3. Fabrication and installation of an access ladder and platform at approx. Fr. 29

4. Fabrication and fitting of sidelight fairings in way of FRC launching path.

5. Fabrication and installation of seats and associated stiffening for the hydraulic power pack and controls

6. Installation and rigging of the davit and auxiliary equipment

7. Relocation of existing rails and stanchions.

8. Installation of new rails, stanchions and chains as required.

9. Supply and installation of the required electrical components and cabling. Install owner supplied hydraulic piping, hoses and fittings (reference drawings as required for the proper and safe operation of the system to the satisfaction of Lloyd's, CCG and Harding Canada representatives.

10. Testing of system to Owners and Lloyd's requirements.

The Contractor is to use fully qualified and competent tradesmen and supervision, and is to ensure a uniform high level of workmanship consistent with generally accepted shipbuilding standards.

## 4 STRUCTURAL MODIFICATIONS

### 4.1 Stiffening in Way of New Davits

1. New deck and underdeck stiffening to suit the davit system installation shall be fitted in accordance with Barclay Drawing Number 102-04-03, CCGS "Leonard J. Cowley" Construction Details. The Contractor shall check all dimensions on installation drawings prior to fabrication. Changes to the details indicated on the drawing shall not be made without prior consent of Harding or Barclay.

2. New 125mm x 65 x 8.5 L headers shall be fitted under the davit feet as indicated on the drawing 205-04-03. The new headers shall extend from fr. 22 to fr. 29, and 400 mm from the side shell. New Boat Deck Brackets shall be fitted under davit feet as indicated on drawing 102-04-03. New brackets shall be constructed of 10 mm plate with 50mm flange.

3. New 12mm insert plates shall be fitted under the davit feet, approx. from 145 mm fwd. of frame 23 to frame 25 for the aft davit footing and approx. frame 27 to 28.5 for forward footing. The insert plate shall start directly inboard of the shell plate and extend 500 mm inboard; the inboard edge of the plate shall extend beyond the new 125 mm X 65 X 8.5 L header by a minimum of 50 mm. The corners shall have a minimum radius of 50mm. The Contractor shall ensure proper edge preparation and weld lay-up, to avoid distortion of the existing deck plating and/or built- in stress.

4. Contractor is to supply and installed an access ladder and boarding platform, as detailed on BA drawing 102-04-04. The ladder is to be finally fitted at ship to suit FRC in stowed position.

5. The Contractor shall insure that the davit feet align with new and existing structure. New headers and brackets shall be fitted after the davit has been installed, properly aligned, and tack welded in place, to ensure a correct alignment.

6. The Contractor shall install the new davit inboard support struts located 52 mm aft of frame 24 for the aft inboard strut and 252 mm aft of frame 28 for the forward strut, as indicated on BA drawings 102-04-03 and 102-04-04. The Contractor shall allow for trimming of the davit arm support struts to suit the camber and sheer of the ship.

7. All materials and equipment used in the modification of the vessel shall be new and free of defects and suitable for the intended purpose. All new steel to be Lloyds grade A or equivalent. All material dimensions are given in millimeters. They can be replaced with equivalent imperial sizes.

8. Deckhead and bulkhead, insulation, linings, cabling and ducts in the accommodation below the modification area shall be removed to avoid damage. After completion of all hot work all removed items are to be reinstalled to ‘as

delivered' condition. Items damaged during removal to be repaired and/or replaced with new, to the full satisfaction of the Owner at the Contractor's expense.

4.2 Electric / Hydraulic Pump Seats

New structural support seats shall be fabricated and installed for the new hydraulic power pack unit in accordance with BA drawing 102-04-03. The seat shall be fabricated from 150mm x 90 x 12.5 O.A. and scribed to suit the camber and sheer of the deck and installed such that the hydraulic power pack unit is parallel with and perpendicular to the ship's baseline. The flange of the seat shall be drilled to take the power pack holding down bolts. The position of the bolt holes should be templated off the hydraulic power pack unit itself. The final fore/aft location to be determined at ship to Owner's satisfaction.

4.3 Davit installation

Proper alignment of the davit is critical for the proper operation of the system. The Contractor shall strictly adhere to the manufacturer's instructions at all times.Extra stock shall be allowed on the davit feet to allow for trimming to suit the camber and sheer of the deck. The davit pivots and all foundations shall be parallel to the baseline.

4.4 New Control Stand

A new control stand shall be supplied by the Owner and installed at the ship in a position to suit the requirements of the Owner's representative.

4.5 Changes, Additions and Deletions

Contractor is at liberty to suggest changes, additions or deletions to the work, but such changes are not to be made without the written consent of the Owner.

The Owner shall have the right to order any alterations, additions to, or deletions from the work, and Contractor shall comply provided they are not of a major nature, and the cost, if any, is agreed upon before commencement of the work.

Such changes shall be carried out at no cost to the Owner unless the Contractor can reasonably demonstrate that additional cost is incurred, in which case the cost shall be negotiated with PWGSC/CCG. The Owner will accept delays in delivery which can be proved to have been caused by such changes. In like manner, if a change can reasonably be demonstrated by the Owner to result in a reduction of cost, a credit shall be negotiated.

4.10 Cleanliness

Cleanliness is to be observed at all times and the vessel is to be re-delivered in a clean condition without any clogged scuppers and drains or foreign matter in any system or location as a result of this work.

4.11 Lighting, Staging, etc.

The Contractor shall provide such temporary lighting, staging, power for electric or pneumatic tools, ventilation and heating for confined spaces, and similar facilities as may be required for the efficient and safe accomplishment of the work.

4.12 Safety of Access

During the progress of the work, the Contractor is to maintain in a state of good repair all gangways, walkways, ladders, railings, guard rails, and similar appliances which are necessary to the safety of persons working or on business in the area where work is in progress.

The Contractor shall ensure that a proper fire watch is maintained at all times during and as required after completion of any works per Provincial Regulations

The Contractor shall ensure that the vessel and all welding equipment are properly grounded at all times. The ground shall be located as close as possible to the Davit area.

4.13 Storage and Handling

The Contractor shall be responsible for the safe keeping of any material, equipment, or goods delivered to it by the Owner. This also includes items removed from the vessel during the course of the work, whether or not it is intended that such removed articles are to be replaced aboard the vessel and if so directed, shall be stored under cover and safe from fire, mechanical damage, theft, or damages from the elements. The Contractor shall be responsible for unloading and loading all materials and equipment from and upon the vessel during the course of the work, and to and from such storage as may be required.

All hydraulic components are to be stored indoors in a clean, dry, environment to avoid condensation and other contaminations. When the components are ready to be installed in the system, shipping and storage blanks are to be removed, and units inspected for cleanliness.

Hydraulic pipes shall be stored under cover in a clean dry environment with caps on both ends. The Caps shall not be removed until the pipes are ready for installation in the system.

4.10 Removals

All materials permanently removed as part of the modification work shall be disposed off as per Provincial Regulations. The Contractor shall treat these materials as described herein under the heading 4.9 Storage and Handling. Loose or attached items or fluids removed for convenience of carrying out the work shall be suitably stored or disposed of at the Contractor's expense and returned onboard unless the Owner makes alternative arrangements to dispose of them.

4.11 Cranage

Cranage and other such equipment requirements shall be supplied by the Contractor at no expense to the Owner.

## 5.0 ELECTRICAL MODIFICATIONS

Refer to Specification HD-19 Electrical P & S Miranda Davit Installation``

## 6.0 HYDRAULIC INSTALLATION

6.1 Hydraulic Materials

Hydraulic installation shall comply with the "Standards for Hydraulics" in Appendix "A", except where specified differently in the following section.

The Contractor shall be responsible for installation of all interconnecting hydraulic piping, hoses and all associated fittings between the power pack, the control console, the davit winch and hydraulic tanks in accordance with Schat Drawings provided.

All fittings to be "Swagelok" 316 stainless steel and tubing material as specified on Harding Drawings. The hydraulic hose to be Parker No-Skive 381 or equivalent with a minimum working pressure of 207bar. The Contractor to install stainless AISI 316 steel rigid pipe for main pipe runs. All joints to be made from flexible hose.

All pipe work shall be site run at ship. The Contractor shall ensure piping is adequately supported and clamped. Piping shall be run so as to avoid unnecessary interference with access ways and to avoid the risk of damage and/or chafing. Where necessary, grating or other suitable means of protection shall be fitted. Final location of all pipe runs shall be to the satisfaction of the Owner.

The Contractor shall supply approximately 320 liters of "Low Therm 22" type hydraulic oil or equivalent. The particular manufacturer or brand shall be determined by the Owner (ship's Chief Engineer).

## 6.2 Hydraulic System Testing and Flushing

The Contractor shall ensure that the pump motors are running in the correct rotation and all davit equipment must be isolated from the hydraulic circuit during hydraulic testing and flushing.

## 6.3 Pressure Test

Prior to flushing, all lines to be subjected to a hydrostatic pressure test as follows:

| | |
|---|---|
| Pressure Line | 30.0 MPa for 15 min. |
| Tank Line | 30.0 MPa for 15 min. |
| Drain Line | 3.5 MPa for 15 min. |

Any line leaking during the test must be repaired and re-tested, this will be indicated by a pressure drop during testing.

6.4 Flushing and Cleanliness

1. After installation and welding, all pipes are to be internally inspected to insure their cleanliness.

2. Upon completion of pressure test, the system shall be flushed section by section prior to connecting to hydraulic components.

3. The flushing unit shall have its own reservoir, and a 15 micron full flow filter with replaceable elements.

4. The system shall be flushed until clean, as determined by a contamination check of the flushing filter, or a test patch.

5. Upon completion of satisfactory flushing, the oil shall be removed from the system, the system connected up, and filled with clean, hydraulic oil, to the specification of that required for correct system operation **Interferences**

**7.0 MISCELLANEOUS**

7.1 Rails and Stanchions

Existing rails and stanchions on boat deck in way of new davit shall be removed. One new access gate c/w safety chains shall be fitted at the inboard side. The Contractor shall supply and install new rails and stanchions, similar to existing ones, to

completely enclose the davit/zodiac area to the Owner's satisfaction. Rails and stanchions in way of the new control stand shall be modified and rerun outboard, to give protection to davit operator, to the satisfaction of Owners.

7.2 Sidelight Protection

The contractor shall fabricate and install sidelight fairing pieces in way of launching cradle path. The fairing pieces shall be constructed from 6mm plate and 20mm round bar as shown on BA drawing 102-05-04. Round bars shall have a spacing of 50mm.

## 8.0 PAINTING

8.1 All new and disturbed steelwork shall be coated in accordance with TP 12445, CCG Paint and Coating Standard.

All new plate and shapes shall be abrasive blasted to SA 2.5 Standard and coated with 2 coats of a suitable shop primer prior to fabrication. After fabrication, weld seams shall be wire brush cleaned and stripe coated with two coats of the same primer. Finish coatings shall be as per ship's current paint system.

Any existing paint work damaged by welding and/or burning shall be cleaned to Owner's satisfaction and repainted utilizing a paint system compatible with the ship's existing system.

The davit system is supplied by manufacturer with two primer coats and one finished coat only. Contractor shall apply one additional finish coat per ship's existing scheme.

At all times manufacturer's written instructions pertaining to preparation, coating thickness, method of application, conditions of application, between coat drying times, etc. shall be strictly adhered to. Defects in paint finish and inadequate finished dry film thicknesses due to failure to properly follow manufacturer’s instructions shall be rectified at the Contractor's expense.

## 9.0 RIGGING:

9.1 The fall wires and fittings shall be provided by Owner. The Contractor shall provide labour to rig the fall and boat gripes. The Contractor shall supply three (3) complete sets of boat gripes, each set consisting of 12 mm diameter wire, hooks, turnbuckles, 1/2" shackles and deck lugs. The contractor shall install the boat gripes in accordance with Harding specifications and to the satisfaction of the Owner.

**13 PROOF OF PERFORMANCE:**

10.1 Testing

The davit shall demonstrate, with a load of 3900 kg and using only one power pack, that it achieves an inhaul speed of not less than 90 fpm with each power pack; and not less than 180 fpm with both power packs on line.

The contractor shall perform trials, showing the correct operation of the davit to the satisfaction of the Owner and Lloyds. The contractor shall also test to the satisfaction of the Owner, all equipment, systems, wiring and piping that was affected by the modification.

A launching and retrieval test of Hurricane Zodiac 749 shall be carried out prior to acceptance of the installations. A representative of Harding shall conduct the testing of the boat launching system, however, the Contractor shall provide all necessary labour, weights, etc. as required to complete the tests.

Onboard 1.1 Dynamic lowering test shall be carried with a load determined from the following formula:

Lowering Test Load = Weight of Zodiac + Complement + 10% of Total Load.

Note: The complement + 10% is to be made up with sand bags.

Complement = 2 crew = 2 x 165 Lbs = 330 Lbs

Any defects determined during the course of the above tests and trials shall be corrected by the Contractor prior to acceptance of the completed installation by the Owner.

**14 Inspection:**

Free access to work, both on ship and ashore, is to be given to all authorized representatives during normal working hours and at such other times as may reasonably

be requested. The Owner's representative will be authorized to condemn workmanship and materials which are not in accordance with good shipbuilding practice, or which do not comply with the requirements of the Specification and/or Contract

**a. Certification**

N/A

## 15 DELIVERABLES:

**a. Drawings/Reports**

i. Supply three written reports and one electronic report.

**b. Spares**

**N/A**

**c. Training**

**N/A**

**d. Manuals**

**N/A**

| Spec item #: E-01 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) E-01 : Generator Engine Overhaul** | | |

# Part 1: SCOPE:

**1.1** The intent of this specification is to carry out the entire engine overhaul as detailed in this specification including all tests and trials with the Chief Engineer in attendance. Contractor to supply the services of a Caterpillar Field Representative (F.S.R.). All work shall be surveyed by Lloyds attending surveyors. Contractor shall be responsible for contacting the surveyor's when they are ready for inspection. Contractor to bid on allowance of $60,000.00 for Caterpillar FSR to be adjusted on proof of invoice by PWGSC 1379 action.

**1.2** Contractor shall carry out a vibration test on the diesel engine and Generator at various loads before and after the overhaul for comparison. Vibration analysis report shall be type written and two copies supplied to the Chief Engineer.

**1.3** The overhaul is to be performed in conjunction with spec item L-01 , overhaul of generator

# Part 2: REFERENCES:

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1.** Caterpillar 3412 D.I.T.A.
12 cylinders

Serial Number 60M02057

Arrangement # 4W1146

**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 to the point of connection.

## Part 3: TECHNICAL DESCRIPTION:

**3.1 General**

**3.1.1** All work involved to dis-assemble, inspect re-assemble and any precautions to be observed during the overhaul shall be in accordance with the engine manufacturers instructions.

**3.1.2** The alignment of the engine to generator is to be checked and recorded prior to work commencing as the generator is to be overhauled as part of spec L-01

**3.1.3** Wear limits shall be those listed in the manufacturers instruction book.

**3.1.4** The engine shall be disassembled in its entirety to meet the requirements of Lloyds inspectors. All components shall be inspected for wear and damage.

**3.1.5** The following components will be exchanged for Re-man components:

Cylinder Heads

Cylinder Head spacer plates

Vibration Damper

Lube Oil Pump

Jacket Water Pump with gear

Sea Water pump complete with gear

Fuel Oil Lift Pump

Injectors

12 Power Pack assemblies

Turbo Cartridge P/N: OR-5889 S/N: 4MF-731 DO 405 2098 R9

Cylinder liner spray nozzles

Rocker arm assemblies

Lifters

Bridges

Cam followers

Valve rotators

Lifter clips (spring clips)

The following bearings and bushings shall be renewed:

Main Bearings

Thrust Bearings

Connecting rod bearings

Cam shaft bearings

Idler gear bushings

The following parts will be renewed:

High water temperature sensor

Exhaust bellows 5L-6297

Exhaust thermocouple

Temperature regulators

The engine shall be re-assembled using all new gaskets and seal including the following:

Front end gaskets

Aft end (Bell end) gaskets

Cylinder head gaskets

Bottom end gaskets (central and lower)

Lube Oil cooler gaskets

Charge air cooler gasket

**3.1.6** The high pressure fuel injection pump assembly shall be removed from the engine and suitably crated and sent to an authorized Caterpillar fuel injection equipment service center, where it shall be completely overhauled, cleaned and calibrated to manufacturer's specifications using OME parts. Upon completion, the high pressure fuel pump shall be power tested. Returned back to the ship and installed in good order.

A Caterpillar representative shall be on hand prior to and during trial run of the engine, to make any adjustments as required.

**3.1.7** The Woodward mechanical governor and actuator shall be, removed from the engine and properly crated and sent to an authorized Woodward governor repair and testing facility where it shall be thoroughly cleaned, inspected, tested and calibrated to the manufacturer's specifications. Upon completion the mechanical governor and actuator shall be returned to the ship and installed on the engine. After the engine overhaul is completed, a governor technician shall be in attendance to make final adjustments as necessary.

**3.1.8** The contractor shall ensure all rocker arm bushings are reamed to manufactures specifications providing the required clearance between bushing and rocker arm shafts.

**3.1.9** The lubrication oil pump suction strainer shall be checked for damage and all lubrication piping shall be proven clear. The relief valve on the lubrication oil pump shall be set to manufactures specifications.

**3.1.10** Crankshaft shall be examined for scoring, cracking, and signs of overheating and gauged for wear on all journals. The crankshaft shall be properly crated and sent to a machine shop to be polished and tested for trueness. Crankshaft shall have all journals measured and recorded. All measurements shall be compared to manufacturer's specifications. Upon completion of inspection and testing, the crankshaft shall be returned to the ship and installed in the engine.

**3.1.11** The charge air cooler, lube oil cooler and jacket water coolers shall be removed and cleaned. The coolers shall be pressure tested as per Lloyd's requirements. The Chief Engineer, Lloyd's inspector shall witness the pressure test on each cooler. After testing the coolers shall be-reassembled using new gaskets and seals.

**3.1.12** Flywheel ring gear shall be examined for tightness and worn or damaged teeth. All oil passages shall be cleaned and proven clear. Contractor shall install new main and thrust bearings with Caterpillar wear in greased. Main bearing cap bolts shall have a torque applies as per manufactures specification. Contractor shall record all main bearing to crank journal clearances to ensure they are within the manufactures specifications. Contractor shall record crankshaft axial clearance after assembly of new bearings in engine.

**3.1.13** Backlash shall be taken and recorded on the front gear group which includes the fuel pump drive gear and timing advance, camshaft gear, water pump drive gear, idler gear, crankshaft and oil pump idler gear. All measurements shall be given to Chief Engineer.

**3.1.14** The Vibration Damper shall be removed and the wear marks checked for alignment. If the marks are not in alignment a new vibration damper shall be installed.

**3.1.15** Camshafts shall be examined for wear in way of cam lobes. Contractor shall gauge wear on all camshaft lobes to see if they are within tolerance of new limits. Camshaft shall be removed and inspected for wear and damage. New bearings shall be installed with camshafts.

**3.1.16** The fuel pump control gear shall be examined for slackness and all wasted motion shall be removed. Fuel strainers and filter housings shall be cleaned and new elements installed on reassembly.

**3.1.17** The engine shall be completely assembled using new gaskets and seals including the fore end and aft end gaskets as well as the crankshaft oil seals on the fore and aft end. The generator end has to be separated from the engine for the removal/installation of the rear crankshaft oil seal, Contractor is to support the generator end at all times when carrying out this procedure. Contractor to re-connect generator to engine using specified procedures and torque settings, alignment between generator and engine to be checked and adjusted so that it is within manufacturers specifications.

**3.1.18** Contractor shall insure that cylinder liner spray nozzles are installed after power pack installation. After installation care must be taken so that the spray nozzles are not disturbed.

**3.1.19** Contractor shall fill engine jacket water space with clean fresh water and apply pre-heat. All jacket water spaces shall be free of entrapped air, including turbo charger cooling space. The engine shall be checked for any sign of water leaks. All leaks shall be corrected.

**3.1.20** Contractor shall clean the engine base prior to filling to the working level with new lubricating oil, vessel supply. New lube oil filters shall be fitted.

**3.1.21** Before start-up of engine the valve clearances shall be adjusted as per manufactures specifications. Fuel pump timing shall be checked and set as per manufactures specifications. The engine shall be adjusted and tested at full speed and full load for four hours. Before attempting full load test, the engine shall be run at a reduced load as outlined by engine manufacture. The overspeed trip, low lube oil pressure and high jacket water temperature safety shutdowns shall be functionally tested and witnessed by Chief Engineer, and Lloyd's Inspector. Pressures and temperatures of engine shall be recorded at 15 minute intervals while testing engine. After initial start-up of engine the lube oil filters shall be opened up and checked for any sign of metal. An oil sample shall be taken after the trial period of four hours and sent to an oil analysis lab for testing, the results of the oil test shall be given to the Chief Engineer.

**3.2** **<u>Location:</u>**

**a.** Harbour generator 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

All work shall be inspected by Lloyds Technical Inspector and Chief Engineer.
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** All wear measurements and clearances on engine components to be recorded, this will include the backlash on all gear transmissions. Three copies of all measurements shall be given to the Chief Engineer

## 5.2 Spares

**N/A**

## 5.3 Training

**N/A**

## 5.4 Manuals

**N/A**

| Spec item #: E-02 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) E - 02 : Bilge and Emergency Fire pump** | | |

# Part 1: SCOPE:

**1.1** The intent of this spec is to open up the Bilge and Emergency Fire Pumps for inspection by the attending Lloyd's classification society surveyor. Inspect component wear, rebuild pumps with all new seals, bearings and gaskets and conduct trials.

**1.2** Pumps are centrifugal vertical mounted single impeller type with mechanical seal and electric motor driven.

**1.3** The successful bidder shall overhaul one pump at a time and prove satisfactory operation prior to overhauling the second pump as each pump provides redundancy to the other for emergencies.

**1.4** Contractor shall carry out the overhaul as per manufacturer's instructions and wear tolerances.

# Part 2: REFERENCES:

**2.1 Guidance Drawings/Nameplate Data**

2.1.1. NAMEPLATE DATA

Manufacturer - Iron A/S Copenhagen
Pump # 44.367 / 3 & 4
Model # - QVP – 4 / 300
1750 RPM
60 cubic meters / hour @ 80 P.S.I.
41 Meter Head
14.5 Kw
1984

**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**

**3.1.1.** Prior to commencing the work in this specification the contractor shall notify the Chief Engineer of their arrival to isolate and lock out the pumps electrically.

**3.1.2.** Contractor shall blank off the inlet and discharge piping at the individual pumps using ¾" 150 # bolted blank flanges c/w gaskets to match existing pipe flanges prior to dis-mantling the pump unit.

**3.1.3.** Contractor shall mark and disconnect motor pump coupling and remove pumping element including casing, shaft, impeller and wear rings and mechanical seal. Contractor shall have surveyors inspect all pump components for wear including pump housing cavity. Contractor shall rebuild pump in its entirety fitting all new, Owner Supplied, gaskets, bearings and a new mechanical shaft seal. Contractor shall record the impeller to casing wear ring clearance.

**3.1.4.** Contractor shall remove and dis-mantle the attached air pump and inspect all components for wear. Contractor shall re-build air pump with new seals, bearings and gaskets.

**3.1.5.** Contractor shall remove all piping blanks and bolt up piping flange to pump connections with new gasket material approved for the application.

**3.2 Location**

Forward Engine Room Stbd Side
Forward Machinery Space

**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**

N/A

**4.3 Certification**

N/A

## Part 5: DELIVERABLES:

**5.1 Drawings/Reports**

**5.2 Spares N/A**

## 5.3 Training N/A

| Spec item #: E-03 | SPECIFICATION | TCMSB Field # N/A |
|---|---|---|
| **E - 03 : Relief Valve Certification** | | |

## Part 1: SCOPE:

**1.1** There are 14 safety relief valves which require recertification for Lloyds. The Contractor is to remove these valves and transport them to a recognized facility for testing and recertification

## Part 2: REFERENCES:

| Valve Name | Description |
|---|---|
| Deicing valve upper receiver | 10990 Kunkle 6010EE01-KM0050 1" X 1" NPT 50 PSI |
| #1 Air compressor | 172932 Seetru 4420 1/2" BSP 31.5 BAR |
| NO.1 Air Compressor | 175666A Seetru 4421 1/2" BSP 9 BAR |
| Top Main Air Receiver | NV 1192 Kunkle 23M 1" NPT 479 PSI |
| Top Reducing Station | NV 2377 Kunkle 82-4 1" NPT 7.7 BAR |
| Emerg Air Compressor | NV 3746 Hamworthy 40408 3/8" BSP 435 PSI |
| N/A NV 4064 | NV 4064 Kunkle 543-A01-KM 1/4" NPT 125 PSI |
| Control Air Receiver | NV 2915 Lorch TUV-SV-81-337-10-D/G M 18 8.5 BAR |
| Line 2 Reducing Station | NV 2382 Kunkle 6182FM01-KM 1" NPT 112 PSI |
| Top Line Main Air Receiver | NV 2376 Kunkle 6010 1" NPT 50 PSI |
| Bottom Main Air Receiver | NV 1191 Kunkle 23M 1" NPT 479 PSI |
| Control Air | NV 1193 Lorch TUV-SV-81-337.10 D/G 1/2" BSP 8.5 BAR |
| NO.1 Air Compressor | 172932A Seetru 4420 1/2" BSP 31.5 BAR |
| NO.1 Air Compressor | 175666 Seetru 4421 1/2" BSP 9 BAR |

## Part 3: TECHNICAL DESCRIPTION:

**3.1** The Contractor is to be responsible for all inspections and is to consult with Lloyds, prior to commencement of work, to determine an inspection schedule; at each inspection point, the Contractor is to advise the Technical Authority, in advance, to allow his/her attendance.

**3.2** Suitable blanks/plugs are to be installed in the piping/receivers while the safety valves are removed; the Technical Authority (or designate) are to witness the removal of the blanks/plugs upon reinstallation of the relief valves.

**3.3** Contractor-supplied thread sealant or new gasket material is to be used on re-installation; connections are to be proven leak-free, using the medium normally contained in the receiver/piping at operating pressure.

**3.4** The Contractor is to include in their bid an allowance of $1,000.00 for any adjustments or repairs required as a result of the above recertification procedures; this value will be adjusted by 1379 action. Any valves failing to operate as required will be replaced by 1379 action.

**3.5** All test certificates are to be issued as close as possible to the end of the VLE/refit period.

## Part 4: PROOF OF PERFORMANCE:

**4.1** Original test certificates are to be supplied to the Technical Authority within three working days of the completion of all work.

| Spec item #: E-04 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) E - 04 : Lifeboats and Davits Quinndrinnal** | | |

**Part 1: SCOPE:**

**1.1** The intent of this specification is to carry out the annual inspection and testing of the Port and Stbd lifeboats, davits and winch systems.

**1.2** 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.

**1.3** Contractor to remove both lifeboat winches for full stripdown to facilitate inspection and installation of all new seals & barrel hubs with bearings and seals

**1.4** Davit arms to be removed, blasted, NDT carried out, primed and painted.

**1.5** Lowering blocks on both stations to be removed, blasted, NDT and painted as directed by Harding FSR and NACE inspector.

**1.6** Contractor to carry out 1.1 dynamic load test of davit system either using method as below in a. or b. as approved by Lloyds inspector

a. Water bags w/load cells
b. or Lifeboat w/ water bags inside

**1.7**

**1.8** An Authorized Harding Technician shall perform the annual inspection on the lifeboats and davit winches. Contractor in the work description below refers to the Harding Technician.

**1.9** All defects found shall be reported to the Chief Engineer as soon as possible when discovered.

**1.10** The systems shall be thoroughly examined and serviced by an Authorized Harding Technician.

**1.11** 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.

**1.12** Contractor to include in their bid an allowance of $60,000.00 for Harding Safety Canada Inc FSR to be adjusted on proof of invoice by PWGSC 1379 action.
**Glenn Francis** Service Coordinator, **Harding Safety Canada Inc, Office** +604 530 0814 | **Fax** + 604 530 0812 , glenn.francis@harding.no .

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1. <u>LIFEBOAT DETAILS</u>**

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

## 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** Prior to commencement of work the Harding 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** Harding shall renew hydrostatic release diaphragm c/w cover retaining screws with a vessel supplied diaphragm

**.4** The contractor will re-hook the lifeboats with owner supplied KH 6.5 hooks under direction of harding FSR. Contractor responsible for cutting hooks to correct length as directed by Harding FSR. Any fiberglass repair and gel coat repairs as a result of the replacements will be under the direction of the FSR and the contractors responsibility. Any defects uncovered during inspections of lifeboats to be covered by 1379 action. Contractor responsible for providing covered structure to allow for fiberglass and gel coat repair if needed.

**.5** After inspection of lifeboats the Harding shall complete annual maintenance of the lifeboat davit winches.

**.6** Harding with the assistance of the contractor shall drain oil from winch gear case and remove gear case cover. Harding shall prove the gear case vent is free. Harding shall inspect the gear case for wear and damage. Harding 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. Harding shall install and secure the gear case cover with correct cover seal.

**.8** Harding 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 Harding shall renew brake linings.

**.9** Harding shall clean all parts including any brake dust from brake housing and de-glaze the brake running surface.

**.10** Harding shall re-assemble brake and centrifugal assembly. After re-assembly the brakes shall be adjusted to correct setting.

**.11** Harding shall remove two sheave, pin and bushing assembly for inspection to get a general idea of the condition of wear.

**.12** Harding shall prove grease fittings, grease channels and holes are clear.

**.13** Harding shall include in their bid unit cost per sheave, pin and bushing removal, inspection and re-installation.

**.14** Harding shall inspect for damage and wear all davit mounting hardware, davit arms, falls, falls wires, turnbuckles, shackles and foundation

**.15** Harding 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** Harding shall carry out an inspection of the Port and Stbd lifeboat davit falls and wires including all associated equipment.

**.17** Harding shall inspect and check for correct operation the operation of the hand crank, limit switches and davit arm track rollers.

**.18** Harding to change out all bolts on barrel drum flanges as recommended by Schatt from last inspection.

**3.2 Location**

**a.** N/A

**3.3 Interferences**

**3.3.1** N/A

**Part 4: PROOF OF PERFORMANCE:**

**4.1 Inspection**

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

**4.2 Testing**

**4.2.1** Harding 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. Harding 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, Harding 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:**

**5.1 Drawings/Reports**

**5.1.1** Harding to supply three typed copies of report to Chief Engineer.

**5.2 Spares N/A**

## 5.3 Training N/A

## 5.4 Manuals N/A

| Spec item : E-05 | SPECIFICATION | |
|---|---|---|

**E - 05 : R.O. Unit Supply Pipe Replacement**

**Part 1: SCOPE:**

**1.1** The intent of this specification is to replace all deteriorated reverse osmosis (RO) piping supplying the RO units with new.

**Part 2: PROCUREMENT**

**2.1 Owner Supplied**

**2.1.1** No Owner supplied equipment required for this specification item. Owner reserves the right to direct procurement.

**2.2 Contractor Supplied**

**2.2.1** Contractor shall supply all materials, equipment, and parts required to perform the specified work.

**2.3 Guidance Drawings**

**2.3.1** General Arrangement, 590-70, Rev. C.

## Part 3: TECHNICAL DESCRIPTION:

**3.1 General**

**3.1.1** Contractor shall inform the Chief Engineer prior to commencement of the work and prior to any hot work being carried out. Hot work has to be carried as per Provincial Regulations.

**3.1.2** Contractor shall ensure, with the help of the Chief Engineer, that the RO system, as well as any other affected systems have been locked out and tagged out as per Provincial Regulations and drained before commencement of any work.

**3.1.3** Contractor shall ensure all work areas are neat and tidy before the end of the work day to ensure a safe environment.

**3.1.4** Contractor shall remove all sharp edges and grind all burrs smooth.

**3.1.5** Contractor shall repaint modified areas as per client specs.

**3.1.6** All new piping, fittings and penetrations shall be as per the original system. The new piping shall be Sch.40, 316 L stainless steel with #150 threaded fittings.

**3.1.7** All welding procedures to be Lloyd's approved prior to any work started, Contractor to follow to Lloyd's latest revision.

**3.1.8** The maximum length of pipe that can be maneuvered within the vessel is 6 feet; however 8 foot lengths of pipe can be maneuvered within the Engine Room via the access hatch on the STBD side.

**3.1.9** Contractor shall store all materials as instructed by the Chief Engineer.

**3.1.10** Contractor shall clean up all debris and dispose of it as per provincial regulations.

**3.1.11** Contractor shall paint new piping as per client specification.

**3.1.12** Any new valves are to be Lloyd's approved and similar to the existing if required.

**3.1.13** Contractor shall recoat all new bulkhead and tank penetrations with two coats of Amercoat Red Oxide Primer followed by two topcoats of Amercoat 5450 White on all surfaces for a final DFT of 3.5 mils. All coatings shall be Contractor supplied.

## 3.2 Piping in Engine Room (Aft of Frame 44)

**3.2.1** Contractor shall unbolt all required deck plating and store.

**3.2.2** Contractor shall remove all piping connecting the seawater intake isolation valve and suction end of the RO unit supply pump and dispose.

**3.2.3** Contractor shall remove all piping connecting the discharge end of the RO supply pump and the bulkhead penetration at frame 44 and dispose.

**3.2.4** Contractor shall disconnect the seawater supply and return lines for the control room A/C condenser, located in the sewage compartment, from the bulkhead penetration at frame 44.

**3.2.5** Contractor shall install new RO piping and couplings following the same route as the removed piping.

**3.2.6** Contractor shall connect the existing seawater supply and return lines for the control room A/C condenser, located in the Transducer Compartment, to the newly installed bulkhead penetration at frame 44 (see 3.3.5).

**3.2.7** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.2.8** Contractor shall have all valves inspected to ensure they are in good condition and are working correctly. Any valves not meeting Lloyds, or the Chief Engineers approval, are to be replaced.

**3.2.9** Contractor shall reinstall all valves, both existing and new, as per the removed system.

**3.2.10** Contractor shall reinstall any removed deck plating to the satisfaction of the Chief Engineer.

## 3.3 Piping in Pipe Tunnel (Fwd of Frame 44)

**3.3.1** Contractor shall unbolt all required deck plating in the Transducer Compartment and store.

**3.3.2** Contractor shall remove the RO supply piping between the bulkhead penetration at frame 44 and the deck penetration at frame 78 (approx).

**3.3.3** Contractor shall disconnect the seawater supply and return lines for the control room A/C condenser, located in the Transducer Compartment, from the bulkhead penetration at frame 44.

**3.3.4** Contractor shall cut out the bulkhead penetration at frame 44 and dispose.

**3.3.5** Contractor shall fabricate a new bulkhead penetration, similar to the one removed, and install at frame 44 in the location of the old penetration.

**3.3.6** Contractor shall install new RO piping and couplings following the same route as the removed piping, connecting to the new bulkhead penetration at frame 44 and the new deck penetration at frame 78 (approx.) (see 3.4.5).

**3.3.7** Contractor shall connect the existing seawater supply and return lines for the control room A/C condenser, located in the Transducer Compartment, to the newly installed bulkhead penetration at frame 44 (see 3.3.5).

**3.3.8** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.3.9** Contractor shall have all valves inspected to ensure they are in good condition and are working correctly. Any valves not meeting Lloyds, or the Chief Engineers approval, are to be replaced.

**3.3.10** Contractor shall reinstall all valves, both existing and new, as per the removed system.

**3.3.11** Contractor shall reinstall any removed deck plating to the satisfaction of the Chief Engineer.

## 3.4 Piping in Fwd Machinery Space

**3.4.1** Contractor shall unbolt all required deck plating and store.

**3.4.2**. Contractor shall disconnect the plastic piping from the steel RO supply piping.

**3.4.3** Contractor shall remove all piping connecting the deck penetration at frame 78 (approx.) and the overboard discharge valve and dispose.

**3.4.4** Contractor shall cut out the deck penetration at frame 78 (approx.) and dispose.

**3.4.5** Contractor shall fabricate a new deck penetration, similar to the one removed, and install at frame 78 (approx.) in the location of the old penetration.

**3.4.6** Contractor shall install new RO piping and couplings following the same route as the removed piping, connecting to the new deck penetration at frame 78 (approx.) and the existing overboard discharge valve.

**3.4.7** Contractor shall connect the existing plastic piping to the new RO supply piping, similar to the original.

**3.4.8** Contractor shall reuse existing hangers and pipe supports where possible and replace any deemed to be unusable by Lloyd's, or the Chief Engineer.

**3.4.9** Contractor shall have all valves inspected to ensure they are in good condition and are working correctly. Any valves not meeting Lloyds, or the Chief Engineers approval, are to be replaced by PWGSC 1379 action.

**3.4.10** Contractor shall reinstall all valves, both existing and new, as per the removed system.

**3.4.11** Contractor shall reinstall any removed deck plating to the satisfaction of the Chief Engineer.

### 3.5 Interferences

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

**3.5.2** All watertight penetrations shall be proven to be watertight as witnessed and signed off by Class.

## Part 4: PROOF OF PERFORMANCE:

### 4.1 Inspection

**4.1.13.** All work to be completed to satisfaction of the Chief Engineer.
**4.1.14.** Visual inspection of all welding 100%.
**4.1.15.** Welds 10% MPI testing completed by approved testing personnel.
**4.1.16.** The Contractor is responsible for all air quality testing to ensure hot work and entry is permitted.
**4.1.17.** The Contractor shall issue and post hot work permits and shall maintain a fire watch. Hot work is to be carried out in accordance with Provincial Regulations.
**4.1.18.** Area where work was carried out to be inspected to ensure all debris has been removed.

### 4.2 Testing

**x.** Hydrostatic test to be carried out to 1.5 time's normal working pressure to be witness by Lloyd's Surveyor and Chief Engineer.
**xi.** Welding 100% visual by Lloyd's and Chief Engineer.
**xii.** Welds to 10% MPI by approved testing personnel
**xiii.** Areas where hot work is to be carried out is to be certified by a Chemist or a qualified person to be determined by Chief Engineer.

**Certification**

Welders must be CWB Certified
Chemist must be Certified
Technicians for NDT testing must be Certified

**DELIVERABLES:**

**5.1** Drawings/Reports

Contractor to supply a detailed report (three written copies and one electronic copy) to Chief Engineer complete with all piping material mil certificates, welder's certificates, Chemist certificates and all testing carried out.

### 5.2 Spares N/A

### 5.3 Training N/A

### 5.4 Manuals

| Spec item #: ED-01 | SPECIFICATION | Lloyds |
|---|---|---|
| **ED - 01 : Steering Gear Controls Upgrade** | | |

**Part 1: SCOPE:**

The intent of this specification is to upgrade the existing Rolls Royce Marine Steering gear controls with new Rolls Royce Marine controls Type SR722-PU50. Contractor will be running all cabling and mounting of equipment as directed by Rolls Royce. Contractor responsible for all costs associated with Rolls Royce engineering, drawings, equipment and FSR installation and equipment. Contractor to include in their bid an allowance of $45,000.00 for Rolls Royce FSR to be adjusted on proof of invoice by PWGSC 1379 action. Contact for Rolls Royce representative familiar with job is:

Ted Gurr
Rolls-Royce Canada Ltd.
Sales Manager - Eastern Canada
Email: ted.gurr@rolls-royce.com
Cell: (902) 488-4153

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

Technical Specification 14-0127
0003-7426 Sheets 1 to 9 Steering Gear Control document list
0003-7429 Sheets 1 to 2 Steering Control system cable list
0003-7430 Sheet 1 Power Consumption List

**2.2 Standards**

**2.2.1** The Contractor is to perform all of the following work and is to provide fully certified personnel acceptable to LLoyds in accordance to latest revision of the Lloyds Rules and Regulations for the Classification of Ships – Part 6, Chapter 2, Section 10

**2.3 Regulations**

**2.3.1** All installations as per most recent version of Lloyds Rules and Regulations for the Classification of Ships – Part 6, Chapter 2, Section 10

**2.3.2** All wiring to follow Lloyds rules. If not specifically mentioned, contractor to follow most recent revisions of TP-127E or IEEE-45

**2.4 Owner Furnished Equipment**

All equipment , wiring and materials responsibility of contractor unless otherwise noted

**Part 3: TECHNICAL DESCRIPTION:**

**3.1 General**

**.1** All electrical circuits associated with the steering controls to be isolated before any work is to proceed.

**.2** Contractor responsible for all costs associated with parts, materials and labour of Rolls Royce FSR's. All work performed will be under the direct supervision of Authorized Rolls Royce FSR and to the acceptance of the Chief Engineer and Lloyds Inspector.

**.3** All equipment locations and wiring detailed in Technical Specification 14-0127.

**.4** The existing Rolls Royce steering controls to be removed as directed by the FSR

**.5** Included provisional installation drawings are for guidance only. Actual connection drawing to be provided by FSR before any work is to begin.

**.6** Drawings including all connections and placement of equipment to be approved by Chief Engineer, Lloyds inspector and FSR before any work to begin

**.7** All associated wiring is to be removed and replaced unless approved to remain after testing and agreement between FSR, Chief engineer and Lloyds.

**.8** All signal , line supply and power cables to be routed away from each other as much as possible to minimize interference. Actual routing must be approved by FSR, Chief Engineer and Lloyds.

**.9** Contractor to give price based on 70meters per cable run with 15 cable penetrations per cable. Contractor may run similar cables in one cable transit keeping in mind requirements in 3.1.8 above. Contractor to give a cable per meter cost and transit cost which is to be adjusted up or down for actual required run by 1379 action. Contractor responsible to contact FSR for actual cable requirements including construction , conductor numbers and bulkhead penetrations requirements.

**.10** All new wiring, controls and cabinets to be installed under direction of Rolls Royce FSR

**.11** All labels that are to be replaced to reflect new equipment to be of similar type and securing arrangement to existing. Contractor responsible for the cost of fabrication and installation of all labelling. All labelling and installation locations to be approved by the chief engineer and attending Lloyds inspector

**.12** Contractor responsible for retrofitting panels where equipment of different sizes or shapes to be mounted. Covering plates ( Contractor responsibility) and mounting arrangements to be approved by the TA before installation. Any modifications to existing panel doors to be similar in standard, material,

design, strength, mounting and coated with the same standard and color paint as per the existing access doors.

**.13** Existing transits and cable hangers may be reused on approval of chief engineer and Lloyds inspector. Contractor responsible for any new cable hangers or transits needed

**.14** All wiring to meet or exceed Lloyds rules.

**.15** All equipment used to have Lloyds approval

**.16** Contractor responsible for all new wiring, terminals, and enclosures as directed by Rolls Royce FSR

**.17** All programming and drawing modification the responsibility of Contractor

**.18** All new and disturbed steelwork is to be protected with 2 coats of primer.

**.19** All cables shall be tagged with circuit identification at all points of connection and on both sides of bulkheads, decks and barriers. The tags will be metal, compatible with the cable sheath and shall have a circuit designation embossed thereon. Both ends of the tag shall be secured to the cable with metal tape or metal ty-raps. The wire Identification numbering philosophy for the new wiring shall be compatible with that utilized with the existing systems

### 3.4 Location

**a.** Wheelhouse

**b.** Steering Gear compartment

**c.** Engine Control room

### 3.5 Interferences

Any interference items that need to be removed are the responsibility of the contractor. Contractor is responsible for the temporary removal, storage and refitting to vessel of all equipment previously identified. No Equipment/wiring or interference items to be removed without prior approval from TA

## Part 4: PROOF OF PERFORMANCE:

### 4.1 Inspection

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

**4.1.8.** All cabling and installations to be to the acceptance of attending Lloyds inspector and Chief Engineer

### 4.2 Testing

Rolls Royce FSR to test complete system to ensure proper operation of functions to the satisfaction of the Chief Engineer and attending Lloyds inspector. This to include all combinations of control including emergency

### 4.3 Certification

Proof of certification of authorized Rolls Royce FSR to be provided

Proof of proper certification/training of all other personnel to be made available on request

## Part 5: DELIVERABLES:

### 5.1 Drawings/Reports

3 hard copies and 1 Electronic copy of the following

i. All hardware manuals from as-fitted equipment
ii. All software programming manuals
iii. As fitted drawings in electronic Cad format as well as hard copy
iv. Copy of all as commissioned programming in electronic and hard copy
v. Recommended spare parts list from Woodward
vi. Copy of all training materials in hard and electronic copy

### 5.2 Spares

Contractor to provide a list of recommended spare with associated costs as detailed by FSR

### 5.3 Training

Contractor to allow services of FSR to provide for 2 - 8 hour days of training for ships crew for correct operation and maintenance of system.

| Spec item #: ED-02 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) ED - 02 : Stbd Main Engine Overhaul** | | |

**Part: 1 SCOPE:**

**1.1** The intent of this specification is to carry out a complete overhaul of the stbd main engine and all associated equipment.
**1.2** Removal and inspection of fore end housing and flywheel end gear trains are also part of this spec.
**1.3** Safety system shut down testing, dockside and sea trials are a requirement after the overhaul is completed.
**1.4** All inspections, work, testing and trials shall be surveyed by the attending Lloyd's classification society surveyor(s), and the Chief Engineer. The Contractor shall be responsible for scheduling and arranging all required surveys with all parties named here within.
**1.5** The contractor shall supply the services of, and pay all charges for an authorized and qualified Wartsila FSR for the duration of the overhaul and all engine trials. FSR service technician required for both the engine, turbo charger(s) overhaul, fuel pump landing and block machining as detailed in this specification. Contractor to include in their bid an allowance of $300,000.00 for Wartrsila FSR to be adjusted on proof of invoice by PWGSC 1379 action.
**1.6** Contractor to include in their bid an allowance of $60,000.00 for Authorizer Bosch fuel injection establishment to overhaul 12 fuel injection pumps and injectors to be adjusted on proof of invoice by PWGSC 1379 action.
**1.7** Contractor to include in their bid an allowance of $8,000.00 for Authorizer Woodward establishment to overhaul Governor to be adjusted on proof of invoice by PWGSC 1379 action.
**1.8** A copy of all manufacturers service bulletin's applicable to this specification shall be made available to the successful bidder.
**1.9** Contractor shall be responsible for taking and recording all wear measurements, gearing back lashes and clearances on all components as specified in the technical description of work. Contractor shall review the measurements in conjunction with the FSR, Chief Engineer and the manufacturer's specifications as soon as they are taken to determine further component serviceability.
**1.10** The Addendum in technical description lists all required measurements. The successful bidder shall be given detailed tables with all measurements listed to be filled in.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1 Stbd Main Engine**

Nohab V12 Cylinder
Model F312V
4 Stroke Single Acting
250 mm Bore x 300 mm Stroke

750 RPM
Service Power 1560 Kw
Serial # 3356

**2.1.2**

**2.2 Standards**

**2.2.1**

**2.3 Regulations**

**2.3.1** Lloyd's Classification rules.

**2.4 Owner Furnished Equipment**

**2.4.1** Owner will supply all main engine parts for the overhaul.
**2.4.2** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.
**2.4.3** All parts for disposal will be held for inspection by Chief Engineer. The disposal of parts will be the responsibility of the contractor.

**Part: 3 TECHNICAL DESCRIPTION**

**3.1 General**

**3.1.1** Contractor prior to starting any work has to notify the Chief Engineer.

**3.1.2** Contractor shall carry out the following prior to commencement of work in this spec as follows:

**3.1.2.1** Isolate and lock out the engine's air starting system.
**3.1.2.2** Isolate and lock out the jacket water pre-heat system.
**3.1.2.3** Isolate and lock out the fuel system valves supply and return.
**3.1.2.4** Isolate and lock out the raw water system valves.
**3.1.2.5** Drain the jacket water system.
**3.1.2.6** Pump out the lubrication system.

**3.1.3** Contractor shall take and record the following prior to commencing overhaul:

**3.1.3.1** The Contractor to carry out a set of hot crankshaft deflections starting from the fly wheel end working forward. Deflections shall be taken prior to the dismantling of engine and after completion of the overhaul, with clutch disengaged & with clutch engaged. Lube oil temperature shall be maintained at or above 50 degrees C while deflections are being taken. The Chief Engineer will witness the deflections taken and a signed type written copy of each set of measurements will be passed to the Chief Engineer as soon as possible following each set of readings.

**3.1.3.2** Crankshaft and camshaft axial thrust clearance to be taken prior to commencement of the overhaul and again after main and thrust bearing removal, inspection and reinstallation.

**3.1.3.3** Engine bedplate witness pin clearances, Port & Stbd forward and Port and Stbd aft. Clearances shall be taken before and after the overhaul.

**3.1.3.4** Back lash clearances of all gearing at the fore end and flywheel end of the engine.

**3.1.4** Contractor shall blank all openings, flanges, pipe connections to prevent ingress of foreign material. Any damage to those components or their connections will be the responsibility of the contractor.

**3.1.5** The contractor shall remove all gauges, thermometers and pyrometers to safe storage. Contractor shall mark components and connection points for correct re-installation. Blank all connections and openings.

**3.1.6 Exhaust System**

**3.1.6.1** Contractor shall remove all exhaust manifold cowling cover plates, securing brackets and mark them for correct reinstallation. Upon completion of the overhaul the cowling and brackets are to be reinstalled.

**3.1.6.2** Contractor shall remove all exhaust expansion bellows and inspect for signs of being cracked using N.D.T. dye penetrant or M.P.I. Exhaust pipes and bellows shall be tagged for correct reinstallation.

**3.1.6.3** Contractor shall reinstall all exhaust expansion bellows with new gaskets, refer to fig. #1223 Group 6. There are a total of twelve expansion bellows with a gasket fitted either side of bellows c/w four bolts per flanged end.

**3.1.6.4** Contractor shall replace the gasket between the turbocharger and the exhaust connection pipes, four gaskets total.

**3.1.7 Cylinder Heads**

**3.1.7.1** Refer to Wartsila service instruction document No. 91 960 003 00E dated 08-04-28 Group 4 of instruction manual.

**3.1.7.2** Prior to removal of the cylinder heads from the engine the contractor shall gauge the valve wear as per paragraph 1.1 in the above noted service instruction.

**3.1.7.3 Fuel injectors**

**3.1.7.3.1** The contractor shall remove the twelve H.P. fuel injector units from the cylinder heads.

**3.1.7.3.2** Contractor will crated and transported to an Authorizer Bosch fuel injection establishment for overhaul and recalibration. The injectors shall be re-assembled with new injector nozzles Figure No. 1014-017, steel washers Fig. No. 1014-021 and cylindrical springs Fig. No. 1014-012 and bench pressure tested in accordance with manufactures instructions, and returned to contractor. Injectors to be re-installed using new sealing washers Fig. No. 1014-009, injector bodies to be coated with high temperature never seize. The old sealing washers shall be removed and cylinder bores cleaned prior to installation.

**3.1.7.4** The contractor shall remove all twelve cylinders heads and transport them to their facility for cleaning, overhaul and testing. Upon completion of overhaul and testing the contractor shall transport all heads back to the vessel for reinstallation. Contractor is responsible for the supply of any protection crating required and the transportation vehicle.

**3.1.7.5** Contractor to survey all cylinder head studs for excessive corrosion.

**3.1.7.6** Contractor shall quote labour, material and tool cost per unit to remove corroded cylinder hold down stud. Past experience with corrosion of studs due to cylinder head jacket water leakage reducing the diameter of the stud requiring renewal. Removal involves welding old cylinder head nut to stud and taking out the stud with a pneumatic type impact wrench. Cost to include installation of a vessel supply stud and O-ring. Contractor to supply and coat the stud with high heat anti-corrosive paint.

**3.1.7.7** All cylinder heads shall be hydro-statically tested for 30 minutes; test pressure is stamped on head. Hydrostatic test shall be conducted prior to over hauling the heads to determine if cylinder head are serviceable.

**3.1.7.8** After serviceability is determined all serviceable heads shall be dismantled, cleaned and inspected as follows.

**3.1.7.9** Contractor shall tag all intake and exhaust valves for correct re-assembly with their respective valve seats.

**3.1.7.10** All jacket water cooling passages blank flange covers shall be removed to carry out an internal inspection of the cylinder head. The heads shall be cleaned by the hot tank method to remove all scale and carbon. Blank flange covers shall be fitted with new gaskets Fig. No. 1155-012. Heads shall be primed afterwards.

**3.1.7.11** All cylinder head components shall be gauged for wear, clearances, ovality and sealing surfaces checked as per the detailed service instructions noted above including all intake and exhaust valves, valve seats, valve guide bores, valve springs and valve spring locks, valve spring free height and height at specified loads, injection valve seating area, clearances between yokes and guides + valves and valve guides clearances.

**3.1.7.12** N.D.T. Dye penetrant testing shall be carried out to checks for cracks on the following:

- **3.1.7.12.1** Cylinder head seating spigot, this is the formed ring which sits on the liner seat supplying a mechanical machine face to face fit. No gasket or sealing ring is fitted.
- **3.1.7.12.2** All valve seats, valve lids and valve stems.
- **3.1.7.12.3** Bottom of head combustion side on the face of the head between valves and around injector hole

**3.1.7.13** Valve mechanism components inspection and wear measurements:

- **3.1.7.13.1** Inspect rocker arm end balls, record rocker arm bushing inside diameters and pin outside diameters. Clean and blow through oil ways.
- **3.1.7.13.2** Inspect push rods for damage, check straightness by turning in lathe, clean and blow through oil ways.

**3.1.7.14** Contractor shall remove all rocker arm bushings, fit new bushings and ream to the manufacturer's running clearance of 0.002" between the new bush and pin. There are 24 rocker arms in total.

- **3.1.7.14.1** Pin diameter 49.975 – 49.959 mm.
- **3.1.7.14.2** Bush 50.00 – 50.016 mm.
- **3.1.7.14.3** Maximum clearance pin to bushing in service 0.15 mm.

**3.1.7.15** Contractor shall remove all injection valve yoke hold down studs on all 12 cylinder heads and replace with new type studs vessel supply as per manufacturers procedures as outlined by the technical bulletin document # 91 972 028 00E.

**3.1.7.16** All Indicator cocks shall be dismantled, gauged for wear as per manufacturers specifications, reassembled and reinstalled with new annealed copper washers.

**3.1.7.17** All safety valves shall be dismantled, gauged for wear as per manufacturer's specifications, reassembled and the test pressure adjusted to the rating stamped on the valve. All valves shall be reinstalled with new annealed copper washers.

**3.1.7.18** New return pipes (rubber hose) Fig. # 115-021 to each seal piece on each cylinder head, 24 in total.

**3.1.7.19** The cylinder heads shall be reassembled and re-installed with all new gaskets, seals and O-rings. Prior to installation of all cylinder heads the liner seat and the cylinder head seats shall be lapped in as per maker's specifications, see Section # 4, Par. # 11. The fit of all cylinder heads to liners will be verified by bluing. On reinstallation the cylinder heads shall be torqued as per manufactures specs.

**3.1.8 Fuel injection H.P. Pumps (12 Total)**

**3.1.8.1** The contractor shall remove all H.P. injection fuel pumps. They will be crated and transported to an Authorizer Bosch fuel injection establishment for overhaul and recalibration. Springs, O-rings and seals are tested in accordance with the manufactures instruction. Pumps will be crated and returned to contractor's facilities for reinstallation where all pumps shall be timed individually by the spill method according to the maker's specs. All used parts to be returned to ship.

**3.1.9 Injection pump lifter brackets**

**3.1.9.1** Contractor shall remove the twelve injection pump lifter brackets Figure 0982 Group 7 of parts manual to carry out the following work. Contractor shall tag each bracket with an I.D. tag detailing which cylinder they were removed from.

**3.1.9.2** Clean carbon and dirt from lower part of bracket which is located in cam shaft housing, when all cleaning is completed, the cam shaft housing surfaces between fuel pump bracket and block shall be cleaned and inspected by Chief Engineer before fuel pump brackets are replaced.

**3.1.9.3** Contractor shall remove all 3 cross head cam followers assemblies from each bracket. Contractor shall dismantle all assemblies for cleaning and gauge all components for wear. All new gaskets and O-rings shall be fitted including Fig. 0982-020 splash guards.

**3.1.9.4** Contractor shall re-assemble all twelve injection pump brackets as per manufacturer's instructions and re-install on the engine. **After fuel injection pump landing have been machined and camshaft sections # 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 have being replaced.**

**3.1.10 Governor and Gearing**

**3.1.10.1** Contractor shall check the hydraulic governor pinion and drive gear for wear and record the gearing backlash as per the manufacturer's instructions.

**3.1.10.2** The contractor shall remove the Woodward hydraulic governor model EGB-10, serial No. 13473888, crate it and transport it to Authorized Woodward

service facility and service for complete dismantling to gauge component wear, overhaul, rebuild, test and recalibration. Governor shall be bench tested at Authorized Woodward service facility to rated output and adjusted accordingly to the manufacturer's and design installation specifications. Upon completion the Governor shall be transported back to the vessel and installed on the engine using a new gasket, Contractor shall check condition of drive spline male and female.

**3.1.10.3** Contractor shall remove the governor booster servo for cleaning and overhaul and re- install unit.

**3.1.10.4** Contractor shall supply a (Authorized Woodward FSR) on board for the initial startup and trials to carry out adjustment as required.

**3.1.11 Pistons & Connecting rod assemblies**

**3.1.11.1** The contractor shall remove all pistons and connecting rod assemblies, reference instructions in Group # 3. Refer to service data – Piston, connecting rod document No. 91 939 104 00E for all measurements, clearances and tightening torques.

**3.1.11.2** Contractor to note that 12 old Connecting Rods and Pistons complete with grudgen pins and retainer clips and small end bushings are to be replaced with all new owner supplied.

**3.1.11.3** Contractor is to have Wartsila FSR survey the old pistons and connecting rods and recommend which ones are suitable for further use these units shall cleaned up by contractor and measurements taken and recorded for the final reports. These units shall be crated up and marked and given to the Chief Engineer. All components not recommended for further use to be disposed off by contractor as per provincial regulations.

**3.1.11.4** Contractor to install all new piston rings. Using a ring expander for installation of all rings.

**3.1.11.5** All new connecting rods have to be cleaned of packing protection and there oil ways cleaned. New small bushings have to be pressed into all new connecting rods.

**3.1.11.6** All connecting rod bottom end bearings shall be renewed. All new upper & lower con rod bottom end bearings shall be fitted in each individual connecting rod and the bearing cap tightened to the manufacturers final torque value. Contractor shall gauge the fitted bearing halves inside diameter axially and horizontally and compare to makers specifications prior to fitting in engine.

**3.1.11.7** Contractor to replace all big end bearing cap bolts with new.

**3.1.11.8** All new components (pistons, connecting rod, small end bushings, grudgen pins) shall have their measurements with them went they come from the manufacture, Wartsila FSR to verify these and enter them in the record table for their final report.

**3.1.11.9** Prior to installation of new pistons, new piston rings and oil scraper rings will have all clearances and ring gaps taken and recorded by the contractor.

**3.1.12 Cylinder Liners**

**3.1.12.1** The contractor shall remove, crate up and transport to Contractor facility clean, inspect, N.D.T., gauge wear and hone cylinder liners as per manufactures instruction manual.

**3.1.12.2** Wear readings will be taken and recorded on the cylinder liners at the top, middle and lower piston wear area's Port & Stbd, fore and aft. Contractor shall use Wartsila's measurement record sheet document no. 91 943 001 00E in group 2 of manual. Any liners exceeding the manufacturer's wear limits as described in the instruction manual shall be discussed with the FSR and Chief Engineer to determine if re-conditioning could add service life or if a new liner is required.

**3.1.12.3** All liners to be de-scaled by sand blasting with glass beaded on the jacket water side and anti-corrosive primer applied.

**3.1.12.4** All rust scale and debris to be removed from internal block walls also the cylinder block will be checked for erosion at the O-ring sealing surfaces and at liner flange collar.

**3.1.12.5** Contractor shall include in the bid price to have an authorized technician to carry out a non-destructive test fluorodized magna-flux to check for cracks on all twelve cylinder liner flange collar seats on the underside. Test results shall be given to the chief engineer as soon as tests have been completed.

**3.1.12.6** Contractor shall hone all cylinder liners to produce a cross hatch pattern as per manufacturer's specifications. Contractor shall gauge all liners after honing is completed as per manufacturer's instructions.

**3.1.12.7** Contractor after reconditioning cylinder liners shall crate liners and return to vessel for installation.

**3.1.12.8 Prior to installation of the cylinder liners the cylinder block and fuel injection pump landing has to be machined.**

**3.1.12.9** Contractor shall follow instructions on page's 13/14 Group 2 Section 2 and 2.2 before installing cylinder liners as per instruction manual. New cylinder liner O-rings shall be fitted and lubricated.

**3.1.12.10** Contractor shall lap the 12 cylinder block landing areas where each liner seats. Contractor shall lap the underside of all 12 cylinder liner shoulders. This lapping shall be carried on the block and cylinder liners until a uniform profile is attained on both. Vessel will supply the lapping tools. Chief Engineer shall inspect finished lapped surfaces prior to re-assembly.

**3.1.13 Cylinder Block Machining**

**3.1.13.1** Contractor prior to machining has to blank off all opening in the engine that filings from machining might enter the engine this included blocking the bottom liner landing so no filing go into the crankshaft base.

**3.1.13.2** Contractor must wrap all crankshaft journals with rubber packing 1/8" thick.

**3.1.13.3** Contractor must ask the Wartsila FSR on any other procedure that should be taken prior to cylinder block machining starting.

**3.1.13.4** Contractor to have Chief Engineer to carry out an inspection prior to machining starting.

**3.1.13.5** Contractor to supply the services of Wartsila FSR machinist and all the proper machine tooling.

**3.1.13.6** Contractor to bid on machining cylinder block in way of cylinder liner landings quantity 4 and quote per 1 for adjustment purposes. After the engine is stripped down the number liner landings to be machined will be determined by Chief Engineer in consultation with Wartsila FSR.

**3.1.13.7** After machining contractor must remove all blanks and clean up any debris as guide by Wartsila FSR after everything is cleaned up contractor shall have Chief Engineer inspected the cleanness to his satisfaction.

**3.1.14 Fuel Injection Pump Landing Machining**

**3.1.14.1** Contractor prior to machining has to blank off all opening in the engine that filings from machining might enter the engine.

**3.1.14.2** Contractor to supply the services of Wartsila FSR machinist and all the proper machine tooling. Contractor to assist Wartsila machinist to machine the required fuel oil pump landings.

**3.1.14.3** Contractor bid on machining 12 fuel oil pump landings and quote per one for adjustment purpose by PWGSC 1379 action. After the engine is stripped down the number fuel oil pump landings to be machined will be determined by Chief Engineer in consultation with Wartsila FSR.

**3.1.14.4** After machining contractor must remove all blanks and clean up any debris as guide by Wartsila FSR after everything is cleaned up contractor shall have Chief Engineer inspected the cleanness to his satisfaction.

**3.1.15 Camshaft Sections**

**3.1.15.1** Contractor under direction of Wartsila FSR (as per manufacture's procedures) shall change out #3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 camshaft sections complete including the bearings with new owner supplied camshaft sections and bearings.

**3.1.16 Crankshaft Main , Support & Thrust Bearings**

**3.1.16.1** Contractor shall remove all main and support bearing shells for inspection, there are nine main bearings in total of which two are support bearings one in the fore end housing and one at the flywheel end. The support bearings are fitted in a cage bolted to the engine housing and fitted with lock wire.

**3.1.16.1.1** Refer to Group 2 first section instructions for hydraulic tightening equipment for main bearing cap screws.

**3.1.16.1.2** Removal of main bearing caps involves removal of cross bar bolts in the cap being removed and slacking up the adjacent cross bar bolts fore and aft. Maximum of two main bearings shall be removed at one time to provide support for the crankshaft.

**3.1.16.1.3** Contractor shall renew O-rings on all cross bar bolts on re-installation. Contractor to take note that access to removal of some of the cross bar bolts involves removal of deck plate framing which the contractor is responsible for, the contractor shall replace framing as original.

**3.1.16.1.4** Contractor shall gauge wear and reinstall all bearings.

**3.1.16.2** Contractor shall remove the thrust bearings for inspection located at the flywheel end, four thrust ring halves. Contractor shall gauge wear and reinstall the thrust bearings. Contractor is reminded here to gauge and record the crankshaft axial play before removal and after re-installation of the thrust bearings.

**3.1.16.3** Contractor shall examine and gauge for wear all main, thrust and crank pin bearing journals**.**

**3.1.16.4** The contractor shall check torque on balance weight bolts as per manufacturer's instructions.

**3.1.16.5** Contractor shall renew O-rings & gaskets on all exterior oil feed supply piping to the main bearings.

**3.1.16.6** The contractor shall dismantle the three crankcase relief valves for inspection, cleaning and renewal of worn components as follows:

**3.1.16.6.1** Springs, valve seats and O-rings. New O-rings and door gaskets shall be fitted.

**3.1.16.6.2** On re-assembly of the relief valves the contractor has to prove to Lloyd's surveyor that they are functional.

### 3.1.17 Rear Crankshaft Oil Seal

**3.1.17.1** The contractor shall fit a new rear crankshaft oil seal as per manufacturer's instructions.

### 3.1.18 Vibration Damper Replacement

**3.1.18.1** Contractor shall remove the existing two piece vibration damper assembly (high viscosity silicone fluid type) and install a vessel supply re-conditioned unit. The fore end housing will have to be removed to gain access for the replacement of the damper assembly and re-installed after completion. The fore end housing is doweled to the cylinder block. The gear transmission for driving the main lube oil pump, jacket water and raw water pumps are in this fore end housing driven off the crankshaft which require removal to gain access to damper.

**3.1.18.2** All pumps, charge air cooler removals and subsequent overhauls of each component are covered in other sections of this specification.

**3.1.18.3** Engine bedplate alignment jacks and chock fast I.W.O. fore end housing.

**3.1.18.4** Additional removals as follows to gain access are raw water and jacket water piping to and from pumps, lube oil piping to and from pump and oil pressure regulator, jacket water electric pre-heater and piping, secondary fuel oil twin filter housing / piping and save all, pre lube oil pump piping, deck plating steel support angle.

**3.1.18.5** Check diametrical clearances on all gearing bushings and check gearing teeth for defects using the dye-penetrant method.

**3.1.18.6** Check alignment between fore end housing and crankshaft prior to and after installation of the new damper is required.

**3.1.18.7** Record back lash on all fore end gearing prior to and after installation of the new damper is required.

**3.1.18.8** Renew all gaskets as per type and grade applicable to the fluid being handled including the fore end housing gasket between housing and cylinder block.

**3.1.18.9** All components shall be re-assembled and all fasteners to be tightened to the manufacturers specified torque values as stated in the overhaul manual. All fasteners requiring lock wire and or Loctite shall be applied.

**3.1.19 Main lubrication oil pump & Lube Oil Pressure Regulation dump valve**

**3.1.19.1** The contractor shall remove main lubrication oil pump from the fore end housing. See spare parts notice document No. 91 978 048 00E dated 2008 – 04-25.

**3.1.19.2** Wartsila will not sell individual overhaul components for the pump any more due to safety concerns with mis-alignment when fitting new bushings.

**3.1.19.3** Vessel shall supply a replacement pump. The original pump shall be given to the Chief Engineer to send back for a rebate core towards a new pump.

**3.1.19.4** The new pump shall be fitted as per the manufacturer's instructions. All removed piping will be re-installed using new gaskets and bolts.

**3.1.19.5** Contractor to check and adjust pump drive gear backlash to within manufacturer's specifications.

**3.1.19.6** The oil pressure regulation dump valve shall be opened up and inspected, re-assembled and installed. Contractor shall mark adjustment screw and verify adjustment setting during run in trials.

**3.1.20 Pre Lube Oil Pump**

**3.1.20.1** The contractor shall remove and open up the pre-lube oil priming pump for cleaning, survey and inspection of components.

**3.1.20.2** The pump is attached to an electric drive motor. Record clearance between impeller and pump casing. The pump shall be reassembled with new gaskets and seals and installed on the engine as per manufacturer's specifications.

**3.1.20.3** Contractor shall test run unit to prove operational pressures are reached with no leaks.

**3.1.21 Fuel Oil Booster Pump**

**3.1.21.1** The contractor shall remove and open up the fuel oil booster pump for survey / inspection.

**3.1.21.2** The booster pump is fitted to the main lube oil pump at the fore end housing driven through a drive coupling.

**3.1.21.3** All components shall be inspected for wear.

**3.1.21.4** The pumps shall be reassembled and reinstalled as per manufacturer's specifications using new gaskets, drive coupling and seals.

**3.1.22 Jacket water Pump + Raw water Cooling Pump**

**3.1.22.1** The Jacket water and raw water cooling pumps shall be removed and opened up for survey and inspection.

**3.1.22.2** All components shall be inspected for wear. The pumps shall be re-assembled as per manufacturer's specifications ensuring correct clearances of all pump components, using new O-rings, bearings, and seals, the pump will be re-installed with new gaskets.

**3.1.22.3** Clearances shall be recorded.

**3.1.22.4** All removed piping will be installed using new gaskets and bolts.

**3.1.23 Turbo Chargers (2 units)**

**3.1.23.1** The contractor shall remove the two Brown Broveri VTR 200N turbo chargers, the turbo chargers are to be crated and transported to an authorized repair facility for overhaul.

**3.1.23.2** The turbo chargers shall be opened up and all parts cleaned and inspected for wear distortion and cracks.

**3.1.23.3** Contractor shall install all new bearings and seals. The rotors will be dynamically balanced; the turbo chargers will be reassembled using new bearings contractor supply and seals then shop tested.

**3.1.23.4** Contractor shall record axial and radial run out and end float on the main turbine shaft.

**3.1.23.5** The turbo chargers to be crated and returned to contractor for re-installation with new gaskets, all in accordance with manufacturer's specification.

**3.1.23.6** Chief Engineer and Lloyd's surveyor to survey turbo chargers when they are opened up at repair shop. All used parts to be returned to ship.

**3.1.24 Jacket water cooler (Alfa Laval Plate type)**

**3.1.24.1** The contractor shall open up Stbd main engine jacket water cooler as per manufacturer's instruction for cleaning and for inspection by the Lloyd's surveyor.

**3.1.24.2** Prior to dismantling the cooler the Contractor shall record the plate pack compression dimension at all four corners.

**3.1.24.3** Contractor shall dismantle the cooler and tag plates for correct re-assembly.

**3.1.24.4** All cooler plates shall be cleaned with a fiber type brush following the recommended cleaning procedures as detailed in the instruction manual. Contractor shall inspect all cooler plate gaskets to determine serviceability.

**3.1.24.5** Cooler shall be rebuilt and plate pack tightened to original dimension. Verify minimum / maximum compression dimension is instruction manual prior to tightening, tighten in unison to prevent plate distortion and damage.

**3.1.24.6** Contractor shall hydrostatically pressure test the cooler as per manufacturer's instructions, pressure to be applied for one half hour. Test pressure is stamped on name plate. The Lloyd's surveyor and Chief Engineer shall witness test.

**3.1.25 Lube oil Cooler (Tube Type)**

**3.1.25.1** The contractor shall open up the Stbd main engine lube oil cooler (tube and shell type) for inspection by the Lloyd's Surveyor.

**3.1.25.2** Contractor shall drain the lube oil from the cooler. Tag and remove the cooler associated piping.

**3.1.25.3** Remove cooler shell end covers and clean the tube nest. Rebuild cooler using new O-rings and gaskets suitable for water and lube oil as required.

**3.1.25.4** Cooler shall be hydrostatically pressure tested as per manufacturer's instruction to 70 P.S.I. at 40 ° Celsius for 30 minutes . Chief Engineer and Lloyd's surveyor shall witness test.

**3.1.25.5** Cooler piping shall be fitted with new flange gaskets, contractor shall supply gaskets suitable for water and lube oil as required for pipe flanges.

**3.1.26 Jacket Water Temperature regulators**

**3.1.26.1** The contractor shall open up three temperature regulators on the fresh water cooling system, two on the engine and one adjacent to the jacket water cooler. The thermostats are to be tagged for re-installation to their original places. All thermostat housings shall be opened up and cleaned.

**3.1.26.2** Contractor shall install all new thermostatic elements. Prior to installation the new elements shall be tested to prove that they open at the specified manufacturers operating temperature range. After testing and inspection of the thermostats, the temperature regulators shall be closed up using new gaskets; contractor shall supply gasket material of approved type for the intended application for flanges on re-installation.

**3.1.26.3** All three temperature regulators have different temperature ratings; the temperature is stamped on the element. Contractor shall have the Chief Engineer confirm which elements belong in each unit.

**3.1.27 Lube Oil System temperature regulators**

**3.1.27.1** The contractor shall open up one temperature regulator on lubrication oil cooling system and clean housing and flanges.

**3.1.27.2** Contractor shall install all new thermostatic elements. Prior to installation the new elements, they shall be tested to prove that they open at the manufacturers operating temperature range.

**3.1.27.3** After testing and inspection the temperature regulator shall be closed up using new gaskets, contractor shall supply gasket material of approved type for the intended application for flanges on re-installation.

**3.1.28 Charge Air Cooler**

**3.1.28.1** The contractor shall remove the charge air cooler (weight approximate 1000 pounds) of the fixed tube plate design-non removable tube stack as per the manufacture instructions and re-installed new Owner supplied Charge Air Cooler on engine with all new piping connection gaskets of approved material for the intended purpose.

**3.1.28.2** Old Charge Air Cooler to dispose of at Contractor expense as per Provincial Regulations.

**3.1.29 Engine Hold Down Bolts**

**3.1.29.1** The contractor shall inspect and check tightness of all engine hold down bolts as manufacturer's instruction, using a torque wrench. Verification of such adjustments shall be passed to Chief Engineer.

**3.1.30 Completion of the Engine Overhaul**

**3.1.30.1** Upon completion of the engine overhaul, the engine and base will be cleaned out as per manufacture procedures or as directed by Wartsila FSR, and checked by Chief Engineer.

**3.1.30.2** The engine will then be closed up using new gaskets, joints and packing.

**3.1.30.3** All liquids systems will be filled with manufacturer's specified fluids and any leaks shall be repaired.

**3.1.30.4** On successful completion of the engine tests and trials listed below, all fuel and lube oil filters will be removed and new filters will be fitted complete with new filter gaskets.

**3.1.30.5** Old Lube oil filters shall be opened to check for metal.

**3.1.30.6** All equipment, components, wiring, etc impeding or effected by the overhaul will be repaired by the contractor at contractor's expense, and will be restored to the original or superior condition at the completion of the overhaul.

**3.1.31 Functional Requirements**

The work will ensure that the stbd main engine meets classification society requirements.

**3.1.31.1 Test & Trials requirements:**
**Dock trials**

**3.1.31.2** Ship's Chief Engineer will verify all VTS Alarm and monitoring system Port main engine alarms are functioning as per normal.

**3.1.31.3** The engine shall be turned by hand to prove freedom of operation and the Contractor shall carry out the engine trials as per Wartsila service instruction document No. 91 960 009 00E "Running – in of engines after major overhauls". See instruction as to load sequence and duration. Contractor shall allow 6 hours. Dock trials shall be conducted in the presence of the Lloyd's Classification Society Surveyor, and Ships Chief Engineer.

**3.1.31.4** As soon as the engine attains normal temperatures and pressures, the control, safety and over speed systems will be verified to operate correctly, Chief Engineer to witness the following:

**3.1.31.4.1** Low lube oil pressure alarm.
**3.1.31.4.2** Low lube oil press shutdown.
**3.1.31.4.3** High jacket water temperature shutdown.
**3.1.31.4.4** High jacket water temperature alarm.
**3.1.31.4.5** Over speed.

**3.1.31.5** Crankcase internal check required to check for jacket water leakage and component temperature checks.

**3.1.31.6** Record temperature and pressures at 15 minute intervals following completion of the normal start up procedures including main and connecting rod bottom end bearing temperature checks.

**3.1.31.7** Take and record firing and compression readings when engine reaches maximum trial load limit.

**3.1.31.8** The lubrication oil pump, fresh water pump, and sea water pump, and turbo-chargers shall be tested in accordance and confirmed to meet the specified manufacturer's performance parameters.

**3.1.31.9 Sea Trials**

**3.1.31.9.1** Important ** Full load trials cannot be tested until the engine has been run in at a reduced load for up to 24 hours. Refer to Wartsila service instruction document No. 91 960 009 00E "Running – in of engines after major overhauls".

**3.1.31.9.2** Following the dock trials the engine will be run for 4 hours at sea. Firing and compression readings will be taken and recorded, Wartsila FSR to balance individual cylinder loads at this time. Contractor shall note all leaks requiring repairs, all defects and leaks to be repaired by the Contractor prior to signing off the specification.

**3.1.32 <u>ADDENDUM</u>**

**The contractor shall record all measurements as follows:**

Reference Nohab Instruction manual No. 12555

Group 2 Data and Specifications Document No. 91 939 103 00E dated 96-11-5 Issue 16

Section 1 – Crankshaft deflections

Section 2 – Checking Liner + Piston

Section 3 – Cylinder liner specs

Section 5 – Clearances crankshaft fore end + Main and Thrust bearing diametrical and axial clearances

Section 6 – Backlash on gearing in fore end housing

Group 3 Data and Specifications Document No. 91 939 104 00E dated 95-03-23 Issue 9

Section 1 – Piston Rings (Gaps + Axial)

Section 2 – Connecting Rod - Diametrical + Axial + Ovality

Group 4 Cylinder head overhaul service instruction Document No. 91 960 003 00E dated 08-04-28 Issue 6

Section 1 - Measurement of valve wear before dismantling cylinder head

Section 11 - Grinding in of sealing faces

Service data – Cylinder head and valves Document No. 91 939 105 00E dated 2001-01-18 Issue 7

Section 2 – Valve clearances (cold engine)

Section 3 – Valve wear limits

Section 5 – Bearing clearances Rocker arm Pins and bushings + Yoke to Yoke guide clearances + Valve to valve guide clearances

Service instructions - document No. 91 960 003 00E dated 1987-06-12

Section 11 - All cylinder head to cylinder liner clearances after grinding in of sealing faces

Group 5 Service data – Gear train and camshaft Document No. 91 939 106 00E dated 2001-05-16 Issue 14

Section 1 – Flywheel end Bearing clearances Gear wheel + Camshaft bearing bushings + Camshaft thrust bearing bushings

Section 2 – Gear backlash Flywheel end

Group 7 Service data – Fuel System Doc. No. 91 939 108 00E dated 2001-07-09 Issue 10

Section 3 – Fuel oil feed pump axial clearance

Group 8 Service data – Lubricating System Doc. No. 91 939 109 00E dated 1999-11-04 Issue 7

Section 3 – Lube oil circulating pump axial clearance

**3.1.32.1** In addition to the above the Contractor shall record the following:

**3.1.32.1.1** All Pistons diameters to be measured Port & Stbd, fore & aft in relation to the engine above the top ring, below the bottom ring and at the piston skirt.
**3.1.32.1.2** Crank pin journal diameters.
**3.1.32.1.3** When new piston rings are fitted all clearances on piston rings as per makers specifications.
**3.1.32.1.4** All piston gudgeon pin diameters, piston pin bores, connecting rod upper bush inside diameters with corresponding clearances.
**3.1.32.1.5** All crank pin journal diameters.
**3.1.32.1.6** Crankshaft end play (axial) before starting overhaul and upon completion of the overhaul.
**3.1.32.1.7** All valve springs free height as per maker's specifications.
**3.1.32.1.8** Pre-lube oil pump rotor to stator clearance.
**3.1.32.1.9** Jacket water and raw water pump wear ring clearances.
**3.1.32.1.10** Fuel oil booster pump axial clearance on pumping assembly.
**3.1.32.1.11** Lubrication oil pump-axial clearance.
**3.1.32.1.12** Radial and axial run out on both turbo-charger main rotor/compressor shaft assemblies.
**3.1.32.1.13** All camshaft bearings diametrical clearances and camshaft thrust bearing axial clearances.
**3.1.32.1.14** Hydraulic governor drive gear to pinion backlash.

**3.2 Location**

**3.2.1** N/A

**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 shall be inspected by Lloyds 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** All coolers shall be tested as per this specification and shall witness by Chief Engineer and Lloyd's surveyor.

**4.2.2** Contractor to carry out functionally test as required by Lloyd's surveyor described previously in this specification.

**4.2.3** Sea Trials to be carried important note full load trials cannot be tested until the engine has been run in at a reduced load for up to 24 hours. Refer to Wartsila service instruction document No. 91 960 009 00E "Running – in of engines after major overhauls".

**4.2.4** Following the dock trials the engine will be run for 4 hours at sea. Firing and compression readings will be taken and recorded, Wartsila FSR to balance individual cylinder loads at this time. Contractor shall note all leaks requiring repairs, all defects and leaks to be repaired by the Contractor prior to signing off the specification.

**4.3 Certification**

N/A

**Part: 5 DELIVERABLES:**

**5.1 Drawings/Reports**

**5.1.1** Contractor to supply to Chief Engineer three written and one electronic copy of all work carried out including measurements and FSR reports.

**5.2 Spares**

**N/A**

**5.3 Training**

**N/A**

***5.4 Manuals***

**N/A**

| Spec item #: ED-03 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **ED – 03 : PORT & STBD M/E Controls Upgrade** | | |

**Part: 1 SCOPE:**

**1.1** The intent of this specification shall be to upgrade the existing control system for Port & Stbd M/E with new UNIC C2 Controls Upgrade.

**1.2** The contractor shall supply the services of, and pay all charges for an authorized and qualified Wartsila FSR for the duration of the Controls upgrade Commissioning and all engine trials and sea trails. Contractor to include in their bid an allowance of $200,000.00 for Wartrsila FSR to be adjusted on proof of invoice by PWGSC 1379 action.

**1.3** This work shall be carried out in Conjunction with the following refit specification item: ED-02 Stbd Main Engine Overhaul.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1**

**2.2 Standards**

**2.2.1** Lloyd's Latest Electrical revision.

**2.2.2** TP127 – Ship's Electrical Standard

**2.2.3** 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

**2.4 Owner Furnished Equipment**

**2.4.1** Owner will supply the complete control upgrade equipment.

**2.4.2** 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** Contractor shall supply all equipment, enclosures, ventilation, staging, chain falls, craneage, 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, of an adequate safe working load for the expected duties. Any brackets or other welded attachments required in the performance of this specification shall be welded into place by CWB-certified welders certified to welding Std. W47.1, Div. 1 and 2.

**3.1.2** The Contractor shall arrange for Wartsila field service representatives (FSR'S) as detailed in this specification to conduct Nohab F30 UNIC C2 Engine Automation Controls Upgrade for both port (3355) and stbd (3356) main engines. Contact for the FSR is as follows:

Barry Broderick
Sales Manager/ Branch Manager
Wartsila Canada Inc
27 Sagona Ave
Mount pearl, NL
Canada
Telephone 709-747-4600 mobile 709-699-8126
Barry.broderick@wartsila.com
www.wartsila.com

**3.1.3** Contractor to supply Wartsila FSR'S for:

**3.1.3.1** Installation (two Engineer, one supervisor) for 28 (12hr) working days.

**3.1.3.2** Commissioning (one Superintendent) for 3 (12hrs) working days.

**3.1.3.3** Commissioning Sea trial (one Superintendent) for 2 (12hrs) working days.

**3.1.3.4** Training vessel's crew (one Superintendent) for 1 (12hrs) working day.

**3.1.4** For the purpose of this installation, the Contractor shall be responsible for the running of new cabling, modifications to existing consoles, the fabrication and installation of new mounting arrangements for new components, and removal of surplus equipment including piping and cabling. All activities will be as per the direction of the FSR.

**3.1.5** The Contractor shall allow for the provision of two (2) electrician for this specification item. For bid purposes, the Contractor shall allow for 400 hours. For the purpose of bid adjustment, the Contractor shall include the hourly rate for this provision.

**3.1.6** The Contractor shall allow for the provision of one (1) welder with required fire watch for this specification item. For bid purposes, the Contractor shall allow for 80 hours. For the purpose of bid adjustment, the Contractor shall include an hourly rate for this provision.

**3.1.7** The Contractor shall ensure that all electrical supplies for the identified equipment have been isolated and are secured using the established lock-out / tagout procedure as outlined in the preamble.

**3.1.8** The Contractor shall be responsible to arrange for Lloyd's survey when completing this specification item.

**3.1.9** 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. The Contractor shall also ensure that the area of work, the system, and the adjacent space is certified as gas free and suitable for hotwork as per the preamble.

**3.1.10** The Contractor shall be responsible to ensure that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this specification item.

**3.1.11** The Contractor shall include for all temporary and permanent removals for the completion of this specification item. All permanent removals are to be disposed of by the Contractor unless otherwise directed by the Owner.

**3.1.12** The Contractor shall remove weld splatter, smooth weld seams and sharp edges, and remove grease, smoke, and soot marks as per SSPC-SP1. All welds shall be power tool cleaned to SSPC-SP3.

**3.1.13** The Contractor shall recoat all heat affected and new steel with two coats of Amercoat Red Oxide Primer followed by two topcoats of Amercoat 5450 of the appropriate colour on all surfaces for a final DFT of 3.5 mils. All coatings shall be Contractor supplied.

**3.1.14** The Contractor shall provide all WHIMIS data sheets for all chemicals, coatings, solvents, etc. which are being used during the course of this specification item. All containers of such are to be removed from the work site at the end of each work day.

**3.1.15** Contractor to contact Chief Engineer prior to starting any work.

**3.1.16** Contractor shall carry out the following before commencement of work:

**3.1.16.1** Isolate and lock out tag out engine's air starting system.

**3.1.16.2** Isolate and lock out and tag out the jacket water pre-heater system.

**3.1.16.3** Isolate lock out and tag out the fuel system valves supply and return lines.

**3.1.16.4** Isolate and lock out and tag out the raw water system valves.

## 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 control features inspection by Chief Engineer and Lloyd's Surveyor.

### 4.2 Testing

**4.2.1** All control features to be tested and proven operable to Chief Engineer and Lloyd's Surveyor. Start & Stop, safety and overspeed system will be verified to operate correctly.

**4.2.2** Chief Engineer and Lloyd's surveyor to witness the following:

**4.2.2.1** Low lube oil pressure alarm

**4.2.2.2** Low lube oil pressure shut down

**4.2.2.3** High jacket water temperature alarm

**4.2.2.4** High jacket water temperature shutdown

**4.2.2.5** Overspeed shut down

### 4.3 Certification

**4.3.1** System has to be certify by Lloyd's Classification Society.

## Part: 5 DELIVERABLES:

### 5.1 Drawings/Reports

**5.1.1** Contractor to supply three type written and one electronic copy of all work complete including FSR report and Lloyd's inspections and certifications.

**5.1.2** The Contractor shall generate a new "As Fitted" drawing for the work. These drawings shall be provided in both electronic and hardcopy format. Electronic copies shall be supplied in AutoCAD format – latest edition.

### 5.2 Spares

**5.2.1** All spares which have been supplied with this item and have not been used in the installation shall be returned to the Owner prior to the acceptance of this item.

**5.3 Training**

**5.3.1** The Contractor shall provide one (1) training course of eight (8) hour duration to be held onboard after the final installation and commissioning of all new propulsion controls and governors. This training shall be provided to the engineering and navigation staff and be provided by the manufacturer's technical representative (FSR). Training shall encompass all items outlined in the operating and maintenance instructions as supplied by the manufacturer.

**5.4 Manuals**

**5.4.1** The Contractor shall ensure that all operation, maintenance, and installation manuals supplied with the new equipment unit are submitted to the Owner prior to the acceptance of this item.

| Spec item #: ED-04 | **SPECIFICATION** | |
|---|---|---|
| **ED - 04 : Stbd ME Silencer** | | |

**Part: 1 SCOPE:**

**1.1** The intent of this specification shall be, Contractor to remove the existing insulation on the Starboard Main Engine Exhaust Silencer, and replace with new insulation.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1** Exhaust system piping as fitted. Drawing # 590-52 sheet 1 of 2
Exhaust system piping as fitted. Drawing # 590-52 sheet 2 of 2

**SILENCERS DEMENSIONS**

**Starboard Main Engine** silencer without the insulation

Height 101 inches

Diameter 56 inches

There is a section toward the top of the silencer that is shaped like half circle that is attached to the silencer. That section is

Length 45 inches

Radius 8 inches

The main exhaust piping that is going into and coming from the silencer is

Diameter 18 inches

**2.2 Standards**

**2.2.1** N/A

**2.3 Regulations**

**2.3.1** Contractor must comply with, the latest edition of all Provincial Regulations.

a) Lock out –Tag Out
b) Work at heights and Fall Protection.
c) Scaffolding

d) Insulation

## 2.4 Owner Furnished Equipment

**2.4.1 Parts / Material /Equipment/Rigging:** Contractor shall supply all consumables, tools, equipment, and rigging, to carry out the work in this specification unless otherwise stated.

## Part: 3 TECHNICAL DESCRIPTION

## 3.1 General

**3.1.1** Contractor shall inform Chief Engineer prior to starting work.

**3.1.2** The contractor shall confirm with the Chief Engineer that the controls and air supply to Stbd main engine is isolated, locked out and tagged prior to work being starting and there is no machinery running.

**3.1.3** Contractor shall complete all forms required for lock out – tag out and working aloft as per the latest of the Provincial Regulations.

**3.1.4** Contractor must have scaffolding/staging erected by a qualified person under the latest edition of the Provincial Occupational Health and Safety Regulations. The contractor must have scaffolding/staging from the engine room deck to the Navigation Deck.

**3.1.5** When the staging is in place the contractor must use qualified personal under the Provincial Occupational Health and Safety Regulations the latest edition. The qualified personal are to remove and dispose of existing insulation material (Calcium Silicate) as per Provincial Environmental Regulations.

**3.1.6** Contractor shall make sure all the insulation and debris is cleaned up in the immediate area and the area below in the engine room after the insulation is removed.

**3.1.7** Contractor must leave the staging in place so that the silencer can be checked for leaks by the Chief Engineer and repairs made if required.

**3.1.8** Contractor must use qualified personal under the Provincial Occupation Health and Safety Regulations of the latest edition to install the new removable insulation covers which are to be secured to the silencer surface with 10 gauge steel weld pins and washers to prevent movement.

**3.1.9** Contractor shall supply the insulation material and fabricate from the material two layers of inch thick removable blankets.

**3.1.10** Contractor must install the new two layers of removable insulation blankets. The inner layer blanket shall consist of a high temperature insulation core (Superwool 607 blanket by Morgan Thermal Ceramics) with stainless steel mesh on both faces. The outer layer blanket shall consist of insulation core (Tri-L vitreous silicate needled blanket insulation) with stainless steel mesh on the inner face and silicone cloth on the outer face.

**3.1.11** Contractor when installing must make sure that all covers can be sewn stapled or hog ringed. Sewn seams are to be of a heavy high temperature tread. All covers to fit snuggly around the equipment being insulated.

**3.1.12** Contractor to make sure that all covers to be made are to include, all openings including pipe, packing glands, valve stems and handles, hangers and other obstacles.

**3.1.13** Contractor to make sure to fabricate the covers so that no force bending or folding is required for the installation and no visible strain is on the fabric once the blankets are in place.

**3.1.14** Contractor shall ensure that a minimum of 2 inch overlap seam where joining to other covers or insulation and where a cover has to be made in more than one piece.

**3.1.15** The insulation covers shall be drawn together with stainless steel wire secured through lacing anchors that are placed no less than 25 mm away from any seam edge and secured through the entirety of the pad with a backing plate. Wire shall be woven through the anchors to draw the pad together and allow the overlap to fall in place around the seams.

**3.1.16** Once the insulation is complete the Chief Engineer and Lloyds Surveyor is to witness the installation.

**3.1.17** Upon completion the contractor shall use qualified personal under the Provincial Health and Safety Regulations latest edition to disassemble the scaffolding /staging and remove it.

**3.1.18** Contractor and the Chief Engineer shall remove the lock out- tag out locks and complete the necessary forms for the vessels ISM book.

**3.1.19** All work to be witnessed by the Chief Engineer.

**3.2 Location**

**3.2.1** Frames 27-42

**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** The Chief Engineer and Lloyds Surveyor to visually inspect 100 % of the work.

**4.2 Testing N/A**

**4.3 Certification**

a) Exhaust Insulation Material must be Lloyds Approved.

b) Contractor shall supply the certificate for each of the insulation material showing that it contains no asbestos and shows the temperature rating of each of the insulation material.

**Part: 5 DELIVERABLES:**

**5.1 Drawings/Reports**

**5.1.1** Contractor shall supply the Chief Engineer with three typed copies and one electronic copy of a report of all work that carried out. The report shall include all measurements off the total area that was covered on the silencer. The types of insulation used for each layer and the temperature rating for each and their certificate.

**5.2 Spares**

**N/A**

**5.3 Training**

**N/A**

**5.4 Manuals**

**N/A**

| Spec item #: ED-05 | **SPECIFICATION** | |
|---|---|---|

**ED - 05 : Exhaust Piping Supports**

**Part: 1 SCOPE:**

**1.1** The intent of this specification shall be for contractor remove all the Exhaust Piping Isolator Support Mounts, Sway Braces, Cushions, Stabilizers as listed in this specification for the Port and Starboard Main Engines, # 1, #2 and #3 Auxiliary Generators, Emergency Generator and Incinerator.

**1.2** Contractor shall supply all Original Equipment Manufactured (OEM) components as listed in this specification from Vibra – Sonic Control Ltd.

**1.3** Contractor shall install all new components for the Exhaust System as per Exhaust System Piping as Fitted Drawings as per original equipment.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1** Exhaust System Piping as Fitted, Drawing # 590-52 sheet 1 of 2.
Exhaust System piping as Fitted Drawing # 590-52 sheet 2 of 2.

Profile and Decks Drawing # 590-04

**2.1.2** The original components supplier are
Vibra – Sonic Control Ltd

Burnaby BC

(604) 294-9495.

**2.1.3** Below is the list of parts required for the exhaust piping, no substitutions.

**2.1.3** the

Material List For Specification ED-05
Exhaust Piping Support
VLE 2015.
(1 of 2)

Appendix 1 VIBRA-SONIC CONTROL LTD.

ISOLATION MATERIALS PROPOSAL - 72 METRE FISHERIES PATROL VESSEL

ITEM 1: STACK PIPE CUSHIONS - Stanley Palmer VA50427 /16&/25

| Exhaust System Name | Pipe Size | Cushion Thickness | Quantity of Pads |
|---|---|---|---|
| Starboard Engine | 500 mm | 25 mm | 30 |
| Port Engine | 500 mm | 25 mm | 30 |
| Incinerator | 300 mm | 25 mm | 20 |
| No 1 Generator | 200 mm | 16 mm | 13 |
| No 2 Generator | 200 mm | 16 mm | 13 |
| No. 3 Generator | 200 mm | 16 mm | 13 |
| Emergency Generator | 150 mm | 16 mm | 10 |

ITEM 2: ISOLATORS - Stanley Palmer W302 Series

| Exhaust System Isolation xx (Location) | Total Kg. Sys. Load | (kg.) Load | Isolator Type | Quantity |
|---|---|---|---|---|
| Port Engine | | | | |
| 1 (Below Silencer) | 149 | 75 | W302-1 | 2 |
| Port Engine Silencer | | | | |
| 2 (Under Silencer Legs) | 1968 | 492 | W302-3 | 4 |
| Starboard Engine | | | | |
| 3 (Below Silencer) | 512 | 256 | W302-2 | 2 |
| Starboard Engine Silencer | | | | |
| 4 (Under Silencer Legs) | 1606 | 401 | W302-3 | 4 |
| Incinerator | | | | |
| 5 (Upper Supports) | 349 | 174 | W302-1 | 2 |
| 6 (Lower Supports) | 318 | 159 | W302-1 | 2 |
| 7 (Upper Deck) | 205 | 102 | W302-1 | 2 |
| No 1 Generator & piping | | | | |
| 8 (Under Silencer Legs) | 773 | 258 | W302-2 | 3 |
| No. 2 Generator & piping | | | | |
| 9 (Under Silencer Legs) | 773 | 258 | W302-2 | 3 |
| No. 3 Generator | | | | |
| 10 (Under Silencer Legs). | 773 | 258 | W302-2 | 3 |
| Emergency Generator | | | | |
| 11 (Under Silencer Legs) | 455 | 152 | W302-1 | 3 |

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**2.1.4** The

Material List For Specification ED-05
EXHAUST PIPING SUPPORT
VLE - 2015
(2 of 2)

ITEM 3: SWAY BRACES - Stanley Palmer W1006/xx

| Exhaust System Isolation xx (Location) | Total kg. Sys. Load | SWAY BRACES Load | Type | Quantity |
|---|---|---|---|---|
| Port Engine | | | | |
| 12 (Piping Top-Wheelhouse) | 357 | 357 | W1006-16 | 2 |
| 13 (Piping Middle-Nav.Brg. | 357 | 357 | W1006-16 | 2 |
| 14 (Piping Bottom-Main) | 114 | 114 | W1006-13 | 2 |
| 15 (Silencer Top) | 818 | 818 | W1006-26 | 3 |
| Starboard Engine | | | | |
| 16 (Piping Top) | 357 | 357 | W1006-16 | 2 |
| 17 (Piping Middle) | 357 | 357 | W1006-16 | 2 |
| 18 (Piping Bottom) | 114 | 114 | W1006-13 | 2 |
| 19 (Silencer Top) | 818 | 818 | W1006-26 | 3 |
| 20 (Silencer Bottom) | 409 | 409 | W1006-16 | 2 |
| Incinerator | | | | |
| 21 (Upper-Wheelhouse) | 310 | 310 | W1006-15 | 2 |
| No. 2 Generator | | | | |
| 22 (1st Pair-) | 230 | 230 | W1006-15 | 2 |
| 23 (Above Muffler) | 126 | 126 | W1006-14 | 2 |
| 24 (Focsle Deck) | 276 | 276 | W1006-15 | 2 |
| 25 (Nav. Bridge Deck) | 184 | 184 | W1006-14 | 2 |
| 26 (Wheelhouse Top) | 207 | 207 | W1006-15 | 2 |
| No. 3 Generator | | | | |
| 27 (1st Pair- ) | 230 | 230 | W1006-15 | 2 |
| 28 (Above Muffler) | 126 | 126 | W1006-14 | 2 |
| 29 (Focsle Deck) | 276 | 276 | W1006-15 | 2 |
| 30 (Nav. Bridge Deck) | 184 | 184 | W1006-14 | 2 |
| 31 (Wheelhouse Top) | 207 | 207 | W1006-15 | 2 |
| No 1. Generator | | | | |
| 32 (1st Pair-) | 115 | 115 | W1006-13 | 2 |
| 33 (2nd Pair-) | 253 | 253 | W1006-15 | 2 |
| 34 (Above Muffler) | 126 | 126 | W1006-14 | 2 |
| 35 (Focsle Deck) | 276 | 276 | W1006-15 | 2 |
| 36 (Nav. Bridge Deck) | 184 | 184 | W1006-14 | 2 |
| 37 (Wheelhouse Top) | 207 | 207 | W1006-15 | 2 |
| Emergency Generator | | | | |
| 38 (1st Pair- ) | 90 | 90 | W1006-13 | 2 |
| 39 (Above Muffler) | 82 | 82 | W1006-13 | 2 |
| 40 (Nav.Brg. Deck) | 143 | 143 | W1006-14 | 2 |
| 41 (Wheelhouse Top) | 180 | 180 | W1006-14 | 2 |

## 2.2 Standards

**2.2.1** N/A

**2.3 Regulations**

**2.3.1** Replacement components must be Lloyds approved.

**2.3.2** Contractor shall comply with the latest edition of all Provincial Regulations:

2.3.2.1 Work at heights and Fall Protection.

2.3.2.2 Hot Work Procedures.

2.3.2.3 Lock – Out / Tag -Out Procedures.

**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**

**3.1.1** Contractor shall inform Chief Engineer prior to starting work.

**3.1.2** Contractor shall confirm to the Chief Engineer that the controls and air supply to each individual machinery component, for (Port & Stbd ME, #1, 2, 3 Aux Generators, Emergency Generator and the Incinerator) and all supply fans to these compartments are isolated, locked out and tagged prior to work being started.

**3.1.3** Contractor must complete all forms required for lock out – tag out and working aloft as per Provincial Regulations.

**3.1.4** Contractor shall have scaffolding/staging erected by a qualified person under the latest edition of the Provincial Occupational Health and Safety Regulations. The contractor must have scaffolding/staging from the engine room deck to the penetration where it goes out through the ships structure.

**3.1.5** If Contractor has to conduct Hot Work, prior to work commencing contractor shall notify the Chief Engineer and have the area certified for hot work by a certified chemist or other certified personal.

**3.1.6** Contractor shall take the following precautions where hot work is to be conducted. 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. Contractor shall post a copy of all certificates at the entrance to the affected spaces; and at the gangway. Protective material shall be used to prevent the spread of sparks, protecting electrical cables and other services and equipment. Fire Sentries shall be provided in each space and in all adjacent spaces, when 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 as per Provincial Regulations.

**3.1.7** Contractor shall mark each component to be removed from the Exhaust System Piping location as per drawing # 590-52 (sheet 1 & 2).

**3.1.8** Contractor shall support exhaust system piping to prevent damage when removing the individual existing support components to be replaced.

**3.1.9** Contractor shall remove all of the components on the Exhaust System Piping one component at a time to be removed and replaced with new component. This will prevent the exhaust system from excessive movement from its original position and causing any unnecessary stresses.

**3.1.10** Contractor shall replace each component as per manufactures specifications.

**3.1.11** Contractor shall make sure all the debris is cleaned up in the immediate area and the area below in the engine room and #1 Auxiliary Generator room during and after the work is carried out.

**3.1.12** Contractor must leave the staging in place so that the Exhaust System piping can be checked for leaks and repairs made if required. All machinery shall be run up at 60 % continuous load for two hours.

**3.1.13** Contractor shall check for piping misalignment issues and correct as required during the run up period with staging in place.

**3.1.14** Upon completion the contractor shall use qualified personal under the Provincial Health and Safety Regulations latest edition to disassemble the scaffolding /staging and remove it.

**3.1.15** Contractor shall notify Chief Engineer prior to removing the lock out- tag out locks and complete the necessary forms for the vessels as per Provincial Regulations.

**3.1.16** All work to be witnessed by the Chief Engineer

**3.2 Location**

**3.2.1** Drawing # 590-04 Profile & Decks ( Frame # 27-42 )

**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** Chief Engineer and Lloyd's surveyor shall visually inspect all the components after installation.

**4.2 Testing**

**4.2.1** All equipment to be run up for minimum of two hours at 60 % continuous load to check for exhaust leaks and misalignment.

**4.3 Certification**

**4.3.1** Contractor shall provide Lloyds approval certificate for all components.

**Part: 5 DELIVERABLES:**

**5.1 Drawings/Reports**

**5.1.1** Contractor shall supply Chief Engineer with three hard copies and one electronic copy of a report of all work carried out complete with certficates.

**5.2 Spares**

**5.2.1 N/A**

**5.3 Training**

**5.3.1 N/A**

**5.4 Manuals**

**5.4.1 N/A**

| Spec item #: ED-06 | SPECIFICATION | TCMSB Field # N/A |
|---|---|---|
| **(M/E) ED - 06 : Upper and Lower CPP Pumps Overhaul** | | |

# Part 1: SCOPE:

The intent of this specification is to overhaul both Upper and Lower Hydraulic CPP pumps as part of 5 year Lloyds survey

# Part 2: REFERENCES:

## 2.1 Guidance Drawings/Nameplate Data

MODEL- VICKERS
MAKE- 35V25A-1A-20-282
CAPACITY- 2.03 M3
OPERATING PRESSURE- 115 BAR
RPM- 1800

## 2.2 Standards

## 2.3 Regulations

## 2.4 Owner Furnished Equipment

The contractor shall all labour required to perform the specified work unless otherwise stated. All parts as required to be renewed to be purchased by contractor to be covered under 1379 action if not available through ships spares.

# Part 3: TECHNICAL DESCRIPTION:

## 3.1 General

1. Contractor shall carry out the following work on both pumps.

2. Disconnect and lock out control starter panel if motor hasn't already been removed for survey.

3. Isolate pump from hydraulic system, closing valves and locking in closed position and tag.

4. Disconnect hydraulic lines ensuring oil does not drain into the bilge and remove pump for overhaul and inspection.

5. The pump cartridge along with seals, shaft and bearing are to be renewed.

6. The pump casing shall be thoroughly cleaned and during assembly of pump, cleanliness of the parts is of the upmost importance.

7. Once the pump has been installed on the motor and hoses connected, the pump is to be tested in the presence of Chief Engineer or his representative.

8. All work to be inspected by Lloyd's and Chief Engineer. Contractor shall be responsible for notifying Lloyd's inspector

**3.2 Location**

Stbd main Engine Room

**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**

**4.2 Testing**

The pumps are to be tested fully operational after overhaul to the satisfaction of the chief engineer and attending Lloyds inspector

**4.3 Certification**

N/A

## Part 5: DELIVERABLES:

**5.1 Drawings/Reports**

A full set of all readings and replacement parts used to be given to the chief engineer in hard copy and electronic pdf format

**5.2 Spares**

**N/A**

| Spec item #: ED-07 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**ED - 07 : CPP OD Box Overhaul**

**Part: 1 SCOPE:**

**1.1** The intent of this specification shall be for the Contractor to arrange the services of a Wärtsilä Field Service Representative and to provide labour in order to complete an overhaul of the oil distribution box for the CPP system. It is the contractor's responsibility to follow the instructions of the Wärtsilä Field Service Representative. Contractor to include in their bid an allowance of $15,000.00 for Wartrsila FSR to be adjusted on proof of invoice by PWGSC 1379 action.

**1.2** This work shall be carried out in Conjunction with the following: Overhaul of CPP pumps and motors.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1**

**2.2 Standards**

**2.2.1** Wärtsilä original equipment manufacturers overhaul procedures.

**2.3 Regulations**

**2.3.1** Canada Shipping Act Marine Machinery Regulations.
**2.3.2** Fleet Safety Manual.

**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**

General: Under supervision of the Wärtsilä Field Service Representative the contractor perform the following:

**3.1** Isolate valves, remove required piping and drain CPP oil from oil distribution box.
**3.2** Disconnect all required electrical and hydraulic connections.
**3.3** Complete disassembly of oil distribution box for inspection, evaluation and measuring.
**3.4** Reconditioning of worn components, if required, will be addressed by 1379 action.

**3.5** Reassembly with all new bearings and seals. These components will be GSM.
**3.6** Reinstallation of oil distribution box complete with piping and electrical connections.
**3.7** Set to work and carry out fine tuning adjustments.

**3.8 Location:** Engine Room

**3.9 Interferences**

**3.10** N/A

**Part: 4 PROOF OF PERFORMANCE:**

**4.1 Inspection** : As per Wärtsilä Field Service Representative and Lloyds Register requirements.

**4.2 Testing:**

**4.2.1** The contractor shall notify the Chief Engineer and Lloyds Inspector in order to witness the test.

**4.2.2** Under supervision of the Wärtsilä Field Service Representative the contractor perform dock trials of the oil distribution box when the CPP system is ready for operation following all CPP work, and then carry out Sea trails for a one hour period.

**4.3 Certification**

N/A

**Part: 5 DELIVERABLES:**

**5.1 Drawings/Reports**

**5.2** Contractor shall supply to Chief Engineer three hard copies and one electronic copy of a report of all work was carried out.

**5.3 Spares**

N/A

**5.4 Training**

N/A

**5.5 Manuals**

N/A

| Spec item #: ED-08 | SPECIFICATION | Lloyds |
|---|---|---|
| **ED - 08 : Bow Thruster Controls Upgrade** | | |

**Part 1: SCOPE:**

The intent of this specification is to upgrade the existing Rolls Royce Marine Bow thruster controls with new Rolls Royce Marine controls Type Helicon X1. Contractor will be running all cabling and mounting of equipment as directed by Rolls Royce. Contractor responsible for all costs associated with Rolls Royce engineering, drawings, and FSR commissioning, startup and sea trials, installation and equipment. Contractor to include in their bid an allowance of $25,000.00 for Rolls Royce FSR to be adjusted on proof of invoice by PWGSC 1379 action. Contact for Rolls Royce representative familiar with job is:

Ted Gurr
Rolls-Royce Canada Ltd.
Sales Manager - Eastern Canada
Email: ted.gurr@rolls-royce.com
Cell: (902) 488-4153

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

Bow Thruster HCX1_2011_AMS_Leonard J.Cowley.pdf
Bow Thruster 12S000370_Chapter4_System_dwg.pdf

**2.2 Standards**

**2.2.1** The Contractor is to perform all of the following work and is to provide fully certified personnel acceptable to LLoyds in accordance to latest revision of the Lloyds Rules and Regulations for the Classification of Ships – Part 6, Chapter 2, Section 10

**2.3 Regulations**

**2.3.1** All installations as per most recent version of Lloyds Rules and Regulations for the Classification of Ships – Part 6, Chapter 2, Section 10

**2.3.2** All wiring to follow Lloyds rules. If not specifically mentioned, contractor to follow most recent revisions of TP-127E or IEEE-45

**2.4 Owner Furnished Equipment**

All equipment is supplied by Owner except: wiring and materials responsibility of Contractor unless otherwise noted.

**Part 3: TECHNICAL DESCRIPTION:**

**3.1 General**

**.1** All electrical circuits associated with the bow thruster to be isolated before any work is to proceed.

**.2** Contractor responsible for all costs associated with parts, materials and labour of Rolls Royce FSR's. All work performed will be under the direct supervision of Authorized Rolls Royce FSR and to the acceptance of the Chief Engineer and Lloyds Inspector

**.3** All equipment locations and wiring detailed in **Bow Thruster 12S000370_Chapter4_System_dwg.pdf**

**.4** The existing Rolls Royce bow thruster controls to be removed as directed by the FSR

**.5** Included provisional installation drawings are for guidance only. Actual connection drawing to be provided by FSR before any work is to begin.

**.6** Drawings including all connections and placement of equipment to be approved by Chief Engineer, Lloyds inspector and FSR before any work to begin

**.7** All associated wiring is to be removed and replaced unless approved to remain after testing and agreement between FSR, Chief engineer and Lloyds.

**.8** Contractor to give price based on 50meters per cable run with 15 cable penetrations per cable. Contractor to give a cable per meter cost and transit cost which is to be adjusted up or down for actual required run by 1379 action. Contractor responsible to contact FSR for actual cable requirements including construction, conductor numbers and bulkhead penetrations requirements.

**.9** Contractor to run a 24vdc control feed consisting of one 40 meter cable with 8 cable penetrations to an as yet unknown 24vdc distribution panel. Contractor to give a cost per meter for cable and unit cost for cable penetrations. Contractor responsible to contact FSR for actual cable requirements including construction, conductor numbers and bulkhead penetrations requirements.

**.10** All new wiring, controls and cabinets to be installed under direction of Rolls Royce FSR

**.11** All labels that are to be replaced to reflect new equipment to be of similar type and securing arrangement to existing. Contractor responsible for the cost of fabrication and installation of all labelling. All labelling and installation locations to be approved by the chief engineer and attending Lloyds inspector

**.12** Contractor responsible for retrofitting panels where equipment of different sizes or shapes to be mounted. Covering plates ( Contractor responsibility) and mounting arrangements to be approved by the TA before installation. Any modifications to existing panel doors to be similar in standard, material, design, strength, mounting and coated with the same standard and color paint as per the existing access doors.

**.13** Contractor is to install Hydraulic proportional control valves and pressure switches, GFE supplied as detailed in drawing **PE92011** attached in **Bow Thruster 12S000370_Chapter4_System_dwg.pdf**

**.14** Existing transits and cable hangers may be reused on approval of chief engineer and Lloyds inspector. Contractor responsible for any new cable hangers or transits needed

**.15** All wiring to meet or exceed Lloyds rules.

**.16** All equipment used to have Lloyds approval

**.17** Contractor responsible for all new wiring, terminals, and enclosures as directed by Rolls Royce FSR

**.18** All programming and drawing modification the responsibility of Contractor

**.19** All new and disturbed steelwork is to be protected with 2 coats of primer.

**.20** All cables shall be tagged with circuit identification at all points of connection and on both sides of bulkheads, decks and barriers. The tags will be metal, compatible with the cable sheath and shall have a circuit designation embossed thereon. Both ends of the tag shall be secured to the cable with metal tape or metal ty-raps. The wire Identification numbering philosophy for the new wiring shall be compatible with that utilized with the existing systems

### 3.2 Location

**a.** Wheelhouse

**b.** Bow Thruster compartment

### 3.3 Interferences

**3.3.1** Any interference items that need to be removed are the responsibility of the contractor. Contractor is responsible for the temporary removal, storage and refitting to vessel of all equipment previously identified. No Equipment/wiring or interference items to be removed without prior approval from TA

## Part 4: PROOF OF PERFORMANCE:

### 4.1 Inspection

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

**4.1.10.** All cabling and installations to be to the acceptance of attending Lloyds inspector and Chief Engineer

### 4.2 Testing

Rolls Royce FSR to test complete system to ensure proper operation of functions to the satisfaction of the Chief Engineer and attending Lloyd's inspector. This is to include all combinations of control.

### 4.3 Certification

Proof of certification of authorized Rolls Royce FSR to be provided

Proof of proper certification/training of all other personnel to be made available on request

**Part 5: DELIVERABLES:**

**5.1 Drawings/Reports**

3 hard copies and 1 Electronic copy of the following

i. All hardware manuals from as-fitted equipment
ii. All software programming manuals
iii. As fitted drawings in electronic Cad format as well as hard copy
iv. Copy of all as commissioned programming in electronic and hard copy
v. Recommended spare parts list from Woodward
vi. Copy of all training materials in hard and electronic copy

**5.2 Spares**

Contractor to provide a list of recommended spare with associated costs as detailed by FSR

**5.3 Training**

Contractor to allow services of FSR to provide for 2 - 8 hour days of training for ship's crew for correct operation and maintenance of system.

| Spec item #: ED-09 | **SPECIFICATION** | |
|---|---|---|

**ED - 09 : Salt Water Cooling Water System Replacement**

**Part: 1 SCOPE:**

**1.1** This specification describes the technical scope of work to be completed by a ship repair facility (Contractor) with respect to replacement of main engine salt water cooling piping from the double bottom sea bay to the discharge manifold port and starboard on the vessel *Leonard J. Cowley.*

The overall execution of this work outlines the delineation of responsibility, such that while the Contractor may understand the broad objectives of the system, they are also equipped with a baseline scope of work.

**1.2** This specification shall be considered in conjunction with the associated drawings as listed in Section 2 of this document. The outline specification and drawings are intended to be complementary; should any technical or other requirement(s) related to new and / or relocated equipment be indicated in either but not all of these documents, such requirement(s) shall be considered as part of the Contractor's scope of work.

**1.3** Note this specification is to be carried out in conjunction with Fire Line, Fuel Oil, Ballast piping replacement and Main Engine work.

**1.4** Information supplied in this scope of work, in particular pipe lengths and number of fittings is approximate.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

2.1.1 Fresh and sea water cooling piping 590-43 (sheets 1 & 2 of 2)
2.1.2 Salt water cooling reference schematic (see Part 5 of this Document)

**2.2 Standards**

**2.2.1** Canadian Welding Bureau Lloyd's Register Canada

**2.3 Regulations**

**2.3.1 Provincial**

**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

The scope of work as listed below is intended to be a broad overview and proposed sequence of project tasks under the responsibility of the Contractor. While every effort has been made to capture the scope of impact on existing vessel arrangements, it is the Contractors responsibility to carry out their own familiarization of the vessel with respect to work to be completed.

In the course of planning or execution of the work, the Contractor is welcome to make suggestions for means of accelerating the completion of the work, provided that such means are acceptable to Canadian Coast Guard (CCG) and Lloyd's Register (LR) Surveyor. The primary tasks to be completed by the Contractor are outlined as in the following sections.

**3.1.1** Contractor is to ensure tank and piping are properly drained, cleaned and certified for hot work prior to the commencement of work and for the duration of the work scope. 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. Contractor shall post a copy of all certificates at the entrance to the affected spaces.

**3.1.2** Protective material shall be used to prevent the spread of sparks; protecting electrical cables and other services. Fire sentries shall be provided in each space and in all adjacent spaces if welding, grinding, or 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 their designated area for at least thirty (30) minutes after any hot work has been completed.

**3.1.3** Contractor to disconnect, remove and replace as original all existing piping, fittings, and flanges as per **Table 1**. All information included in **Table 1** is approximate and should be verified onboard.

| Item | Location | Nominal Size (mm) | Approx. Pipe Length (m) | Fittings |
|---|---|---|---|---|
| 1 | Sea bay to main engine SW pump Port | 150 | 0.6 | 1x 150mm tank penetration<br>3x $90^{O}$ @ 150mm<br>1x $22.5^{O}$ @ 150mm<br>1x 150-100 reducer<br>3x 150mm flange |
| 2 | Main engine SW pump to Alpha Laval plate heat exchanger Port | 125 | 1.5 | 1x $90^{O}$ @125mm<br>3x $45^{O}$ @ 1250mm<br>1x $45^{O}$ @ 75mm.<br>2x 125mm flange<br>1x 125-75 reducer<br>1x 125mm tee |
| 3 | First tee in item 2 to gearbox oil cooler | 75 | 4.0 | 1x 75-50 reducer<br>1x 125-75 reducer<br>1x 75mm tee<br>3x 75mm flange<br>2x $90^{O}$ @75mm<br>2x $45^{O}$ @ 75mm<br>1x $22.5^{O}$ @ 75mm |
| 4 | Plate heat exchanger to sea chest (re-circulated water) Port | 75<br>125 | 0.25<br>4.0 | 2x 75mm flange<br>1x $90^{O}$ @75mm<br>1x $45^{O}$ @ 75mm<br>1x 125-75 reducer |

| | | | | |
|---|---|---|---|---|
| | | | | 1x 90$^{O}$ @125mm<br>2x 45$^{O}$ @ 125mm<br>1x 125mm flange |
| 5 | Second tee in item 4 to overboard discharge manifold port | 125 | 1.5 | 1x 125 welded saddle<br>1x 90$^{O}$ @125mm<br>1x 45$^{O}$ @ 125mm |
| 6 | Gearbox oil cooler to first tee in item 4 | 75 | 5.0 | 1x 75-50 reducer<br>4x 90$^{O}$ @75mm<br>1x 45$^{O}$ @ 75mm<br>3x 22.5$^{O}$ @ 75mm<br>2x 75mm flange<br>1x 75mm welded saddle |
| 7 | Sea bay to generator #2 SW pump Port | 65 | 7.5 | 4x 65mm flange<br>3x 90$^{O}$ @65mm<br>4x 45$^{O}$ @ 65mm<br>1x 65mm tank penetration |
| 8 | Generator #2 oil cooler to sea chest (re-circulated water) port | 65 | 1.5 | 2x 90$^{O}$ @ 65mm<br>1x 65mm flange |
| 9 | Tee in item 8 to overboard discharge manifold port | 65 | 4.0 | 1x 65mm saddle<br>1x 65mm flange<br>1x 90$^{O}$ @65mm<br>1x 45$^{O}$ @ 65mm |

**Table 1 – Segments of SW cooling system corresponding to attached sketch, see Figure 1 in Part 5**

| Item | Location | Nominal Size (mm) | Approx. Pipe Length (m) | Fittings |
|---|---|---|---|---|
| 10 | Sea bay to main engine SW pump Stbd | 150 | 0.6 | 1x 150mm tank penetration<br>3x 90$^{O}$ @ 150mm<br>1x 22.5$^{O}$ @ 150mm<br>1x 150-100 reducer<br>3x 150mm flange |
| 11 | Main engine SW pump to Alpha Laval plate heat exchanger Stbd | 125<br>75 | 4.0<br>0.5 | 1x 125-75 reducer<br>3x 90$^{O}$ @ 125mm<br>2x 90$^{O}$ @ 75mm |
| 12 | Tee in item 11 to gearbox oil cooler | 75 | 5.0 | 3x 75mm flange<br>1x 75mm tee<br>1x 90$^{O}$ @ 75mm<br>2x 45$^{O}$ @ 75mm |
| 13 | Plate heat exchanger to overboard discharge manifold Stbd | 125<br>75 | 5.0<br>0.25 | 1x 125-75 reducer<br>1x 65mm flange<br>1x 90$^{O}$ @125mm<br>1x 90$^{O}$ @ 75mm<br>3x 45$^{O}$ @ 125mm<br>1x 45$^{O}$ @ 75mm |
| 14 | Second tee in item 13 to sea chest (re-circulated water) Stbd | 125 | 2.0 | 1x 125mm welded saddle<br>1x 125mm flange |
| 15 | Gearbox oil cooler to first tee in item 13 | 65 | 9.0 | 1x 65mm welded saddle<br>5x 65 mm flanges |

| | | | | |
|---|---|---|---|---|
| | | | | 3x 90$^{O}$ @65mm<br>1x 45$^{O}$ @ 65mm<br>3x 22.5$^{O}$ @ 65mm |
| 16 | Sea bay to generator #1 (Hr. Gen.) SW pump Stbd | 65 | 1.2 | 1x 65mm tank penetration<br>1x 65mm bhd. penetration<br>4x 65 mm flanges<br>5x 90$^{O}$ @65mm<br>3x 45$^{O}$ @ 65mm |
| 17 | Generator #1 (Hr. Gen.) oil cooler to overboard discharge manifold Stbd | 65<br>100 | 6.0<br>1.5 | 1x 125-100 reducer<br>1x 100-65 reducer<br>1x 90$^{O}$ @100mm<br>3x 90$^{O}$ @ 65mm<br>2x 45$^{O}$ @ 65mm<br>1x 65mm bhd. penetration<br>2x 65mm flange |
| 18 | Second tee in item 17 to sea chest (re-circulated water) Stbd | 100 | 3.0 | 1x 100mm welded saddle<br>1x 125-100 reducer (flg)<br>2x 22.5$^{O}$ @100mm<br>1x 45$^{O}$ @ 100mm |
| 19 | Sea bay to Generator #3 SW pump Stbd | 65 | 7.5 | 4x 65mm flange<br>3x 90$^{O}$ @65mm<br>4x 45$^{O}$ @ 65mm<br>1x 65mm tank penetration |

**Table 1 (Continued)**

| Item | Location | Nominal Size (mm) | Approx. Pipe Length (m) | Fittings |
|---|---|---|---|---|
| 20 | Generator #3 oil cooler to second tee in item 17 Stbd | 65 | 4.0 | 1x 65mm welded saddle<br>1x $90^{O}$ @ 65mm<br>1x $45^{O}$ @ 65mm |
| 21 | Stern tube oil cooler supply (incl. intermediate shaft bearing) | 25 | 12.0 | 7x $90^{O}$ @ 25mm<br>1x bhd. penetration<br>1x tee @ 25mm<br>1x 25-75 reducer<br>Flex hose<br>2x flex hose couplings<br>**All threaded connections |
| 22 | Stern tube oil cooler return (incl. intermediate shaft bearing) | 25 | 12.0 | 6x $90^{O}$ @ 25mm<br>1x bhd. penetration<br>2x tee @ 25mm<br>1x 25-75 reducer<br>Flex hose<br>2x flex hose couplings<br>** All threaded connections |
| 23 | Second tee in item 12 to CPP oil cooler | 40 | 1.5 | 1x 40-75 reducer<br>1x 75mm tee |
| 24 | CPP oil cooler to third tee in item 6 | 40 | 1.5 | 1x 40-75 reducer<br>1x 75mm tee |

**Table 1 (Continued)**

3.1.4 Contractor to use bolts and gaskets appropriate for salt water systems.

3.1.5 Existing pipe hangers to be used where possible.

3.1.6 Piping from the overboard discharge manifold to the sea valves Port and Starboard is not included in this scope of work.

3.1.7 All new piping to be Copper-Nickel as original.

3.1.8 Upon completion of all hot work, sea bay to be appropriately cleaned. All new and disturbed surfaces to have primer and paint applied as per original paint scheme as required.

3.1.9 All new piping to be marked "S.W." where appropriate.

3.1.10 Contractor shall clean / flush all new and disturbed piping.

3.1.11 All work to be inspected and tested as described in **Part 4** or to the satisfaction of attending LR Surveyor.

3.1.12 Contractor to supply all necessary equipment, materials, fittings, blanks, flanges, and labour for respective tests.

3.1.13 Contractor to clean all debris and dispose as per provincial regulations.

3.1.14 Contractor shall have all removed valves inspected to ensure they are in good condition and are working correctly. Any valves not meeting Lloyds or the Chief Engineers approval are to be replaced by PWGSC 1379 action. Contractor shall reinstall all valves as per the removed system.

**3.2 Location**

**3.2.1** Engine room (frame 28-44) and harbour generator compartment (frame 44-52).

**3.3 Interferences**

**3.3.1** Contractor is responsible for the identification of interference items, their temporary removal, storage, and refitting to the vessel if necessary. Interferences may include the following items and systems:

(i) Fuel system
(ii) Ballast water system
(iii) Jacket water system
(iv) Exhaust piping
(v) Lube oil system
(vi) Engine breather piping
(vii) Ventilation trunks
(viii) Cable trays
(ix) Lifting supports
(x) Checker plate supports

3.3.2 Contractor may suggest modifications which limit interferences. Any suggestions must be approved by CCG and LR.

## Part: 4 PROOF OF PERFORMANCE:

### 4.1 Inspection

**4.1.1** All work to be completed to the satisfaction of the Chief Engineer and LR Surveyor.

4.1.2 Visual inspection of all welding100%.

4.1.3 The Contractor shall issue and post hot work permits and shall maintain a fire sentry.

4.1.4 Upon completion of work areas to be visually inspected to ensure all debris has been removed.

### 4.2 Testing

**4.2.1** Hydrostatic test to be carried out to 1.5x normal working pressure or as specified by the original equipment manufacturer where applicable. Test to be witnessed by LR Surveyor and Chief Engineer.

**4.2.2** Welds to 10% MPI by a certified technician.

**4.2.3** System to be flow tested to the satisfaction of LR Surveyor and Chief Engineer.

**4.2.4** The contractor is responsible for all air quality testing to ensure hot work and entry is permitted.

### 4.3 Certification

4.3.1 Welders must be CWB certified.

4.3.2 Chemist must be certified.

4.3.3 Technicians for NDT must be certified.

4.3.4 Contractor to provide welding procedures to LR for approval which must be approved prior to commencement of work.

Part: 5 **REFERENCE SCHEMATIC**

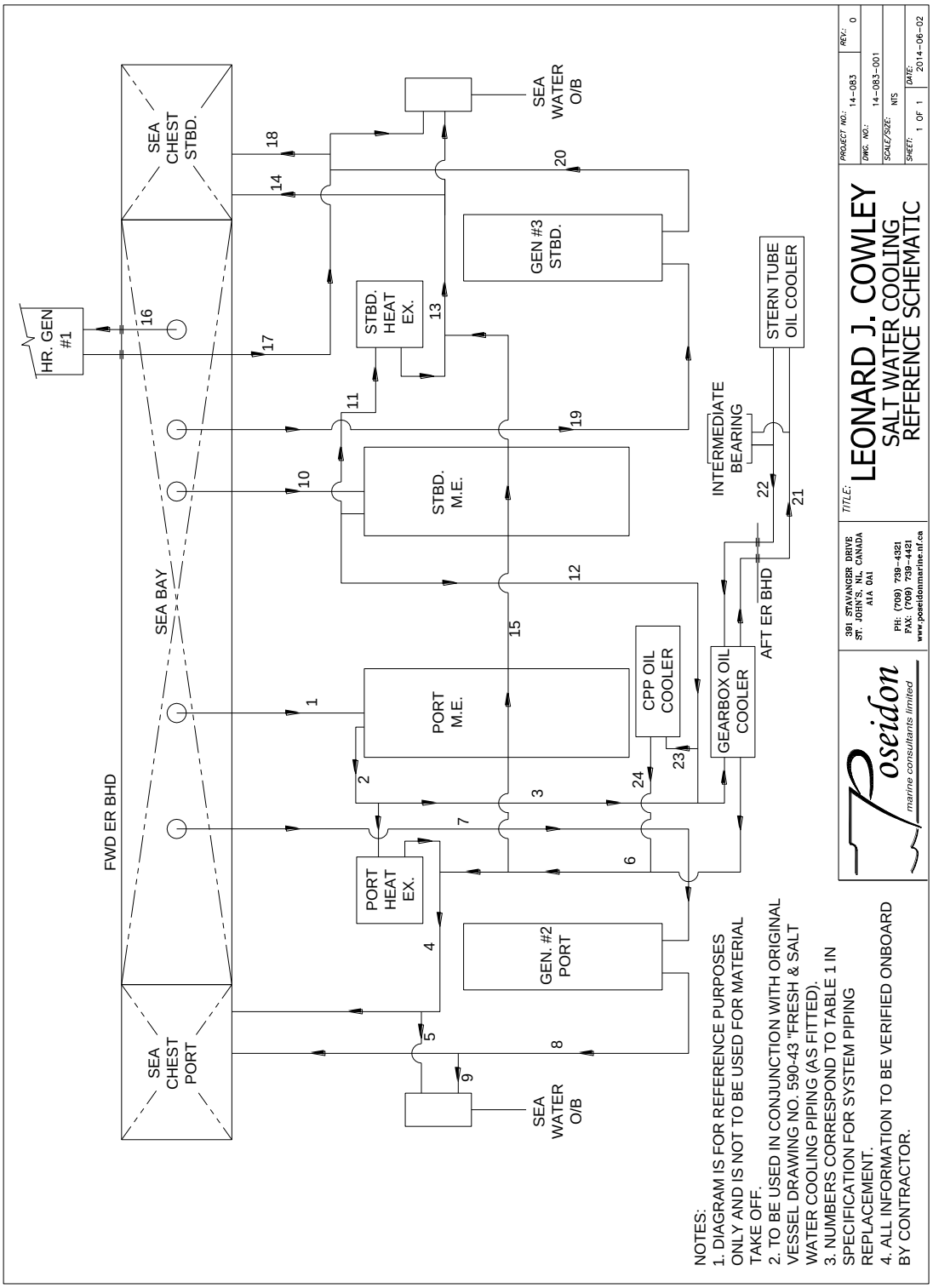


**Figure 1 - Salt Water Cooling Reference Diagram**

| Spec item #: L-01 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) L - 01 : Auxiliary Generators #1, 2 and 3 Overhaul** | | |

## Part 1: SCOPE:

The intent of this specification is to to inspect / clean / overhaul #1, #2 and # 3 ships service generator's as require by Lloyd's.

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**
Manufacture, Stamford

TYPE MSC634A, VOLTS 460/266, KVA 562.5, 450KW, RPM 1800, AMPS 706, Connection DWG # D419.1146

**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:

**General**

**3.1** Contractor shall carry out a Vibration test before and after the overhaul on the generators.

**3.2** Before alternator is un-coupled from the diesel, contractor shall check and record the crankshaft axial movement as well as stator and exciter airgaps, Chief Engineer to witness.

**3.3** The generator megger readings shall be recorded and witnessed by the Chief Engineer.

**3.4** The contractor will record all resistance readings for all windings and RTD's prior to and after overhaul

**3.5** The contractor shall remove the generator from the engine and transport it to the contractor's facility to carry out all work in this specification.

**3.6** The main rotor shall be with drawn from the stator core.

**3.7** The non drive end bearing assembly and housing shall be removed and a new bearing SKF 6317 2ZC3 or equivalent shall be fitted as per the manufacturer's instruction assembly procedures.

**3.8** The generator stator windings shall be cleaned using the approved methods, if the windings required dipping and baking a separate price shall be given for this work which shall include all removals.

**3.9** The generator components shall be inspected for signs of damage, wear and deterioration, and replace parts and material where needed to be taken care of by 1379 action.

**3.10** All winding temperature probes to be checked and proved in good working.

**3.11** Contractor shall provide heating equipment and enclosure to bring up the resistance value of the windings to Lloyds standards.

**3.12** Contractor shall re-install the generator to the diesel engine as per alignment procedures set out in the installation manual. Manual shall be provided to the successful bidder. Proper connection and alignment shall be proven with a functional test. Contractor shall gauge the new pedestal bearing inner and outer race's / shaft O.D. and bearing housing I.D. prior to fitting the new bearing.

**3.13** After alternator is coupled up to the diesel, contractor shall check the crankshaft axial movement, Chief Engineer to witness.

**Location:**
**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**

Generator to be test ran with maximum load for one hour with temperatures taken at various points of the stator housing and the non drive end bearing. All work to be inspected Lloyd's, and Chief Engineer.

### 4.2 Certification

## Part 5: DELIVERABLES:

### 5.1 Drawings/Reports

Contractor shall supply Chief Engineer with 2 hard copies and one electronic pdf copy of all readings taken.
The Contractor shall supply the Chief Engineer with a detailed Work Report after completion of spec item in electronic pdf format

### 5.2 Spares
**N/A**

### 5.3 Training
**N/A**

## 5.4 Manuals

**N/A**

| Spec item #: L-02 | SPECIFICATION | |
|---|---|---|
| **L - 02: Auxiliary Generators Electronic governor upgrade** | | |

**Part 1: SCOPE:**

The intent of this specification is to upgrade the existing Woodward 2301a governor controls and SPM-A synchronizers with new Woodward 2300 and Easygen 3500 Controls on the 3 ship service generators located in the engine room while retaining the existing EGB reverse acting actuator/mechanical governor located on each engine.

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

(3)G620 3-51015- L001 Main Switchboard Layout
(3)G62013-S1015- S135 Main switchboard drawings
(3)G62013-S1015- 5000 Switchboard Drawings
590-30 Machinery arrangement

**2.2 Standards**

**2.2.1** The Contractor is to perform all of the following work and is to provide fully certified personnel acceptable to LLoyds in accordance to latest revision of the Lloyds Rules and Regulations for the Classification of Ships – Part 6, Chapter 2, Section 10

**2.3 Regulations**

**2.3.1** All installations as per most recent version of Lloyds Rules and Regulations for the Classification of Ships – Part 6, Chapter 2, Section 10

**2.3.2** All wiring to follow Lloyds rules. If not specifically mentioned, contractor to follow most recent revisions of TP-127E or IEEE-45

**2.4 Owner Furnished Equipment**

All equipment , wiring and materials responsibility of contractor unless otherwise noted

## Part 3: TECHNICAL DESCRIPTION:

### 3.1 General

**.1** All electrical circuits associated with the 3 governor controls to be isolated before any work is to proceed.

**.2** Contractor responsible for all costs associated with parts, materials and labour of Woodward FSR's. Contractor to include in their bid an allowance of $80,000.00 for Woodward FSR to be adjusted on proof of invoice by PWGSC 1379 action.

**.3** All work performed will be under the direct supervision of Authorized Woodward FSR and to the acceptance of the Chief Engineer and Lloyds Inspector

**.4** The existing Woodward EGB reverse acting actuator/mechanical governor is to remain on each Ship service generator

**.5** The existing Woodward 2301A, and SPM-a synchronizers located in the MCR switchboard are to be removed

**.6** All associated wiring is to be removed and replaced unless approved to remain after testing and agreement between Woodward FSR, Chief engineer and Lloyds.

**.7** All new wiring, controls and cabinets to be installed under direction of Woodward FSR

**.8** The new Woodward 2300's and Easygen 3500 series controls to be installed as per FSR recommendations

**.9** Local generator on-screen control panels to be included at all generators in new contractor supplied panels as detailed by FSR and approved by chief engineer and Lloyds inspector

**.10** Remote screen for each generator to be installed in each respective generator section in the MCR

**.11** Full control of start/stop and synchronization to be available at each control panel location and in the MCR

**.12** Full manual control of start/stop and synchronization to be provided at each location.

**.13** All labels that are to be replaced to reflect new equipment to be of similar type and securing arrangement to existing. Contractor responsible for the cost of fabrication and installation of all labelling. All labelling and installation locations to be approved by the chief engineer and attending Lloyds inspector

**.14** Contractor responsible for retrofitting panels where equipment of different sizes or shapes to be mounted. Covering plates ( Contractor responsibility) and mounting arrangements to be approved by the TA before installation. Any modifications to existing panel doors to be similar in standard, material,

design, strength, mounting and coated with the same standard and color paint as per the existing access doors.

**.15** Existing transits and cable hangers may be reused on approval of chief engineer and Lloyds inspector. Contractor responsible for any new cable hangers or transits needed

**.16** All wiring to meet or exceed Lloyds rules.

**.17** All equipment used to have Lloyds approval

**.18** Contractor responsible for all new wiring, terminals, and enclosures as directed by Woodward FSR

**.19** All programming and drawing modification the responsibility of Woodward FSR

**.20** If programming/diagnostics of Easygen system must be done by laptop, contractor is to supply fully functioning laptop with full versions of software as needed for normal servicing, maintenance and reprogramming of replacements

**.21** All new and disturbed steelwork is to be protected with 2 coats of primer.

**.22** All cables shall be tagged with circuit identification at all points of connection and on both sides of bulkheads, decks and barriers. The tags will be metal, compatible with the cable sheath and shall have a circuit designation embossed thereon. Both ends of the tag shall be secured to the cable with metal tape or metal ty-raps. The wire Identification numbering philosophy for the new wiring shall be compatible with that utilized with the existing systems

### 3.4 Location

b. Port and Stbd Main Engine room, #3 generator room and MCR

### 3.5 Interferences

**3.3.1** Any interference items that need to be removed are the responsibility of the contractor. Contractor is responsible for the temporary removal, storage and refitting to vessel of all equipment previously identified. No Equipment/wiring or interference items to be removed without prior approval from TA

## Part 4: PROOF OF PERFORMANCE:

### 4.1 Inspection

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

**2.** All cabling and installations to be to the acceptance of attending Lloyds inspector and Chief Engineer

**Testing**

Woodward FSR to test complete system to ensure proper start/stop and synchronization functions to the satisfaction of the Chief Engineer and attending Lloyds inspector. This to include all combinations of synchronization and loading from low load up to as much as possible full load. Generators are to be able to sync to shore power and emergency generator as well.

## 4.2 Certification

Proof of certification of authorized Woodward FSR to be provided

Proof of proper certification/training of all other personnel to be made available on request

## Part 5: DELIVERABLES:

## 5.1 Drawings/Reports

3 hard copies and 1 Electronic copy of the following

i. All hardware manuals from as-fitted equipment
ii. All software programming manuals
iii. As fitted drawings in electronic Cad format as well as hard copy
iv. Copy of all as commissioned programming in electronic and hard copy
v. Recommended spare parts list from Woodward
vi. Copy of all training materials in hard and electronic copy

## 5.2 Spares

Contractor to provide a list of recommended spare with associated costs

## 5.3 Training

Contractor to allow for services of Woodward FSR to provide 2, 2 day sessions with 2 trainers for ships crew . Training materials to be supplied for 6 persons per shift with details of additional cost per person above the required 6 persons per shift

| Spec item #: L-03 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) L - 03 : 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.
All work shall be performed by authorized qualified technicians.

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**

a. Cowley fire alarm detector listing.pdf

**2.2 Standards**

**2.2.1**

**2.3 Regulations**

**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:

**3.14 General**

3.1.1 Contractor to test all smoke detectors, heat detectors, fire pulls, mimics (including door and pressure switches) and alarms/lights for correct operation as per Notifier recommended test procedures. All defects to be noted and repaired by 1379 action.

3.1.2

**3.2 <u>Location:</u>**

a. Various locations throughout vessel as identified in Cowley fire alarm detector listing.pdf

**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:

**4.2 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-04 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) L - 04 : 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

Meggering readings blank form.pdf

## 2.2 Standards

**2.2.1** TP127E transport Canada Electrical Standards

## 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 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.

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-05 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **(M/E) L - 05 : Thermoscan** | | |

**Part 1:THERMOSCAN**

**1.1 SCOPE:**

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.

**2.1 REFERENCES:**

2.1.1 Nameplate Data

n/a

Related Specifications

n/a

**3.1 TECHNICAL DESCRIPTION:**

3.1.1 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.

Summary of Equipment to be surveyed:

| 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 Breaker/Buss |
| 4A | 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 |

3.1.2 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.

**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

| Spec item #: L-06 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|

**L – 06 : ICS and Related Systems Supply and Installation**

**Part: 1 SCOPE:**

**1.1** The intent of this specification is to remove the existing ships internal communications system and replace with a new Contractor supplied Hose McCann, or equivalent. Please refer to paragraph 3.1.2.6. Contractor to include in their bid an allowance of $26,000.00 for Hose McCann FSR or equivalent supplier FSR to be adjusted on proof of invoice by PWGSC 1379 action.

**1.2** This work shall be carried out in conjunction with the following:

**1.2.1** Deckhead Replacement Spec
**1.2.2** Master Clock Replacement Spec

**1.3** Contractor shall supply all materials and parts required to perform the specified work unless otherwise stated.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

| | |
|---|---|
| **2.1.1** General Arrangement Bridge/Focsle Decks | Drawing # 59017601 |
| **2.1.2** General Arrangement Main/Upper Decks | Drawing # 59017701 |
| **2.1.3** General Arrangement Upper/Main/Hold | Drawing # 59017602 |
| **2.1.4** PA and Telephone System Lower Decks | Drawing # 59016002 |
| **2.1.5** PA and Telephone System Upper Decks | Drawing # 59016001 |
| **2.1.6** Cowley Ship Layout | Drawing # 8010-100 |
| **2.1.7** ICP Nav Bridge Layout | Drawing # 8010-100 |
| **2.1.8** ICP Bridge Deck Layout | Drawing # 8010-100 |
| **2.1.9** ICP Forecastle Deck Layout | Drawing # 8010-100 |
| **2.1.10** ICP Upper Deck Layout | Drawing # 8010-100 |
| **2.1.11** ICP Main Deck Layout | Drawing # 8010-100 |
| **2.1.12** ICP Hold Layout | Drawing # 8010-100 |
| **2.1.13** System Component Drawings | |

**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** TCMS recognized, Classification Society Approval
**2.2.6** Standard Technical Architecture for the Shipboard Computer Installation (46-000-000-ES-TE-001)

**2.3 Regulations**

**2.3.1** Canada Shipping Act, 2001

**Part: 3 TECHNICAL DESCRIPTION**

**3.1 General**

**3.1.1** Contractor shall remove and dispose of all cabling from the original United Marine ICS (PA/PBX) system. Contractor shall remove all components from the original United Marine ICS (PA/PBX) system and return to the crown as this will be used as spares for similar equipment in CCG fleet.
Contractor shall note that there are a total of 8 connection boxes (IC-1 to IC-8) total to also be removed as detailed in reference drawings.

**3.1.2** Contractor shall supply and install a Class Approved, as recognized by Lloyds or relevant classification society, Internet Protocol (IP) based End-to-End Digital, Integrated Communications System (ICS) Public Address (PA) and PBX (VIOP) and audio Entertainment shall be provided.

**3.1.2.1** Integrated Internal Communication System Requirements;

The system shall use only STP Cat5e copper and Multi-Mode fiber optic cabling. All endpoint equipment shall be connected using RJ45 jacks wired in accordance with TIA/EIA 568B specifications regardless of equipment type. Exterior connections shall have an environmental rating of IP66 of better.

All Systems shall be IP based, (End-to-End Digital) and must operate on the same cable infrastructure. The systems shall be designed so that the failure of one system does not affect operation of another system.

The main equipment rack(s) (Node) are to be shock mounted and contain thermostatically controlled cooling fans. The node shall contain the Public Address system controller, the hot standby Public Address system controller, VoIP PBX system controller and all equipment for endpoint (speaker, phone, beacon, etc.) connectivity eliminating the need for additional cross-connect or junction panel hardware.

The node(s) shall receive power from an emergency 220Vac power source as well as a normal 220Vac source via a transfer switch, and include UPS that will maintain system power for 30 minutes, this ensures a disturbance free and clean source of power.

**3.1.2.2** Public Address (PA) Requirements:

A marine grade Public Address (PA) system capable of multichannel paging shall be installed. The system will be designed in accordance with ABS/Lloyds Register requirements.

All speakers shall be self-amplified and arranged such that announcements cab be heard and understood over normal ambient noise. Interior speakers and horns are to be individually addressable and PoE powered. Loudhailers and beacons are to be individually addressable and supported by 120Vac external power. The failure of one IP speaker must not affect the operation of any other IP speaker in the system.

Controlhead stations shall be touch screen units capable of making announcements, controlling alarms or other signals and making/receiving phone calls via programmable menus/sub-menus. The controlhead must be backlit and powered via PoE. The controlheads must also monitor and report failure of any Public Address device (loudspeakers, beacons, IP relay boxes, IP contact maker/boxes, etc.) including PA system controller and hot standby system controller. Users must be notified at the controlhead of the exact PA device failure in the system. In the event that the Public Address system controller and hot standby are lost, emergency All Call activation must still be possible via the controlhead.

Talkback communication between the controlhead(s) and outlying stations shall be by use of the controlhead handset, integrated push to talk button and outlying station selection via controlhead touch screen. Call in from outlying stations shall be accomplished via “call in” push button at talkback speaker. The talkback speakers shall also receive audio associated with activated alarms and normal group paging per system configuration without the use of any switching at the talkback speaker.

The system must have PA and alarm override capabilities based on priority settings. PA zones shall be software configurable to accommodate future changes in configuration or operation without re-cabling.

The system shall be capable of multiple configurations so that speakers can be placed into different paging zones, volume controls can be changed to support activities as “at pier”, “underway”, etc. Multiple configurations shall be pre-programmed and selectable at the controlhead.

The system shall be capable of accepting a dry contact closure from another system to provide alarm activation (an example is an unacknowledged fire alarm). The system shall provide a contact to silence the general alarm during a page.

Speakers installed in storerooms and offices shall be provided with the capability to connect an IP phone via Cat5e cable. This feature is included to reduce cabling and to provide volume/channel control for shipboard entertainment over the local loudspeaker.

IP (Internet Protocol) Equipment for public address shall be provided with Ingress Protection (IPxx) indicated as follows:

- IP Ceiling Loudspeaker, for cabins and common areas, (IP22) – 99 pcs.
- IP Horn type loudspeaker for machinery spaces, (IP66) – 30 pcs.
- IP Horn type loudspeaker for outside spaces, (IP66) – 12 pcs.
- IP Horn type loudspeaker for outside spaces w/push button for talkback (IP66) – 12 pcs.
- IP Loudhailer for bridge top and heli hanger (IP66) 120V/60Hz supply – 3 pcs.
- IP relay box for TV mute and General Alarm Bells Mute – 2 pcs.
- IP contact box for fire system interface – 1 pc.
- IP general alarm switch (Bridge and ECR console) – 2 pcs.
- IP EPIC control head (or equal) – 4 pcs.

**3.1.2.3** PBX (VoIP) System Requirements

A marine grade VoIP system shall be provided. The system shall provide operator free dialing and communication for incoming and outgoing calls between all spaces identified.

System Features

- Self-contained unit
- Programmable from Web Interface
- Call forwarding
- Call transfer
- Voicemail
- 3-way conferencing
- Exterior Communication Access – Programmable (Shoreline, Satellite, Cellular)
- Incoming call routing
- Public Address Interface
- Remote Diagnostics/Maintenance
- Night Bells

All IP telephones shall be able to dial all other telephones on board and access shore trunks and other external communication systems if so programmed. IP telephones shall be equipped with special marine handset retainers, suitable for bulkhead or desk mount and be either drip-proof of waterproof type, depending on location. In high noise areas, auxiliary visual signaling via rotating (blue) beacons shall be supplied and installed to indicate an incoming call.

The VoIP system shall be supplied with a 4 line shoreline connection box (including 150ft. custom shoreline cable) and have the ability to access satellite and cellular line as applicable. It shall be capable of interfacing with a fax machine on the vessel.

A wake-up system shall be incorporated with the PBX allowing for individual operator programming and cancelling of wake-up calls.

Equipment for PBX (VoIP) system shall be provided with Ingress Protection (IPxx) indicated as follows:

- IP telephone (wall or desk mount) – 59 pcs.
- RJ-45 outlet/wall plate for telephone – 59 pcs.
- IP telephone (rugged), with headset jack and beacon, and headset stowage box (machinery spaces) wall mounted, (IP44) – 9 pcs each.
- IP telephone (weatherproof) exterior – 2 pcs.
- Shoreline connection box (4 line with 150 ft. shoreline cable) 12Vac, 60Hz – 1 pc.
- IP interface (for Iridium and Cell) 120Vac, 60Hz – 1 pc.
- IP interface (for fax machine) 120Vac, 60Hz – 1 pc.

**3.1.2.4** Ships Recreational Entertainment Systems Requirements:

The IICS shall be capable of accepting (4) line level audio inputs for Ship's Recreational Entertainment. Distribution of entertainment audio (i.e. music, recorded announcements, etc.) for cabins and offices shall be programmable via system configuration software. Additional cabling and speakers for entertainment audio shall not be required. Control of audio source and volume in spaces shall be via local phone. Entertainment audio shall be over-ridden and volume level selected for entertainment will be automatically bypassed in the event of an alarm or PA announcement.

A standard relay will be used to override entertainment in the event of General Alarm Bell activation.

Equipment for Entertainment System shall be as follows:

- IP 4 Channel Interface 120Vac, 60Hz – 1 pc.

**3.1.2.5** Wireless Telephone System Requirements:

An IP based Wireless Telephone System with two portable units (minimum) shall be provided for the operation on the bridge. The system will operate in conjunction with the previously specified PBX. The base controller will connect to the node via Cat5e cable.

The system will consist of:

- IP VoIP base Unit – 1 pc.
- IP VoIP Portable Telephones (with chargers) – 2 pcs.

**3.1.2.6** OEM Equivalency

One supplier which meets the above IICS system requirement is Hose McCann. Contractors that wish to supply and install an Equivalent system shall seek approval within the formal "Question and Answer" process, during the Solicitation. Additionally, Training and Spares Requirements for Equivalent systems shall be included within the known work scope, as detailed within the formal "Answer" for each proposed system.

**3.1.3** The Contractor shall arrange for OEM authorized field service representatives (FSR) to conduct the set to work and commissioning of the ICS system.

**3.1.4** The Contractor shall work in conjunction with a Coast Guard Electronics Technician to oversee the installation of the new ICS system to ensure compliance with the applicable Coast Guard standards and to determine the final installation location of additional components as supplied with the system. Terminations and crimping at all end points shall be completed by the CCG Technicians

**3.1.5** Prior to any hot work 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.

**3.1.6** Contractor shall ensure that all identified electrical supplies for the system have been isolated and secured using the established lock-out / tag-out system as outlined in the preamble.

**3.1.7** All electronic components removed from the vessel resulting from the performance of this specification shall be returned to the Owner for disposal/reuse.

**3.1.8** All cabling which has been deemed surplus to the installation of this system shall be removed from the vessel and disposed of at the Contractor's expense.

**3.1.9** Contractor shall be responsible to ensure that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this specification item.

**3.1.10** Contractor shall remove a total of 115 speakers and any associated volume control knobs (75 Deck head Flush Mount complete with backing boxes and associated volume control knobs, 2 Loudhailers, 24 Submerge Proof talkback speakers and associated talkback buttons, 5 horn type speakers, 2 intrinsically safe speakers, on the wheelhouse top, navigation deck, bridge deck, forecastle deck, upper deck, main deck, and hold deck). Removals of these speakers shall be complete with connecting cable back to originating locations as detailed in reference drawings. For any bulkhead mounted speaker the backing boxes are to remain for mounting the new speaker using adaptor plate.

**3.1.11** Contractor shall install 154 new speakers (99 deck head flush mount, 3 loudhailers, 30 horn speakers, and 22 Submerge proof speakers on the wheelhouse top, navigation deck, bridge deck, forecastle deck, upper deck, main deck, and hold deck) as detailed in reference drawings.

**3.1.12** Contractor shall install 75 of the 99 SS flush mount speakers in the space vacated by the old speakers by flush mounting the new speakers using 12-1/2" x 12-1/2" x 1/16" thick sheet metal with rounded edges. This speaker will now occupy the larger space left behind by the speakers that were removed. The remaining 24 speakers shall be flush mounted in areas indicated in reference drawings by cutting deck head panels to accommodate the extra speakers.

**3.1.13** Contractor shall install three (3) loudhailers in the space vacated by the old as indicated in reference drawings. The contractor shall be responsible for modifying the mounting as necessary to accommodate the new loudhailers. The contractor shall be aware that the new loudhailers are supplied with a driver box that has to be mounted **above** and **near** the speaker for connection of an acoustic tube. The contractor shall also be responsible for mounting these driver boxes.

**3.1.14** Contractor shall install 30 horn type speakers. Some of these will be a direct replacement of the old and some will be in addition to the old. See reference drawings attached.

**3.1.15** Contractor shall remove 36 telephones complete with cable back to originating locations as detailed in reference drawings. Contractor shall also remove all associated dial telephone jacks complete with cable as shown in reference drawings.

**3.1.16** Contractor shall install 70 new telephones (59 bulkhead IP phones, 11 ruggedized phones, and 1 dect portable VoIP handset with charger) as detailed in reference drawings.

**3.1.17** Contractor shall install 36 of these telephones in the space vacate by the old telephones. The remaining 34 phones shall be installed as per the reference drawings.

**3.1.18** Contractor shall remove four (4) auxiliary visual signaling devices (Blue Rotating Beacons) in the following locations (engine Room, harbor generator, emergency generator room, and bow thruster compartment) complete with signal cable as shown in reference drawings. Electrical isolation for these beacons are via panels

- EL4-25A/27C
- EL4-9B/11C
- EL4-13A/15B
- EL5-1A/3B.

**3.1.19** Contractor shall install nine (9) new beacons (blue) four of these will replace the four that were removed and will reuse the 115Vac, the remaining 5 will be installed in the (engine room, steering gear compartment, Purifier room, transducer compartment, fwd machinery room). AC for the remaining beacons shall be junctioned from the nearest rotating beacon.

**3.1.20** Contractor shall remove three (3) existing IDCH-7200 control heads complete with cable from the bridge port & starboard wings and forward machinery console. Contractor shall also remove one (1) control head for direct line access in the engine control room complete with cable as detailed in reference drawings.

**3.1.21** Contractor shall install four (4) new EPIC control heads complete with handsets in the space vacated by the old control heads. The EPIC control heads for these locations shall be installed using adapter plates with the EPIC control heads and handsets fitted in the adapting plates. These plates shall be of the same paint scheme as the location they are being installed.

**3.1.22** Contractor shall remove the Main Equipment PA/GA control cabinets complete with Telephone Exchange (PBX) on the bridge in the electronics equipment room. Contractor shall completely remove all cabling associated with both cabinets. Contractor shall be responsible to isolate the AC mains prior to removal.

**3.1.23** Contractor shall install an IP relay box in the emergency generator room for connection of the ICS system to this panel for muting the General alarm during a PA announcement.

**3.1.24** Contractor shall install two nodes, one in the electronics equipment room on the navigating bridge, and the other in the LAN closet on the upper deck. Exact locations and mounting configuration to be determined on site. The Nodes shall be mounted to allow the split rack to open out to 180 degrees. A UPS shall be mounted beneath each Node and off the deck.

**3.1.25** For the purpose of Deck and Bulkhead penetrations the contractor shall use existing where possible.

The contractor shall supply and install six (6) S 4x1 Roxtec primed frames complete with 36 RM20 modules per frame, one Wedge kit galvanized per frame, and six stay plates per frame. Contractor may substitute the 36 RM20's with RM15's or any mixture of.

For the purpose of adjustments, the contractor shall include a unit cost for the supply and install for one (1) S 4x1 Roxtec primed frame complete with 36 RM

20 Roxtec modules per frame, one wedge kit galvanized and stay plates per frame.

**3.1.26** Contractor shall supply and install 100m (2 runs) of fiber optic cable for the interconnection of the two main ICP nodes. The fiber cable shall be ran from Node #1 in the electronics equipment room frame 46 port on the navigating bridge to upper deck frame 81 stbd. Fiber Cable shall be the Drake series S611T (S611T50H) 50um multimode fiber.

The contractor shall supply and install two Almond 3 duplex port fiber drop boxes complete with 3 LCD (duplex) couplers to be mounted at the back of each node.

For the purpose of adjustment, the contractor shall include a unit cost for the supply and install for 10 meters of this cable type.

The contractor shall supply and install (2) 1m LC to LC fiber patch cord between the fiber drop boxes and the nodes.

**3.1.27** Contractor shall supply and install **8000m of Cat5e cable** (Belden 1300SB Category 5e Shipboard ABS Type Approved) for the connection of speakers, phones, beacons, controllers, and accessories as detailed in the reference drawings.

For the purpose of adjustments, the contractor shall include a unit cost for the supply and install for 10 meters of 1300SB Cat5e cable.

**3.1.28** Contractor shall run 200 Cat5e homerun cables from all peripheral devices to the Nodes. 75 homeruns will be to Node #2 in the LAN closet upper deck, and 125 homeruns will be to Node #1 in the electronics equipment room. These can be seen in reference drawings attached.

Contractor shall run an additional 60 Cat5e cables for the connection of chained devices as outlined in the reference drawings.

**3.1.29** Contractor shall be aware that the majority of the bulkhead phones are connected to the nearest speaker within that space and not the nodes.

**3.1.30** For the bulkhead mounted telephones, the contractor shall supply and install seventy (70) Panduit (KWP5EY) stainless steel wall phone plates with complete with one punch down Cat5e keystone jack modules, and seventy (70)

back boxes. Each KWP5EYwall plate with jack and back box shall be mounted in the space vacated by the old phone. Cable runs behind bulkhead panels shall be suitably protected and secured by the back box used. Bulkhead telephones shall be mounted directly over these wall plates and be connected via a short Cat5e patch cable supplied with phone. Mounting configuration can be seen in reference drawings.

**3.1.31** All Cat5e homerun cables shall be labelled with stamped metal tags affixed with the designation of (N:x CH:x P:x S:x) at both ends. The S can be substituted with a P to indicate phone, B to indicate beacon, R to indicate relay, CM to indicate contact maker, CH to indicate control head, SH to indicate shore connection. N represents Node and x represents number, CH represents Chassis and x represents number, P represents port and x represents number. As an example, the following label **N:1 CH:1 P:1 S1** is identified as **Node: 1, Chassis: 1, Port: 1, Speaker: 1**. These cable designations are found on the layout drawings.

**3.1.32** Contractor shall replace/refurbish all outside speaker cable clips that are not suitable for further use. The contractor shall ensure the new Cat5e cable is properly secured from the exit of each outside gland to the termination point at each speaker. Spacing between these clips shall not exceed 300mm, if this is the case new clips are to be added.

**3.1.33** All cabling, once installed, shall be labelled with a stamped metal tags securely affixed to the cable at each end with the designation for each cable provided in the installation drawings or as per the respective electrical supply.

**3.1.34** All cabling shall follow existing cable trays and transits throughout the vessel where fitted. Once installed, all cabling shall be secured of per TP127.

**3.1.35** Contractor shall supply and install a new 460V to 230 Vac step-down transformer capable of supplying the new system when under full load (system is supplied by two (2) 20 amp circuits one for each node) in the HVAC/Electrical Room. Supply for this transformer shall be from an existing spare circuit on the 460Vac Emergency Bus. Suggested circuit is EP10 (Spare) on emergency switchboard in the emergency generator room. The transformer shall be mounted above the existing two transformers in the HVAC/Electrical Room in a similar fashion. A second circuit shall be provided from the 230Vac Heating Panel in the HVAC/Electrical Room to the transfer switch. A new breaker shall be supplied and installed in the 230Vac heating panel rated to handle 2 – 20 amp circuits.

**3.1.36** Contractor shall supply and install 10 meters of 10/4 awg marine shipboard cable for the purpose of connecting the switchboard to the new transformer.

**3.1.37** Contractor shall supply and install a new 230Vac service panel Lloyds approved, complete with two (2) 20Amp supply breakers, in the HVAC/Electrical room on the focsle deck beside the existing 230Vac Heating Panel.

**3.1.38** Contractor shall supply and install a new automatic changeover switch (ACOS) in the area of the new 230Vac panel. This automatic changeover switch will be fed one circuit from the new transformer and from a spare circuit on the heating panel in the HVAC/Electrical Room. The transfer switch shall have indication for normal and emergency power operation. Normal supply will be from the heating panel and the Emergency Supply from the new transformer. The Changeover switch shall have a contact on each input to sense a power failure on each supply circuit and shall be integrated into the alarm and monitoring system (Trihedral, VTS Scada system). Contractor shall arrange to have an FSR for the alarm and monitoring system available to perform this integration.

A cable run from the contact on each input shall be ran to the Alarm & Monitoring System for this purpose. Cable type TBD

This shall meet regulation **18.3 Public Address System** of the (General Information for the Rules and Regulations for the Classification of Ships).

The Automatic Changeover Switch shall meet Lloyd's approval.

**3.1.39** Contractor shall supply and install 75 meters of 10/4 awg marine shipboard cable for the connection of these components.

**3.1.40** Contractor shall supply and install 100 meters of 12/3 awg marine shipboard cable for the connection of the UPS's for each of the nodes to the new panel. Contractor shall also feed this same cable from each UPS to each node.

**3.1.41** For the purpose of adjustments, contractor shall include a unit cost for the supply and install for 10 meters of these cable types.

**3.1.42** Contractor shall install two (2) Uninterruptable Power Supplies (UPS), one with each node. UPS is to be installed in the vicinity of each node. Electrical configuration of these UPS units is Wye (Y) configuration. These UPS shall be installed near each node.

**3.1.43** Contractor shall provide an AC feed to each of the Loudhailer speakers, two (2) on wheelhouse top, one (1) in the helicopter hanger, and one for the

shoreline connection box that's to be mounted on the upper deck via a spare circuit in Panel EL7 on bridge.

**3.2 Location**

All regularly occupied spaces will be affected by this installation.

**3.2.1** Navigating Bridge Deck
**3.2.2** Bridge Deck
**3.2.3** Forcastle Deck
**3.2.4** Upper Deck
**3.2.5** Main Deck
**3.2.6** Hold

**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 bidders conference.

**Part: 4 PROOF OF PERFORMANCE:**
**4.1 Inspection**

**4.1.1** All work shall be subject to witness by chief engineer of delegate and the attending surveyor.

**4.2 Testing**

**4.2.1** The commissioning of the new ICS system shall be done under the direction of an approved FSR and in accordance with the manufacturers approved procedures.

**4.2.2** Testing shall be completed on the system to confirm that all system aspects are in accordance with the requirements of Transport Canada and the relevant Classification Society to ensure a class approved installation. A report on all testing and findings shall be submitted to the Owner prior to the acceptance of this item.

**4.2.3** Programming of the system shall be carried out by the FSR at time of installation

**4.3 Certification**

**4.3.1** All original Class approval certificates for all system components shall be submitted to the owner prior to acceptance of this item.

**Part: 5 DELIVERABLES:**

**5.1 Drawings/Reports**

**5.1.1** Contractor shall provide the Technical Authority 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.

**5.1.2** As-built drawing package shall be provided. At minimum, this package shall include separate drawings for :

1. Device Locations (over-laid on the vessels General Arrangement, provided)
2. Cable run, Deck and Bulkhead Penetration details over-laid on the vessels General Arrangement, provided)
3. Block Diagram with Connection Details and electrical supply.
4. Regulatory & Statutory requirements. Three (3) paper copies ISO A2 size and one (1) electronic copy ACAD 2013.dwg format.

Hose McCann (or the accepted proposed equipment supplier) shall provide an itemized list with details and serial numbers for all replaceable items used in this install to CCG. This is required for CCG to be able to enter all items in AMS (Asset Management System)

As built Programming/Configuration File (Flash Drive of CD)

## 5.2 Spares

**5.2.1** The list of recommended spares provided shall be returned to the owner prior to acceptance of this item.

## 5.3 Training

**5.3.1** Contractor shall provide one (1) training course of eight (8) hour duration to be held onboard after the final installation and commissioning of all new system components. This training shall be provided to the ship's personnel involved in the operation of the system (both crews) and to the CCG Technicians responsible for the maintenance on the system. The training shall be provided by the manufacturer's technical representative (FSR). Training shall encompass all items outlined in the operating and maintenance instructions as supplied by the manufacturer. This may have to be provided on completion of the Vessel Life Extension based on access to the vessel during VLE.

## 5.4 Manuals

**5.4.1** Contractor shall ensure that all operation, maintenance, and installation manuals supplied with the new equipment unit are submitted to the Owner prior to the acceptance of this item.

| Spec item #: L-07 | **SPECIFICATION** | **LLOYDS #** |
|---|---|---|
| **L - 07 : Master Clock Replacement** | | |

**Part: 1 SCOPE:**

**1.1** The intent of this specification is to remove the existing ships master clock and install new clock system.

**1.2** This work shall be carried out in conjunction with specification item L-06.

**1.3** Contractor supplied Power over Ethernet clock system is required for this specification item

**1.4** Contractor shall supply all materials and parts required to perform the specified work unless otherwise stated.

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

| | |
|---|---|
| **2.1.1** General Arrangement – Profile | Drawing # 590-70 |
| **2.1.2** Antenna Arrangement | Drawing # 59015901 |
| **2.1.3** Electric Clock System | Drawing # 590-ED9 |
| **2.1.4** Electric Clock System | Drawing # 59014301 |
| **2.1.5** Power Over Ethernet Clock System | Drawing # Preliminary |

**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** 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 allow for the supply of a MCR5000 Masterclock System, or equivalent, with the following components; "Contractors that wish to supply and install an Equivalent system shall seek approval within the formal "Question and Answer" process, during the Solicitation".

- One (1) Master Clock MCR5000
- One (1) MCR-DS6D date/day display
- One (1) MCR-DS6T time display
- One (1) MCR-GPS-Stnd GPS receiver w/gps antenna and mounting kit
- One (1) MCR-HSO-2 high stability oscillator
- One (1) MCR-NTP, NTP reference time server
- One (1) SA90-SMA gps inline surge arrestor
- One (1) PKG-2 gps antenna cable
- One (1) NMEA 0183 input NMEA Software
- Twenty (20) NTDS24 wall mountable PoE clocks
- Five (5) NTDS46-2 wall mountable PoE clock.

**3.1.2** The contractor shall supply all equipment, enclosures, ventilation, staging, chain falls, craneage, 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, of a safe working load for the expected duties.

**3.1.3** 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 of metal filings.

**3.1.4** All cabling, once installed, shall be marked with a stamped metal tag securely affixed to the cable at each end with the designation for each cable as provided in this specification.

**3.1.5** 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.

**3.1.6** 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.

**3.1.7** The Contractor shall dispose of all cables that have been identified for removal. There are 23 cables to be removed and one (1) to be rerouted. Please refer to reference drawings attached.

**3.1.8** Contractor shall remove and dispose of 500 meters of cable. Contractor shall reroute 10meters. Contractor shall supply and install 400 meters. For adjustment purposes, Contractor shall provide a unit cost per meter for each.

**3.1.9** Contractor shall be responsible to ensure that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this specification item.

**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.

**3.1.12** Contractor shall remove the Simplex 2350 Master clock in the electronics equipment room. Contractor shall isolate and relocate the supply circuit **EL2-26A/28B** from the electronics equipment room to the equipment racks on the navigation bridge.

**3.1.13** Contractor shall remove the two cables from the master clock that go to two clocks on the bridge.

**3.1.14** Contractor shall remove cable from master clock in electronics equipment room to junction box (JB-1) in commanding officers cabin deck head frame 65. Contractor shall then continue to remove eight (8) cables from junction box JB-1 (as well as the junction box) in commanding officers cabin to the following clock locations (Commanding Officers Cabin, Chief Engineers Cabin, Senior Program Officers Cabin, Chief Officers Cabin, Bridge Deck Passage Frame 62, Ships Office, Forecastle Desk Passage Frame 62, and Upper Deck Frame 52). The contractor shall continue to remove the clocks at these locations.

**3.1.15** Contractor shall remove cable from master clock in electronics equipment room to junction box (JB-2) in crews lounge in cable way frame 48. Contractor shall then continue to remove seven (7) cables from junction box JB-2 (as well as the junction box) in crew's lounge frame 48 to the following clock locations (Officers Mess, Officers Lounge, Crews Mess, Crews Lounge, Main Deck Aft frame 8, Galley, and Engine Control Room). The contractor shall continue to remove the clocks at these locations.

**3.1.16** Contractor shall run eight (8) Cat5e (1300SB Multi-Conductor – Category 5e ScTP Shipboard ABS Type Approved) contractor supply from the bridge equipment racks to the following locations (wheelhouse port chart table, wheelhouse starboard side, Commanding Officers cabin, Chief Engineers cabin, Senior Program Officers cabin, Chief Officers cabin, Bridge Deck passageway frame 62). All these cables shall be run to existing clock locations as they will be replaced with new digital clocks. Cable terminations at the clock locations shall be done using the following;

- PanCJ5E88TBU (CJ5E88TBU Modular Jack Cat5e)
- PanCFP1WH (CFP1WH 1 Port Face Plate)

Connection from termination point to clock will be made via a short Cat5e patch cord. CCG Production Techs shall be responsible for all terminations. Contractor shall be responsible for mounting digital clocks.

**3.1.17** Contractor shall run five (5) Cat5e (1300SB Multi-Conductor – Category 5e ScTP Shipboard ABS Type Approved) contractor supply from ships office network rack to the following locations (Ships office, Forecastle Deck Passage frame 62, Upper Deck frame 52, Officers Mess, and Officers Lounge). All these cables shall be run to existing clock locations as they will be replaced with new digital clocks. Cable terminations at the clock locations shall be done using the following;

- PanCJ5E88TBU (CJ5E88TBU Modular Jack Cat5e)
- PanCFP1WH (CFP1WH 1 Port Face Plate)

Connection from termination point to clock will be made via a short Cat5e patch cord. CCG Production Techs shall be responsible for all terminations. Contractor shall be responsible for mounting digital clocks.

**3.1.18** Contractor shall run eight (8) Cat5e (1300SB Multi-Conductor – Category 5e ScTP Shipboard ABS Type Approved) contractor supply from the LAN room Upper Deck frame 80 to the following locations (Crews Mess, Crews Lounge, Galley, Main Deck Aft frame 8, Engine Control Room, Recreation Room, Main Deck frame 61, and Upper Deck frame 82). All these cables shall be run to existing clock locations as they will be replaced with new digital clocks. Cable terminations at the clock locations shall be done using the following;

- PanCJ5E88TBU (CJ5E88TBU Modular Jack Cat5e)
- PanCFP1WH (CFP1WH 1 Port Face Plate)

Connection from termination point to clock will be made via a short Cat5e patch cord. CCG Production Techs shall be responsible for all terminations. Contractor shall be responsible for mounting digital clocks.

**3.1.19** Contractor shall run one (1) owner supplied RF cable from bridge equipment racks to newly installed antenna platform for connection to GPS antenna that is used as a source of timing for the master clock. CCG technical representative will identify the exact location on antenna.

**3.2 Location**

**3.2.1** Navigating Bridge Deck
**3.2.2** Bridge Deck
**3.2.3** Forcastle Deck
**3.2.4** Upper Deck
**3.2.5** Main 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 shall be subject to witness by chief engineer of delegate and the attending Lloyds 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 shall be replaced at the contractor's expense.

**4.2.2** All cable testing shall be verified by a Coast Guard Technician.

**4.2.3** New AC/DC circuits shall be proven operational.

**4.2.4** Electronic equipment which has been removed for the performance of this specification item shall be returned to operational condition.

**4.3 Certification**

N/A

**Part: 5 DELIVERABLES:**

**5.1 Drawings/Reports**

**5.1.1** 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**

**5.2.1** All owner supplied cable which has not been used shall be returned to the owner prior to the acceptance of this item.

**5.3 Training**

**N/A**

**5.4 Manuals**

**5.4.1** The Contractor shall ensure that all operation, maintenance, and installation manuals that are supplied with new equipment are submitted to the Owner prior to the acceptance of this item.

| Spec item #: L-08 | SPECIFICATION | LLOYDS # |
|---|---|---|
| **L - 08 : Miranda Davit Electrical Installation** | | |

**Part: 1 SCOPE:**

**1.1** The electrical scope of work for this project will include the removal of the existing electrical controls, related wiring and equipment for the presently fitted davit and the installation of four new MRT-3900 davit 40KW hydraulic power packs and related electrical equipment to support two new davits. The scope of work shall also include the installation of 2 x 120VAC - 15amp receptacles.

**Part: 2** REMOVAL

**2.1** Lockout/tagout procedures are to be implemented prior to commencement of any electrical work.

**2.2** Prior to disconnecting and removal of any cables the contractor is to carefully identify all related wiring to be removed and ensure all sources of energy are isolated. All related wiring that is identified for removal shall be pulled back to its source where practical. Where complete removal is impractical the contractor shall inform the Chief Engineer.

**2.3** All redundant electrical equipment including old wiring removed from the existing system shall be turned over to the Chief Engineer .

**Part: 3** INSTALLATION

**3.1** The contractor shall install 4 Crown supplied NEMA soft start electric motor controllers in a position to be identified by the Chief Engineer or his designate. All cables entering and exiting these controllers shall be bottom entry only.

**3.2** The contractor will supply and install 4 new 3 pole circuit breakers properly sized for the 4 x 40KW motor starters at 460 Volt. The new breakers will be installed in the main control room switchboard. Location of breaker placement to be determined by chief engineer.

**3.3** The contractor will install the stbd davit controllers in the dry stores compartment located on the main deck on the inboard bulkhead at approximately frames 40 - 43. Power supply cabling sized appropriately for attached breakers will be routed to the MCR switchboard. Cabling of identical size and construction will be routed to the davit motors via the cold room located on the main deck. This is to be done in conjunction H-25 Cold Room Insulation renewal. Two (2) additional control feeds for the crank limit switch(minimum 14/3) and stop/start station (minimum 14/4) will be routed to the davit location as well.

All cabling exiting onto outer decks to have protective marine braid with outer pvc jacket. Cabling penetrating through deck to be water tested with fire hose at 40psi minimum to ensure watertight integrity to the satisfaction of the chief engineer and Lloyds inspector. Two (2) additional 14/3 cables will be run from the stbd davit starters 1 & 2 to the respective port davit starters. These cables are to be tagged and terminated as spares to be used for interlocking purposes if needed to prevent more than 2 davit starters to be engaged at any one time. Any associated controls to effect such interlocking arrangements will be covered by 1379 action.

**3.4** The contractor will install the port davit controllers outside the Engine room workshop located on the hold deck on the inboard bulkhead at approximately frames 18-21. Power supply cabling sized appropriately for attached breakers will be routed to the MCR switchboard. Cabling of identical size and construction will be routed to the davit motors via the galley located on the main deck. This is to be done in conjunction H-17 and H-18 galley equipment and flooring renewals. Two (2) additional control feeds for the crank limit switch (minimum 14/3) and stop/start station (minimum 14/4) will be routed to the davit location as well. All cabling exiting onto outer decks to have protective marine braid with outer pvc jacket. Cabling penetrating through deck to be water tested with fire hose at 40psi minimum to ensure watertight integrity to the satisfaction of the chief engineer and Lloyds inspector. See 3.3 for details on interlocking cable requirements.

**3.5** Contractor to bid on the supply and installation of following cable lengths and give a price per meter (supply and install) . Contractor to also include a price per transit ( suggested number is for provisional route, actual route as yet to be determined) and supply and install cable hanger as per code for given length (existing cable hangers may be used if available and approved for use by chief engineer) to be adjusted up or down as needed by 1379 action. Approximate cable runs are as follows:

**Stbd Davit:**

- **Starters to MCR switchboard 15 meters x2 ( 3 transits )**
- **Starters to davit motors 20 meters x2 ( 6 transits )**
- **Starters to davit limits and start stop 20 meters x4 ( 12 transits)**
- **Starters to Port Davit starters interlock cables 20 meters x2 (6 transits)**
- **120Volt power feed 25 meters. (3 Transits)**

**Port Davit**

- **Starters to MCR switchboard 22 meters x2 ( 3 Transits )**
- **Starters to davit motors 20 meters x2 ( 6 Transits )**
- **Starters to davit limits and start stop 20 meters x4 ( 12 transits)**
- **120Volt power feed 25 meters (3 Transits)**

**3.6** All new cables to be supplied and installed by the contractor and shall be low smoke, zero halogen with an insulation rating of at least 85.0°C. The cables are to comply with Lloyds Rules and Regulations for the Classification of Ships – Part 6, Chapter 2, Section 10

-Cables are to be installed on existing wire ways where possible. If new hangers are required to be supplied and installed by the contractor they will be of similar design and quality as those used for the existing installation.

-Power cables will be restricted to no greater than double banking. Cables are to be secured to the wire ways at intervals as specified by Lloyds. The contractor is to ensure Physical separation of non-shielded electronic cables from the power, control and lighting cables.

-Miscellaneous "local" cable runs will be secured with approved clips and studs. (Nelson or equal)

-All cables supplying power to equipment, fixtures and electrical apparatus exposed to the weather shall be run internal to the ship's hull and superstructure as much as practicable. Where unavoidable, the cable selected shall be of a type that includes basket weave bronze braid armour covered with an external impervious non-metallic jacket.

In locations where cables may be exposed to mechanical damage they will be protected in accordance with TP127E and Lloyds.

-Wire ways will be routed to avoid areas of high fire risk (such as over exhaust pipes), except as required in such areas to provide service. If it is necessary to route cables in proximity to such areas, suitable heat shields are to be provided by the contractor.

-Transition pieces through water tight, gas tight and fire proof bulkheads and decks will be in accordance with the requirements of TP127e and Lloyd's latest rules.

-MCT brattberg or Roxtec packing systems will be the only systems accepted for applications requiring multiple cables through one penetration. Electric cables passing

through decks are to be protected by deck tubes or ducts installed in accordance with TP127 and Lloyds.

-Cableways and cables shall be installed clear of machinery access routes and maintenance envelopes.

-Cables terminated in enclosures will have strain relief fittings approved for the applicable environment and will be connected via terminal blocks were practicable. Strain reliefs utilized on weather deck application shall be of a metal construction to resist damage from icing conditions and deicing operations.

- The remote start/stop stations associated with each set of hydraulic pumps shall be mounted inside a single NEMA 4X stainless steel enclosure, suitably sized for the application. The enclosure will be hinged on the bottom and come complete with an internal backing plate. All penetrations will be bottom entry only. The door shall be capable of being opened without any tools. The Chief engineer or his designate will site the mounting location of each enclosure for the Port and Starboard systems.

-All cables shall be tagged with circuit identification at all points of connection and on both sides of bulkheads, decks and barriers. The tags will be metal, compatible with the cable sheath and shall have a circuit designation embossed thereon. Both ends of the tag shall be secured to the cable with metal tape or metal ty-raps. The wire Identification numbering philosophy for the new wiring shall be compatible with that utilized with the existing systems.

**3.7** The contractor will supply and install 2 new 15amp 120VAC double pole circuit breakers in a Power panel to be identified by the Chief Engineer or his designate.

-2 x 120VAC – 15amp electrical circuits, one for each davit shall be run from the power panel to the top of each FRC embarkation structure to be utilized for the charging and anti-condensation requirements of the FRC.

-The FRC comes complete with an extension cord which must be plugged into the vessel. The contractor is to provide a receptacle and receptacle box compatible with the twist lock plug at the end of this owner supplied extension cord.

-The receptacle shall be mounted at the top of each embarkation structure in a location identified but the chief engineer or his designate.

-The cable running up the embarkation structure shall be run inside a piece of 1 inch ridget conduit attached to the side of the structure to protect the cable against mechanical damage.

**3.8** The contractor is to supply and mount a junction box to be used to make the Davit "Hand Crank" interlock connections.
-This Junction Box shall be an IP56 enclosure of stainless steel construction. The strain reliefs shall be of brass construction.

-If deck mounted, the enclosure shall be a minimum of 300mm in height above the deck and located outside the work envelope required for hand crank operations.

**Part: 4 REFERENCES:**

| | |
|---|---|
| TP 127E | Transport Canada, Marine Safety, Ship Electrical Standards, Current Edition |
| Lloyds | Rules and Regulations for the Classification of Ships. |
| IEEE Std 45-2014 | Recommended Practice for, Electrical Installation on Shipboard |
| MOSH | Canada Labour Code - Marine Occupational Safety and Health Regulation |
| Schat | Schat-Miranda Davit Installation Instruction Manual |
| Schat | Schat-Electrical Wiring Diagram (460 V) Dwg. No. UK29434 |

| | |
|---|---|
| Other | CSA, IEC and other rules or codes as referenced in TP 127E & Lloyds Rules and Regulations for the Classification of Ships. |
| NOTE 1: | In case of conflict between CCG specifications and any of the standards then the most stringent requirements will prevail. |
| Note 2: | 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 Department. Plastic tie-wraps may be used to secure wiring in panels or junction boxes only. |

**4.1 Owner Furnished Equipment**

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

**4.2 Location**

**4.2.1** N/A

**4.3 Interferences**

**4.3.1** N/A

**Part: 5 PROOF OF PERFORMANCE:**

**5.1 Inspection**

**5.1.1**

**5.2 Testing**

Megger testing shall be conducted in accordance with TP127E and Class rules. The insulation resistance shall be measured by applying a voltage of at least 500 volts to the circuit

The Miranda davit and all of the associated electrical and control systems shall be functionally tested buy the contractor in accordance with the manufacturer's instructions. The test must be completed to the satisfaction of the Owners Representative or his designate, Class. All tests shall be completed under the direction and supervision of the Schat Field Service Representative. and witnessed by Lloyds and the Chief Engineer.

**5.3 Certification**

N/A

**Part: 6 DELIVERABLES:**

**6.1 Drawings/Reports**

6.1.1 The contractor is to provide Cable Size/Number of Conductors/Lengths of all major cables installed on this project. This info will be required for the new Fault Current Calcs/Arc Flash/Coordination study.

6.1.2 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.

**6.2 Spares**

**N/A**

**6.3 Training**

**N/A**

**6.4 Manuals**

**N/A**

| VLE Spec Item: L-09 | **Specification** | TCMS Field #: |
|---|---|---|
| **L - 09 : Navigation Light Installation** | | |

## Part 1: Scope

**1.1** The intent of this specification shall be to remove the existing navigation lights and control panel and replace with new, Contractor supplied LED navigation lights with integrated control panel and associated wiring

## Part 2: References

### 2.1 Guidance Drawings/Nameplate Data

**2.1.1** Navigation light Arrangement

### 2.2 Standards

**2.2.1** Fleet Safety and Security Manual (DFO/5737)
**2.2.2** Standards for Navigation Lights, Shapes, Sound Signal Appliances and Radar Reflectors – TP1861
**2.2.3** Ship's Electrical Standards – TP127

### 2.3 Regulations

**2.3.1** Canada Shipping Act 2001- Collision Regulations
**2.3.2** International Regulations for Preventing Collisions at Sea, 1972 (IMO)
**2.3.3** International Convention for the Safety of Life at Sea (SOLAS), 1974 (IMO)

### 2.4 Contractor Furnished Equipment

**2.4.1** The Contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.
**2.4.2** Contractor shall supply LED navigation fixtures as per 3.16, Table 1
**2.4.3** Lights are to be Glamox/Aquasignal Series 65 LED or equivalent.
**2.4.4** Controller to be Glamox/Aquasignal Series 65 LED compatible or equivalent
**2.4.5** All fixtures shall have an ingress protection rating of IP67 or greater.

**2.4.6** All fixtures to be constructed of fibre-reinforced polycarbonate material which is matte black in finish.

**2.4.7** All fixtures shall contain a main and standby LED lighting element with a combined life expectancy greater than (>) 100,000 hours.

**2.4.8** All fixtures shall be rated for use on vessels greater than (>) 50 metres in length.

**2.4.9** All lighting elements must operate on 115VAC / 60 Hz supply.

**2.4.10** To facilitate retrofit of lighting fixtures, new lights to fit existing mounting arrangement and bolt pattern. Current arrangement is a square, four bolt arrangement with 155.5 mm bolt-to-bolt spacing.

**2.4.11** Should the proposed fixtures not fit the desired mounting arrangement, Contractor shall submit proposal for adaptive mounting and include cost for supply of such.

**2.4.12** The control panel shall be capable of controlling sixteen (16) main and sixteen (16) standby lights.

**2.4.13** The control panel shall be capable of operating on 115VAC / 60 Hz supply and shall have means for two (2) independent supplies.

**2.4.14** The control panel shall have indication lighting showing functionality of the ships lights.

**2.4.15** The control panel shall be fitted with audible and visual alarms indicating failure of a power supply or of any of the ships lights.

## Part 3: Technical Description

### 3.1 General

**3.1.1** Contractor shall supply all equipment, enclosures, ventilation, staging, chain falls, craneage, 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, of a safe working load for the expected duties.

**3.1.2** The Contractor shall be responsible to arrange for LLoyds survey when completing this specification item.

**3.1.3** Prior to any steel work 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.

**3.1.4** The Contractor shall be responsible to ensure that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this specification item.

**3.1.5** Prior to the commencement of any electrical work, the Contractor shall ensure that both electrical supplies feeding the system have been isolated at the source following an established lockout / tagout procedure.

**3.1.6** The Contractor shall disconnect the wiring from the twentyfour (24) existing light fixtures, dismount the fixtures, and install new Contractor supplied fixtures of the same configuration. Existing wiring is to be reused. The fixtures to be supplied are identified in the following table:

**Table 1**

| Navigation Light Panel (CCGS Leonard J. Cowley) | | | | |
|---|---|---|---|---|
| Quanity | Light | Lens Colour | Arc of Visibility | Range |
| 2 | Fwd Masthead | White | 225° | 6 |
| 2 | Main Masthead | White | 225° | 6 |
| 2 | Port Side | Red | 112.5° | 3 |
| 2 | Starboard Side | Green | 112.5° | 3 |
| 2 | Stern Light | White | 135° | 3 |
| 2 | Tow Light (Stern) | Yellow | 135° | 3 |
| 2 | Tow Light No. 1. (All-round) | White | 360° | 3 |
| 2 | Tow Light No. 2. (All-Round) | White | 360° | 3 |
| 2 | Forward Anchor Light | White | 360° | 3 |
| 2 | Upper Not Under Command | Red | 360° | 3 |
| 2 | Restricted in Ability to Maneuver | White | 360° | 3 |
| 2 | Lower Not Under Command | Red | 360° | 3 |

**3.1.7** The Contractor shall mount the new fixtures with new, Contractor supplied, stainless steel bolts complete with washers and self-locking nuts. A total of four (4) bolts are required for the mounting of each fixture.

**3.1.8** The Contractor shall remove the current PMC Navigation Lighting Control Panel as fitted in the center console in the Wheelhouse and replace with the new Contractor supplied control panel. The Contractor shall be responsible to fabricate a covering plate for the hole where the existing panel was removed and modify to suit the installation of the new panel. This new panel shall be painted flat black to limit the reflection of any light incident upon the surface.

**3.1.9** The Contractor shall mount the new switching unit inside the center console in a location to be determined at the time of installation. In the event that the current wiring will not reach the proposed location, the Contractor will be required to terminate the wiring at a Contractor supplied terminal strip, suitable

to the purpose, which will be mounted inside the console. Connection to the switching unit will then be made from this point.

**3.1.10** Contractor will be responsible for the following wiring runs which are all approximate in length. All cabling to be marine rated with marine braid and with pvc outer jacket over marine braid. Contractor to bid on approximate lengths including noted transits/bulkhead penetrations. A cost per meter for cabling and per transit/bulkhead penetrations will be given and adjusted per 1379 action

**3.1.10.1** Stern Light - 4x 80m of 14/3 marine cable with 24 penetrations

**3.1.10.2** Stack light - 4x 45m of 14/3 marine cable with 20 penetrations

**3.1.10.3** Main Mast - 24x 45m of 14/3 marine cable with 26 penetrations

**3.1.10.4** Forward Mast – 12x 80m of 14/3 marine cable with 16 penetrations. Also two new transits need to be installed in the forward deck to accommodate cables where the existing kick pipes are rusted out.

**3.1.12.5** Side lights - 4x 20m of 14/3 marine cable with 4 penetrations

**3.1.11** Contractor will remove all old wiring to existing lights. Existing hangers and bulkhead penetrations may be re-used after approval by chief engineer

**3.1.12** The Contractor shall ensure that all wiring has been identified prior to disconnecting from the control panel and shall be reconnected as per the supplied drawings.

**3.1.13** Upon final installation, testing shall be carried out as per Section 4.2 of this specification item.

## 3.2 Location

**3.2.1** Wheelhouse
**3.2.2** Lighting Mast –Aft Stack
**3.2.3** Forward Lighting Mast
**3.2.4** Main Mast
**3.2.5** Aft Lighting Mast - Stern

## 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 shall be subject to witness by the Chief Engineer or delegate and the attending TCMS surveyor.

**4.2 Testing**

**4.2.1** All light fixtures shall be checked for operation on both the main and standby lamps, for both the main and standby supplies.

**4.2.2** The automatic switching of the control panel from main to standby supply shall be verified.

**4.2.3** Each fixture shall be tested for operation of the alarm circuit.

**4.2.4** All penetrations that lead out onto outer weather decks are to be leak tested with fire hose at 40psi minimum pressure to the satisfaction of the chief engineer.

**4.2.5** All testing shall be conducted in the presence of the Chief Officer or delegate and the attending TCMS surveyor.

**4.3 Certification**

## Part 5: Deliverables

**5.1 Drawings/Reports**

**5.1.1** The Contractor shall provide the Chief Engineer with a typewritten report of the Contractors work in both electronic and hardcopy formats outlining the

details of the inspection and any alterations / repairs made prior to the acceptance of this item.

## 5.2 Spares

**5.2.1** The Contractor shall return all dismounted light fixtures and the control panel to the Owner for disposal prior to the acceptance of this item.

## 5.3 Training

## 5.4 Manuals

**5.4.1** The Contractor shall ensure that all manuals supplied with the navigation lights and control panel are submitted to the Owner prior to the acceptance of this item.

| Spec item #: L-10 | **SPECIFICATION** | TCMSB Field #: N/A |
|---|---|---|
| **L - 10 : FM200 Remote Alarm Added** | | |

**Part: 1 SCOPE:**

**1.1** The intent of this specification Low Pressure monitoring of the Kidde Nitrogen actuation, siren and FM200 systems must be connected to the Vessels Machinery Monitoring System. Any programming and designs where applicable must be completed by the OEM equipment representative of the Monitoring System which is Trihedral Engineering.

**1.1.1** Any equipment required for expanding the current machinery monitoring system must be supplied by the OEM

**1.2** Work to be carried out by certified Manufacture Representive for the FM200 system and Trihedral Engineering. Contractor to bid on allowance of $15,000.00 for FM200 FSR and $10,000.00 for Trihedral Engineering FSR, both to be adjusted on proof of invoice by PWGSC 1379 action.

**1.3** This spec references (Spec item H-03 Fixed Fire System Re-certification).

**Part: 2 REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1** Drawing number L1-3516401-01 Title: Kidde Marine FM-200 system layout and installation N2actuation schematic details.

**2.1.2** Manual and drawings are available to successful bidder from vessel located in the Chief Engineer cabin.

**2.1.3** Trihedral drawings 390-B-001 to 390-B-048.

**2.1.4 Contact information for Trihedral Engineering:**
**Blair Sooley 902-832-6166, cell 902-489-0044, Fax 902-835-0369**
**b.sooley@trihedral.com**
**Address: 1160 Bedford Hwy #400, Bedford, NS B4A 1C1**
**WWW.trihedral.com**

**2.2 Standards**

**2.2.1**

**2.3 Regulations**

**2.3.1** Lloyd's and Transport Canada TP 127E (5/2005) Revision 02 May 2008

**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**

**3.1.1** Contractor must have a Kidde FSR supply and install 18 contact devices switches and 3 engage switches providing contacts which can be appropriately monitored by the Machinery Monitoring System. These switches shall not be required to have additional sources of power; if additional sources of power are required it must be supplied by the Machinery Monitoring system, or another source which is supervised for loss of power.

**3.1.2** The Contractor must also supply 12 low pressure supervisory type switches to monitor the FM200 suppression tanks. These switches shall not be required to have additional sources of power.

**3.1.2.1** The circuit must be monitored for both low pressure and open circuit/open wire conditions. Open circuit faults must be indicated at the control station.

**3.1.2.2** The Discharge pressure Switches must also be monitored for Discharge conditions.

**3.1.2.3** The source of any additional power shall not be supplied by the vessel's Fire Detection system.

**3.1.3** Contractor must bid on the installation of the cabling and supporting equipment necessary to connect the Low Pressure Switches to the Machinery Monitoring System. The location the wiring has to be taken from the FM200 stations and bottles refer to Spec item H-03 Fixed Fire System Re-certification to the Machinery alarm modules LUA and LUB in the engineroom.

**3.1.4** This contractor shall be qualified for the installation of the cabling and components as required by the OEM of the Machinery Monitoring System.

**3.1.5** All cables components and methods shall comply with Lloyd's electrical rules and electrical standard TP127.

**3.1.6** The selection of material, cables and components shall be compatible with those currently used by the vessel as normal approved electrical spares.

**3.1.7** All serviceable components shall be din rail mounted.

**3.1.8** All penetrations installed shall maintain the rating of the decks and bulkheads affected.

**3.1.9** Enclosures shall be NEMA4 with back mounting plate.

**3.1.10** Each FM200 alarm is to have its own designated channel with a text description denoting name of bottle and location.

**3.1.11** Each Individual FM200 alarm shall be able to be able to be blocked. All blocked alarms are to be indicated on central blocked alarm page.

**3.1.12** Contractor shall program and test system for correct operation. To be witness by Chief Engineer.

**3.1.13** Contractor shall supply three paper copies and one Auto-Cad electronic drawing upgrade of the existing drawings for FM200 System and the Machinery Alarm and Monitoring System.

## 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**

### 4.2 Testing

**4.2.1** Testing to be carried out by certified Manufacture representive for the FM200 system and OEM for the Alarm and Monitoring system witness by Chief Engineer.

### 4.3 Certification

That the FM200 and OEM systems are certified.

## Part: 5 DELIVERABLES:

### 5.1 Drawings/Reports

**5.1.1** Contractor to supply three paper copies and one Auto-Cad electronic drawing upgrade of the existing drawings for FM200 and the Alarm and Monitoring system.

### 5.2 Spares

**N/A**

### 5.3 Training

**N/A**

### 5.4 Manuals

**N/A**