CCGS Leonard J. Cowley
Annual Refit Dry-Docking 2012

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REFIT PREAMBLE

1. INTENT

The intent of this specification shall describe the necessary work involved in carrying out ship's Dry-Docking refit June 29 to August 16, 2012 by the contractor.

All work specified herein and all repairs, inspections and renewals shall be carried out to the satisfaction of the: Owner's Representative, and Lloyd's Surveyor.

Unless otherwise specifically stated, the Owner's Representative is the Chief Engineer.

2. MANUFACTURER'S RECOMMENDATIONS

The overhaul and installation of all machinery and equipment specified herein shall be as per the manufacturer's applicable instructions, drawings and specifications.

3. TESTING AND RECORDS

All test results, calibrations, measurements and readings shall be properly tabulated, compiled and two typewritten copies shall be presented to the Owner's Representative before the completion of the refit. All tests shall be performed to the satisfaction of the Owner's Representative and attending surveyors.

4. 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.

5. FACILITIES

Quotation shall include all the necessary labour and equipment required for the erection of access staging, rigging, lighting, tugs, pilotage, necessary cranage and line handling including 5 lifts.

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.

6. MATERIALS AND SUBSTITUTIONS

All material shall be contractor supplied, new and unused unless otherwise specified. All replacement material in the form of jointing, packing, insulation, small hardware, oils, lubricants, cleaning solvents, preservatives, and all others, shall 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 prior to its use.

7. 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.

8. 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.

The contractor shall adhere to local bylaws for containment of blasting debris.

9. CLEANLINESS

The contractor shall at all times to maintain the work areas in which personnel have access in a clean condition and free from debris. Upon completion of this refit, the contractor shall ensure that the vessel is in a clean condition, free from all foreign material placed there as a result of this refit.

The contractor shall dispose of any and all oil and water residue which accumulates in the machinery space bilges as a result of this refit.

10. 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.

11. ASBESTOS

Any and all materials used shall be asbestos free and approved for the required application.

12. ENTRY INTO ENCLOSED SPACES

Provincial Regulations for enclosed spaces be responsible to ensure the safety of contractor's personnel, including any subcontractors, inspection personal, Lloyd's Surveyor, Chief Engineer, Nace Inspector and Technical Authority Representive.

13. HOTWORK

Any item of work involving the use of heat in its execution requires that the contractor advise the owner's representative prior to starting such heating and upon its completion. The contractor will be responsible for maintaining a competent and properly equipped firewatch during and for one full hour after all hot work. The firewatch shall be arranged such that all sides of surfaces being worked on are visible and accessible.

The contractor shall provide sufficient suitable fire extinguishers and a fire watch during any such heating and until the work has cooled. Ship's extinguishers are not to be used except in an emergency.

Contractor to follow Provincial Regulations with regards to hotwork that there must be sufficient fire watches and proper hotwork permits filled out prior to starting hotwork.

14. PAINTING

All new and disturbed steel work that will not be on the underwater wetted surface of the ship's hull shall be protected with one coat of primer. Unless otherwise stated in the individual specification item the primer shall be International Paints Interplate zinc silicate NQA262/NQA026 red or equivalent. The paint shall be applied as per the manufacturer's instructions on their product data sheet. Paints containing lead, mercury or copper shall not be used.

15. WELDING

Welding shall be in accordance with the Canadian Coast Guard Welding Specifications for Ferrous Materials, Rev 4., available from Canadian Coast Guard.

Contractor must be currently certified by the Canadian Welding Bureau (CWB) in accordance with CSA Standard W47.1, latest revision at the time of bid closing. All welders must be CWB registered and certified.

16. SMOKING

The Public Service Smoking Policy forbids smoking in Government ships in all areas inside the ship where shipyard personnel will be working. The contractor shall inform his workers of this policy and ensure that it is complied with.

17. RESTRICTED AREAS

The following areas are out of bounds to the contractor's personnel except to perform work as required by the specifications:
All cabins, wheelhouse, public washrooms and mess area.

18. 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:

- TP 127E - Ship Safety Electrical Standards, available form Transport Canada Marine Safety

- 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.

19. DRAWINGS

All drawings and drawing revisions that the contractor is requested to do in the execution of this contract shall be of a quality equal to that of the drawings that are requested to be updated.

20. 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.

21. VESSEL CREW

The contractor shall note that the vessel will be manned during the refit period.

Provision for safe and timely access to the vessel shall be made for the vessel's crew during the period of the refit and until the vessel leaves the contractor's premises. The ship's crew is not to be locked out of the contractor's premises during security guard rounds or similar situations.

22. FIRE DETECTION AND SUPPRESSION SYSTEM

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.

23. WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM

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. Copies of the MSDS sheets
shall be kept in a central location on the vessel for viewing.

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

25. 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.

26. LOCKOUT AND TAGOUT PROCEDURES

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:

- electrical current
- hydraulic pressure
- pneumatic pressure
- gas or steam pressure and vacuum
- high temperatures
- cryogenic temperatures
- radio frequency emissions
- potential reactive chemicals
- stored mechanical energy
- 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.

27. SHIP'S 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:	1495tonnes

Spec item #: HD-1	**SPECIFICATION**	TCMSB Field #: N/A
HD-1 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

3.1.1. The successful contractor shall supply three hard copies to Chief Engineer and forward one electronic copy to the vessel's Senior Vessel Maintenance Manager donald.hartery@dfo-mpo.gc.ca. also facsimile to be sent to Public Works Government Services Canada (PWGSC) at 709-772-2932.

3.1.2. 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.

3.1.3. 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.

3.1.4. If work arises that affects critical path, it shall be immediately brought to the attention of the Chief Engineer, Senior Vessel Maintenance Manager and PWGSC. Every effort shall be made to prevent completion delay.

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. 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 Senior Vessel Maintenance Manager.

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 #: HD-2	**SPECIFICATION**	TCMSB Field #: N/A
HD-2 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

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 to the point of connection.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1. Berthing: 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.

3.1.2. 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..

3.1.3. **Gangways**: 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. Provincial regulations regarding gangways must be followed. Access to both gangways is to be constantly maintained in a safe and secure manner clear of all obstacles.

3.1.4. **Fire Main**: 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.

3.1.5. Contractor shall supply a pressure reducing valve with pressure gauge which shall be fitted before the shore connection valve on board the ship.

3.1.6. **Parking**: Three parking spaces near the vessel shall be provided for: Commanding Officer, Chief Engineer and Senior Engineer.

3.1.7. **Electrical Shore Power**: 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 throught 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 thethe Upper Deck stbd. side. Contractor to quote for supplying 30,000 KW hours. Contractor to quote KWH unit rate for adjustment purposes.

3.1.8. 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.

3.1.9. Contractor is advised that the ship requires shore power from the starting date to the completion date of the contract.

3.1.10. **Garbage Removal**: A garbage container of 215 cu. ft. (6 m^2) 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.

3.1.11. **Cranage**: Crane and operator usage for vessel's purpose; quote for 10 lifts and unit cost per lift. Also quote hourly rate for services of crane, operator and spotter. Adjustments to total number of lifts will be by (PWGSC)1379 action.

3.1.12. CG Personal: Dry-Docking is a manned refit with approximately 13 crew members onboard for the duration of the refit

3.1.13. The contractor is to bid on the removal 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.

3.1.14. The contractor is to provide labor 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.

3.1.15. The 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.

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

3.2 Location

3.2.1.

3.3 Interferences

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

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

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 #: HD-3	**SPECIFICATION**	TCMSB Field #: N/A
HD-3 Drydocking		

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:

- All specification items described in this document.

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 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

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. Crew will be on board when putting vessel on and off dock.

3.1.2. 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.

3.1.3. 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.

3.1.4. 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.

3.1.5. Within <u>two</u> 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.

3.1.6. Prior to commencing hydroblasting, all hull mounted equipment and openings are to be fully protected

3.1.7. The following information is to be recorded on Ship Condition Reports.

3.1.8. 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.

3.1.9. 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.

3.1.10. Prior to flooding the dock the contractor shall re-check the security of the keel/bilge blocks and docking plugs in the presence of the owner's representative. The condition of the vessel shall be the same as at the time of docking.

3.1.11. On docking, all tanks emptied to be listed, and copies held by Contractor and Chief Engineer.

3.1.12. 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.

3.1.13. 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.

3.1.14. 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 adjuted up or down by PWGSC 1379 action.

3.1.15. The Contractor is not to remove or transfer any tank contents without first discussing same with the Chief Engineer.

3.1.16. 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.

3.1.17. 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.

3.1.18. 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.

3.1.19. 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

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

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. Contractor shall dock the vessel in accordance with the vessel's docking plan drawing

4.1.2. At undocking, all tanks to be refilled to obtain same draft and trim as at docking, and the condition agreed by the Docking Master, the ship's Captain and the Chief Engineer

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

4.2 Testing

N/A

4.3 Certification

4.3.1 Copy of Docking Master Certification or qualified person.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

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

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals

N/A

Spec item #: HD-4	**SPECIFICATION**	TCMSB Field #: N/A
HD-4 CATHODIC PROTECTION		

Part 1: SCOPE:

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.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Drawing, instruction book, tech. Order:
"Cathelco System / Sea boxes and Sea Bay Electrolytic Protection"
Drawing # ECMS-05-04-01 and 02
The drawing, installation and parts manual are on board the vessel and will be made available to the Contractor.
The system controller is fed from panel L10 Breaker 21/23, 115 V.A.C. 3 Phase

2.2 Standards

2.2.1

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

2.4.1.1 It is noted that Canadian Coast Guard will provide 16 anodes for this specification item Anodes shall be vessel supplied. All other materials required to complete this spec shall be Contractor supply including the 4 x Z-26 sacrificial anodes.

2.4.2 Contractor shall supply the services of the following Field Service Representative (FSR) who shall supervise all work within this

specification and to carry out the necessary adjustments and tests to bring the system to within the manufacturers operational design parameters. **Contractor to quote $5000.00 allowance for FSR.**

2.4.3 Contact information for (FSR) is
Martin Yeatman
Andover Management Inc.
MCC Division 279 Portland Street
Dartmouth, Nova Scotia
Andover@eastlink.ca
Cell 902-488-4119
Office 902-464-8896

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1. 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.

3.1.2. **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.

3.1.3. Contractor shall remove all manhole covers and sea chest grids to gain access to the anodes. Contractor shall remove all wasted anodes including T.C., M.G., Iron and sacrificial and dispose of as per provincial environmental regulations.

3.1.4. 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

3.1.5. 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.

3.1.6. Contractor shall record the resistance values of all anodes and anode wiring from the control panel down to the termination point inside each safety cap prior to installation.

3.1.7. 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. Contractor to supply 15 liters of Vaseline. The anode safety caps shall be fitted with new seals.

3.1.8. Contractor shall install a total of four z-26 sacrificial anodes, one in each structural cell of the main sea bay. Contractor shall supply the z-26 anodes.

3.1.9. 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

3.1.10. 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.

3.1.11. 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 under water hull painting spec.

3.1.12. 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

3.2.1. 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

3.2.1. 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

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

5.1.1 The Contractor shall provide the Chief Engineer with two type written copies of all Contractor + FSR work reports and readings.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals

N/A

Spec item #: HD-5	**SPECIFICATION**	TCMSB Field #: N/A
HD-5 SACRIFICAL HULL ANODES		

Part 1: SCOPE:

1.1 The intent of this specification is to renew the two anodes, one each attached port and stbd mid-ships just under the Bilge Keels and four outside the Bow Thruster tunnel two on each side. Anodes are welded to the hull.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

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

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 Total of six, 22 POUND Z-26 from Eastern Foundries Ltd or equal.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1. Contractor shall remove wasted hull anodes outside the Bow Thruster tunnel and midships under Bilge Keels port and stbd side of the vessel.

3.1.2. Contractor to grind old weld residue flush where brackets have been cut off. Install new anodes outside Bow Thruster tunnel and midships under Bilge Keels port and stbd side of the vessel. Contractor to touch up Hull coating.

3.1.3. All materials shall be Contractor supply. Contractor shall dispose of wasted anodes as per the provincial environmental regulations.

3.1.4. Contractor shall remove existing wasted anodes located midships under bilge keels Port & Stbd side of vessel and install new anodes.

3.1.5. 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.

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

3.2 Location

3.2.1. Four anodes outside Bow Thruster tunnel, two anodes on each side and two attached port and stbd mid-ships just under the Bilge Keels.

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. 100% visual by Chief Engineer.

4.2 Testing

N/A

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals

N/A

Spec item #: HD-6	**SPECIFICATION**	TCMSB Field #: N/A
HD-6 UNDERWATER HULL PAINTING		

Part 1: SCOPE:

1.1 The intent of this spec is to affect repairs to the 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-7 Hull Above Ice Belt Painting.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Total underwater area is 1188square meters.

2.2 Standards

2.2.1 Follow Manufacture's product data sheets.

2.2.2 Related specifications
HD-3 Dry-docking
HD-4 Cathodic Protection
HD-5 Sacrificial Anodes
HD-7 Painting Above the Ice Belt
HD-8 Butts and Seams.

2.2.3
Drawings

2.3 Regulations

2.3.1 Meet the satisfaction of an NACE Inspector.

2.4 Owner Furnished Equipment

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

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1. Contractor shall repair 140 square meters of the underwater hull coating (SA 21/2 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 all coatings including 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.

i. This includes the main engines and main generators exhaust outlets located at the top off stack.
ii. Scupper pipes.
iii. Sea bays and sea chests.
iv. All overboard discharges.
v. Main engine air intake plenums.
vi. Engine room supply and exhaust fans.
vii. Tank vents.
viii. Stern tube.
ix. Rudder gland in rudder stock housing.

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. Spot prime 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.

3.2 Location

3.2.1. Entire under water hull area.

3.3 Interferences

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

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

4.2 Testing

4.2.2.
The NACE inspector will be required to inspect the preparation and application of the hull coatings.

4.3 Certification

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

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 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-7	**SPECIFICATION**	TCMSB Field #: N/A
HD-7 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

2.4.1 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:

3.1 General

3.1.1. The damage affected areas are to be grit blasted SA-21/2 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.

3.1.2. 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.

3.1.3. 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.

3.1.4. 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.

3.1.5. Contractor to provide unit cost for grit blasting per square meter.

3.1.6. Contractor shall provide unit cost for complete coating per square meter.

3.1.7. 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.

3.1.8. All traces of grit used for blasting are to be removed by contractor.

3.1.9. Contractor is responsible and liable for ensuring the hull is clear and clean prior to, during and immediately after coating application.

3.1.10. 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.

3.1.11. 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.

3.1.12. 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.

3.1.13. 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.

3.1.14. 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.

3.1.15. Sea bays and grid shall be protected during the grit blasting and coating process and orifices shall be proven original diameter prior to undocking.

3.1.16. Equipment used to apply the coating shall meet the specifications of the coating manufacturer.

3.1.17. No substitutes shall be permitted for any paint. Only dry film thickness (DFT) used for assessment.

3.1.18. Coating sequence as follows: The areas which have been cleared to bare metal shall be coated with 4 coats of paint as follows; (2 primer coats and 2 finish coats). are then to be coated with.

3.1.19. Under areas which are to finished CCG Red, add Interprime CPA 099 Prime RED to 3 mils DFT (Dry film thickness). Under areas which are then to be finished white to prevent shadows in the finish coat, add CPA 097 Prime white to 3 mils DFT.

3.1.20. 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. Contractor shall paint : Coast Guard stripe, identity program; Canada , Fisheries and Oceans, Ship's name. bow thruster symbols.

3.1.21. 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

3.2.1. Hull from waterline to the upper bulwarks.

3.3 Interferences

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

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

4.2 Testing

4.2.2.

The NACE inspector will be required to inspect the preparation and application of the hull coatings.

4.3 Certification

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

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 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-8	**SPECIFICATION**	TCMSB Field #: N/A
HD-8 BUTTS AND SEAMS		

Part 1: SCOPE:

1.1 The intent of this specification shall be to prepare the underwater section of the hull for survey by Lloyd's surveyor and the Chief Engineer.

1.2 Note this item has to be done prior to Specifications: HD-6 Underwater Hull Painting and HD-7 Painting above the ice belt.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Docking Plan Drawing # 590-96 Rev. 2
2.1.2. Shell Expansion Plan 590-01

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. Upon completion of Hull Cleaning, the contractor shall make allowance for Hull Survey by Lloyd's surveyor and the Chief Engineer.

3.1.2. Hull plate welding butts and seams to be repaired will be determined at the time of the hull survey by the Lloyd's surveyor and the Chief Engineer.

3.1.3. Seams and butts selected for repair are to be marked, cleaned to sound metal by air arc gouging or grinding, and brought up to original level by Lloyd's approved welding techniques and materials. Contractor to use

welding rods suitable for use with Grade EH-36 steel. All work to be to the approval of Lloyd's surveyor, and the Chief Engineer.

3.1.4. Contractor shall quote on 200 linear meters of gouging / grinding. Contractor shall include a unit cost / meter of gouging and grinding for adjustment purposes. The Contractor shall quote on 1,000 bead meters of weld. Contractor shall include a unit cost / meter welding for adjustment purposes. The Contractor shall include the cost for six non-destructive tests of the weld repair at locations indicated by the Chief Engineer. The contractor's bid shall include the cost for two separate visits by the inspection company for the NDT testing and include all costs for travel.

3.1.5. Butts and seams falling in way of any fuel tanks will require fuel tank to be gas freed and certified safe for hot work. Butts and seams falling in ballast/void tanks that are painted will require interior paint work to be touched up in way of damage. Damage surface to be repair as per HD-10 Ballast Tanks coating specification. The foregoing gas-freeing and paint repair will be handled by PWGSC 1379 action. The contractor shall include unit cost per tank for gas-free certificate and unit cost per m2 for tank coating repair.

3.1.6. Contractor to quote the services of a person lift and operator for 8 hours for survey, plus unit cost per hour.

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

4.1.2. All work to be carried out and be to the approval of Lloyd's surveyor, and the Chief Engineer.

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 The contractor shall supply three copies of the inspection company reports.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

Spec item #: HD-9	**SPECIFICATION**	TCMSB Field #: N/A
HD-9 Freshwater Tank		

Part 1: SCOPE:

1.1 The intent of this specification shall be to complete cleaning, inspection, repairing, recoating and hydrostatic testing of the domestic fresh water tank.

1.2 Coast Guard will arrange for a NACE inspector to view the tank condition and inspect the coatings.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

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

2.2 Standards

2.2.1 Fleet Safety Manual 7.F.12 Potable Water Quality

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

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

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1. Contractor shall connect up a separate fresh water supply of 3.5 bar pressure to ship's domestic freshwater system, before the fresh water tank is taken out of service and left in place until the fresh water tank is ready to go back in service.
3.1.2. Contractor is to sound and record the amount of water in the tank before starting work. Contractor shall pump out contents of the tank and dispose of any residue water remaining. The contractor is to remove the remaining

water from the tank and shall bid on the removal of 1m3 of water and provide unit cost per m3 for the removal of additional water.

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

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

3.1.5. The contractor shall quote on cleaning 100 m² and provide unit cost for cleaning per m2. Any rust areas and/or bare areas in the tank are to be surface prepared, as per the coating manufacturer's specifications. The Contractor shall bid on repairing 25m2 of tank coating and shall provide unit cost per m2 for repair.

3.1.6. The contractor shall repair the coating using Interline 925-100% solids epoxy tank coating @ 5-6 mils DFT per coat (two coats required). Before coating begins the contractor, Chief Engineer and NACE inspector will inspect the tanks to agree on the total m2 involved. Coating must be a high gloss and white or light in color and NSI/NSF Standard 61 approved for use in potable domestic water. After coatings are completed the coated areas shall be inspected by the Chief Engineer and the NACE Inspector.

3.1.7. The contractor is to provide each tank with a mechanical ventilation system vented to the outside of the ship. Good ventilation must be provided and any blowers/extractors must ensure good air movement and solvent vapour removal from the lowest point in the tank.

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

3.1.9. Contractor shall supply / install a steel elbow adaptor c/w bolt type 150 # flange / gasket sized to bolt to 1.5 inch sounding pipe isolation valve located lower end of tank stbd side in the forward machinery space. Contractor shall remove the existing short section of sounding pipe already flanged to the isolation valve for removal to fit install the adaptor. This adaptor will allow the Contractor(s) supplied pump / hoses / fittings

to be connected for the purpose of pumping out the fresh water tank when flushing / chlorinating the tank. Upon completion of all work in this spec and prior to commissioning the domestic fresh water system the Contractor shall remove adaptor and re-pipe sounding pipe as per original.

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

3.1.11. The tank vents on deck are to be removed and the tanks are to be filled with water to the top of their respective sounding pipes in order to provide a hydrostatic test. Test to be carried out to the satisfaction of attending Lloyd's surveyor and the Chief Engineer. Upon completion of the hydrostatic test the contractor is to remove and dispose of the water used in the test. The tank vents are then to be reinstalled using new gaskets. Anti-seizing compound is to be used on the fastener threads.

3.1.12. Upon completion of hydrostatic test contractor shall pump the tank dry and replace the vent cap. Contractor shall flush the tank once and refill with fresh water then super chlorinate (disinfect) the tank as per procedure set out in the Fleet Safety Manual 7.F.12 Potable Water Quality, Section 3.5 Disinfection. All taps throughout the vessel shall be turned on to supply super chlorinated water to all piping. The super chlorinated water shall stand for a minimum of four hours. Super chlorination is achieved by adding unscented bleach @ 5% sodium hypochlorite at a volume of 1 litre / cubic meter of water in the tank. Contractor to dispose of the super chlorinated water in the tank as per provincial regulations. Contractor to fill tank once to flush tank off super chlorinated water.

3.1.13. Contractor shall re-fill the tank with fresh water and chlorinate to a standard level of 0.2 – 0.5 mg/litre which is achieved by dosing the tank with unscented bleach at a rate of 2 litres / 100 cubic meters. Contractor shall first take sample of shore water supply and send to an independent laboratory for testing, the testing parameters (28) shall follow the testing parameters set out in the Fleet Safety Manual 7.F.12 Potable Water Quality.

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

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

3.1.16. All work shall be as per the coating Product Data/ Application Instructions to the latest issue and to the satisfaction of the Chief Engineer and Technical Authority.

3.2 <u>Location:</u>

3.2.1. Frame, 71-75

3.3 Interferences

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

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

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

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

4.2 Testing

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

4.2.2. Water test Total Hydrocarbon.

4.2.3. Air Test VOC'S levels.
4.2.4. Hydrostatic test for Lloyd's
4.2.5. Entry into confined space shall be carried out in accordance with the instructions given in the Preamble of this specification.
N/A

4.3 Certification
4.3.1 An inspection certificate shall be sent to the Chief Engineer or Chief Officer.
N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 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 Two copies of laboratory reports should be sent to Chief Engineer or Chief Officer.

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 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 eight listed water ballast tanks for cleaning and coating repairs and for inspection and hydrostatic testing. All inspections and testing shall be witnessed by the Chief Engineer and the attending Lloyd's Register inspector.

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 20% For Floors / Framing
No. 1 Water Ballast port	Fr. 71-81	35.8	130	156
No. 1 Water Ballast stbd	Fr. 71-81	39.1	130	156
No. 2 Water Ballast port	Fr. 66-71	58.7	142	170
No. 2 Water Ballast stbd	Fr. 66-71	58.7	142	170
No. 3 Water Ballast Center	Fr. 29-42	52.1	158	190
No. 4 Water Ballast port	Fr. 18-28	37.2	86	103
No. 4 Water Ballast stbd	Fr. 18-28	47	86	103
No. 5 Water Ballast port	Fr. B-Aft	48.8	102	122

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

3.1.2. 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 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.

3.1.3. 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.

3.1.4. All of the above listed tanks shall be inspected by a Lloyd's Surveyor, Chief Engineer and NACE inspector prior to coating repairs.

3.1.5. Any damaged tanks coating to be cleaned down to bare metal by (1) Power tooling to meet SSPC SP-11 with a suitable profile or (2) of SSPC SP-10/NACE 2 Near White Abrasive Blast clean with an angular Surface Profile of 50-75 microns (2-3 mils) with edges feathered out. All debris shall be removed ashore by Contractor and properly disposed of in accordance with enviromental regulations.

3.1.6. Prior to Power tooling or Abrasive Blast cleaning the damaged areas of tank coatings has to be identified in agreement with Chief Engineer.

3.1.7. Contractor to quote on repairs / coating of 200 m^2 of tank surface area and rate per square meter. Contractor to quote on cutting four access holes a minimum of 41cm by 61cm in number three water ballast tank these inserts must be re installed as per Lloyd's Specification. Contractor to

quote per one access for number three ballast tank for adjustment purposes. On two types of surface preparation (1) Power tooling to meet SSPC SP-11 with a suitable profile, (2) or SSPC SP-10/NACE 2 Near White Abrasive Blast clean with an angular Surface Profile of 50-75 microns (2-3 mils). Adjustments will be made by PWGSC 1379 action.

3.1.8. The method of surface preparations we be made by the Chief Engineer after the inspection of the tanks.

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

3.1.10. Coating Specification for Application :

i. **Surface Preparation:** Steel surface shall be prepared to meet a minimum of(1) Power tooling to meet SSPC SP-10/Nace2 with a suitable profile. or (2) of SSPC SP-11 Near White Abrasive Blast clean with an angular Surface Profile of 50-75 microns (2-3 mils).

ii. **Coating System:** 2 (two) coats: One primer coat Intershield ENA 300 – Aluminium and one Top coat Intershield ENA 300 – Bronze or approved equal product. Apply each coat (8-10 mils) dry film thickness (dft) directly on to the prepared steel surface.

1. 1st coat: Colour Aluminium, followed by a stripe coat.
2. 2nd coat: Colour Bronze, followed by a stripe coat.

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

1.0 Description

1.1 Work Included

1.1.1 The work under this Section shall include the supply of all labour, supervision, materials, equipment, and transportation necessary for the supply, fabrication, surface preparation, and delivery to site required for the Work, as specified herein, and as directed by the Engineer, complete in every respect.

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

(1) High pressure water cleaning at 3500 pounds per square inch (PSI) 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) Touch up of damaged applied coating.

(6) Testing and Inspection of the applied coating.

1.2 **Codes, Standards, and, Related Documents.**

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

1.2.1 Paint Manufacturer's Technical Bulletins:
(a) Product Data and Safety Data Sheets.
(b) Repair procedures for correcting damage to coated surfaces.

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

1.3 Quality Assurance

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

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

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

(a) Surface preparation including anchor profile and abrasive used.

(b) Wet and Dry film thicknesses.

(c) Surface temperature, ambient temperature, room temperature, relative humidity, dew point and coating temperature.

(d) Continuity of Paint to be checked using low voltate detector (Sponge Test) as specified by the Chief Engineer.

(e)

(f) Coating Batch Numbers.

1.4 Product Delivery, Storage, and Handling

1.4.1 Delivery

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

1.4.2 Storage

1.4.2.1 Only approved materials shall be stored at the job site, and these shall be stored only in suitable and designated areas restricted to the storage of paint materials and related equipment. Provide and maintain dry temperature control and weather proof storage. Store materials and equipment in a well ventilated area with temperature range 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.**

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

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

1.4.3 Combustion

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

1.4.4 Protection

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

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

2.0 PRODUCTS

2.1 Materials

2.1.1 General

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

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

2.1.1.3 The use of accelerators will not be permitted.

2.1.2 Compatibility

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

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

2.2 Application Equipment

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

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

2.3 Protective Coating systems

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

(1) 400-600 microns (16-24 mils) on flat and curved surfaces. Total dry film thickness applied in two (2) coats.

(2) Stripe coating shall be applied to all corners, crevices, rivets, bolts, welds, and other edges using the specified coating prior to application of the full coat on the interior structure. Such striping shall extend a minimum of 2.2 cm (1-inch) from the edge. The stripe coat shall set to touch before the full coat is applied. **Note: stripe coating is most effective on edges that are rounded by grinding.**

2.4 Shop and Field Touch-Up Painting

2.4.1 At the completion of the painting and as part of acceptance of the Work by the Chief Engineer, the Contractor shall, in the presence of the Chief Engineer, inspect the painting system for damage.

2.4.2 Damaged areas shall be clearly noted by the Chief Engineer and when requested by the Chief Engineer the Contractor shall repair the previously agreed upon damaged areas at no cost to the owner.

2.4.3 Procedure to determine applied coating discontinuity using ASTM D 5162-01, ASTM D4787, Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates. This procedure is carried out at the request of the Engineer.

2.5 Mixing

2.5.1 Painting materials shall be mixed and prepared in strict accordance with the manufacturer's recommendation.

2.5.2 Materials shall be stirred prior to and during application to produce a uniform mixture.

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

3.0 EXECUTION

3.1 Surface Preparation

3.1.1 Ballast Tanks

3.1.1.1 All surfaces to be coated shall be abrasive blast cleaned to a commercial blast finish according to Steel Structures Painting Council (1) specification SSPC-SP-11, near white metal abrasive blast. Steel shall be cleaned with a minimum surface profile of 50-75 microns (2-3 mils)or(2) Power tooling to meet SSPC SP-10/Nace2 with a suitable profile.to obtain the required adhesion of the Intershield ENA 300 paint to the steel. The SSPC surface preparation, as specified, must be in evidence immediately before application of coating.

3.1.2 Determine level of cleanliness using International Standard ISO 8502-3, Part 3. Three random tests per tank to be recorded in the daily inspection report. **Note: acceptable level for dust quantity and dust particle size shall not exceed rating 2.**

3.1.3 Determine surface profile of blast cleaned steel using Replica Tape (ASTM D 4417) Method C. **Note: This Replica Tape provides an anchor profile and shall be affixed to final report. A NACE Certified Coating Inspector shall witness and record the Test Results.**

3.1.4 All sharp edges shall be ground prior to sand blasting to form a rounded contour of minimum edge radius of 2 mm. This 2 mm rounding may be achieved by minimum 2 or 3 strokes of a grinding disc as recommended by coating manufacturer. Contractor to bid on 30 m of grinding and quote per 1 m grinding.

3.1.5 The acceptable chloride ion level on prepare surface shall be less than 2ppm. Coating shall not be applied until this level is achieved. Number of test one per tank, to be put into daily inspection reoprt.

3.1.6 Weld joints which do not have a smooth ripple finish, shall be ground to a rounded contour.

3.2 Other Surface Preparations

3.2.1 Any major surface defects, particularly surface laminations or scales, and welding defects, as holes and very sharp transitions between layers detrimental to the protective coating shall be removed by suitable dressing and/or with repair welding as required. Where such defects have been revealed 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.

3.2.2 Steel surfaces shall not be blasted nor coated when:

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

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

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

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

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

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

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

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

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

3.2.9 All edges of areas to receive touch-up shall be feathered so as to produce a sound edge and to provide a roughened surface to act as a mechanical key. Contact Coating Manufacturer for additional instructions for this procedure.

3.2.10 Any contamination which has taken place since the surface was prepared shall be removed and any dust settlement removed by blowing down with oil-free, dry air.
Coatings shall not be applied to damp surfaces or to surfaces below -7°C or above 43°C. Consult coating manufacturer.

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

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

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

3.3 Chloride ion Testing

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

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

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

3.3.4 NACE Inspector shall witness and record these tests.

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

3.4 WORKMANSHIP

3.4.1 General

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

3.4.2 Inspection

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

3.4.3 Application

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

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

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

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

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

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

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

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

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

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

(1) Runs, sags, holidays or shadowing caused by inefficient application methods.

(2) Evidence of poor coverage at plate edges, lap joints, crevices, pockets, corners and re-entrant angles.

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

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

3.4.3.13 Coatings shall not be applied closer than 8 inches to a non-blasted area. Any subsequent blasting operation shall not result in sand particles embedded in the coating film.

3.5 INSPECTION

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

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

3.5.3

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

4.0 ENVIRONMENTAL AND SAFETY REQUIREMENTS

4.1 General

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

4.2 Final Clean-Up

4.2.1 General Requirements, during application of the coating systems the Contractor shall prevent spillage of coating materials and, in the event of such spillage, shall immediately advise the 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 Engineer at no additional cost to the Owner.

4.2.2 Upon completion of the application work, the Contractor shall visually inspect all surfaces and remove all coatings and traces of coatings from surfaces not scheduled to be coated.

3.1.11. 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.

3.1.12. 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.

3.1.13. 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.

3.1.14. Contractor shall fill all the tanks with fresh water and perform a hydrostatic test on the tanks.

3.1.15. 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.

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

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

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

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

4.2 Testing

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

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

4.3 Certification

Part 5: DELIVERABLES:

5.1 Drawings/Reports

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

5.1.2 Contractor supply Chief Engineer two 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 #: HD-11	**SPECIFICATION**	TCMSB Field #: N/A
HD-11 FUEL OIL TANKS		

Part 1: SCOPE:

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

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

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

2.2 Standards

2.2.1

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

3.1.2. The tanks shall be pumped empty by crew. Contractor to remove manhole covers, tanks gas freed "safe for personnel" as per Provincial regulations.

Certificates to be given to Chief Engineer, and posted by manhole for tank to be entered and posted by gangway.

3.1.3. All tanks shall be cleaned and wiped down using lint free wiper rags to remove any water and fuel residue that is remaining including all mud and debris and disposed off in accordance with the provincial environmental regulations. Contractor shall bid on disposal of 20 cubic meters off residual fuel and water mixture and quote per cubic meter to be adjusted up or down by PWGSC 1379 action.

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

3.1.5. Contractor shall be responsible for removing and subsequent replacement of all docking plugs for the purpose of carrying out the work in this specification. No docking plugs are to be removed from the tanks until tanks have been pumped as low as possible and confirmed by the vessel's Chief Engineer. Contractor shall supply and fit all docking plugs openings with wooden plugs to prevent ingress of dirt during operations such as sandblasting, painting, etc. which could cause contamination of tanks to occur. After all tank work is completed all docking plugs shall be installed using new sealing thread and white lead. Tap to be run over threads in hole. Docking plug threads shall be cleaned on a lathe if required. Contractor to quote on thread cleaning 13 docking plugs in lathe.

3.1.6. Contractor to quote on fabricating three new docking plugs and quote on fabricating per one docking plug.

3.1.7. Immediately after the tanks are cleaned the Contractor shall spray all fuel tank internal surfaces with mineral oil for protection against corrosion. The lube oil tanks surfaces shall be given a thin coat of oil of the type which is going to be stored in the tanks.

3.1.8. The tanks shall be inspected by Lloyd's and the Chief Engineer or his delegate Engineer.

3.1.9. After final inspection by the Chief Engineer the manhole covers shall be replaced with new approved neoprene rubber gasket and anti seize compound on all studs. Studs to be wire brushed clean.

3.1.10. Contractor to quote on replacing three manhole cover studs and quote on replacing one stud.

3.1.11. The contractor shall remove vent caps from vent pipes and check all vent cap fire arrestor screens for damage / blockage.

3.1.12. The contractor shall conduct an air pressure test on all tanks as per Lloyd's requirements. Lloyd's Surveyor and the Chief Engineer must witness all testing.

3.1.13. After testing is completed the Contractor shall install all vent caps. Bolt threads on Victaulic couplings shall be cleaned and coated with never seize prior to installation by the contractor. Tightening of manhole covers, installation of vent caps and docking plugs shall be witnessed by the Chief Engineer or a person delegated by the Chief Engineer.

3.1.14. Upon completion of all work in this spec the Contractor shall arrange with the Chief Engineer to have fuel transferred to the tanks as per the condition prior to docking the vessel. The docking master shall verify same.

3.1.15. All work in this specification shall be to the satisfaction of the Chief Engineer.

3.2 Location

Hull of ship.

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

3.2.1.

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. 100% visual to be carried out by Chief Engineer and Lloyd's Surveyor.

4.2 Testing

4.2.1. This testing is to be carried out in the presence of the attending Lloyd's Surveyor and the Chief Engineer. The contractor is to be responsible to contact Lloyd's Surveyor for all inspections.

4.2.2. Tank shall be air tested to the satisfaction of the Chief Engineer and Lloyd's.

4.2.3. The contractor is responsible for all air quality testing to ensure hot work and entry into tanks is permitted. The contractor shall issue and post such permits and shall maintain the appropriate watch that is required.

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

4.2.5. The Contractor is to be responsible for all inspections and is to consult with Lloyd's Surveyor, prior to commencement of work, to determine an inspection schedule; at each inspection point, the Contractor is to advise the Chief Engineer, in advance, to allow his/her attendance.

4.3 Certification

Part 5: DELIVERABLES:

5.1 Drawings/Reports

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

5.1.2 Contractor to supply Chief Engineer with two written reports of work completed.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

Spec item #: HD-12	**SPECIFICATION**	TCMSB Field #: N/A
HD-12 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.

1.5 The contractor shall bid on replacement of 5 m2 of steel plate. The contractor shall provide a unit price per meter squared of steel plate renewal and the price shall be adjusted up or down based on the square meter of renewed steel repaired.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Bilge keels Arrangement and Details Drawing # 87536-1 Rev 1.

2.1.2. Related Specifications:

i. HD-3 DRY-DOCKING
ii. HD-5 SACRIFICIAL HULL ANODES
iii. HD-6 UNDER WATER HULL PAINTING
iv. HD-10 WATER BALLAST TANKS
v. HD-11 FUEL OIL TANKS

2.2 Standards

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. 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.

3.1.2. 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.

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

3.2 Location

3.2.1. 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

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

4.2 Testing

4.2.1. 100% Magnetic Particle Inspection (MPI).

4.3 Certification

4.3.1. Welding in accordance with CSA W47.1 & W59.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

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

5.1.2

All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyds surveyor.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

Spec item #: HD-13	**SPECIFICATION**	TCMSB Field #: N/A
HD-13 BLACKWATER SYSTEM		

Part 1: SCOPE:

1.1 The intent of this specification shall be to pump out, clean and inspect the vertical black water tank, the main treatment tank and the grey water section including all associated internal and external piping and touch up the tank's internal coatings. Install owner supplied eighteen air diffusers in the main treatment tank. Open up, inspect & clean associated valves as detailed in the description of work below. Inspect, clean and prove operational all tank operating and alarm probes

1.2 To keep the system operational during the work in this spec the Contractor shall install vessel supply by-pass piping with new gaskets. Gaskets shall be contractor supply. The by-pass piping shall be connected to the main treatment tank vent line, the ship's grey water line, the Black water tank discharge piping and tie into the overboard discharge pipe. The contractor shall capture and dispose of the black water discharged overboard while in dry-dock, in accordance with provincial and environmental regulations. Contractor to bid on removing 5000 liters and bid per 100liters. Chief Engineer will detail where piping has to be fitted.

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

1.4 All work in this specification shall be inspected by Chief Engineer.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. COMPONENT/SYSTEM

HAMWORTHY SUPERTRIDENT SEWAGE TREATMENT UNIT
AEROBIC 3 STAGE TYPE ST4.
SERIAL # TC1074
Drawing Number CA0103 Rev. 3
Parts List # CA0004
Operation & Maintenance manual P.N. 50400118
Vacusan General arrangement collecting station Dwg # 400084C

2.1.2. TANK CAPACITIES

Main treatment tank	3375	Litres
Grey water section	450	Litres
Black water tank	450	Litres

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

3.1.2. Contractor shall open up and pump out the black water tank & the main sewage treatment plant compartments including the grey water section and dispose of the contents as per provincial environmental regulations.

3.1.3. When all work in this spec is finished the contractor shall remove all by-pass piping and fittings and re-install the main piping c/w new gaskets and test for leaks.

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

3.1.5. The contractor shall bid on the replacement of four manhole studs and quote a unit price per stud replacement. (Studs 1 ¾" Length by ½" Width. N.C. 13 threads per inch)

3.1.6. Contractor shall bid on supplying and coating tank internals with International Intertuf 709. Contractor to bid on 18 square meters and to supply bid price per square meter coverage. Contractor to bid on power tooling 3meters square and quote per one square meter.

3.1.7. Contractor shall replace the eighteen air diffusers using stainless steel nuts and washers as per makers' specifications. Diffusers and fasteners are vessel supply.

3.1.8. Contractor shall prove clear the vent lines from the main treatment tank and both Black water vacuum tanks to the exit point at the funnel top.

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

3.1.10. Contractor shall remove the manhole cover on the vertical black water Stainless steel tank and clean the tank internals and dispose of as per provincial environmental regulations. Contractor shall inspect the internal level probes for damage and corrosion. Contractor shall clean the tank sight glass and re-install.

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

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

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

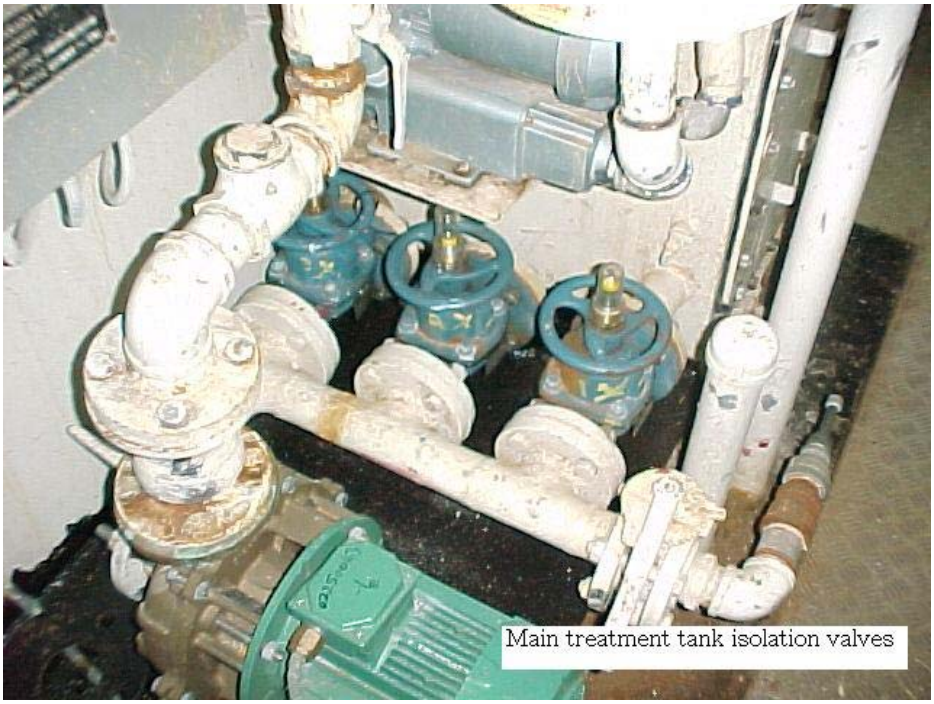
3.1.14. Contractor shall open up, clean and inspect the following plant valves as listed in the following table. Contractor shall close up valves using new gaskets, gland packing and seals. Contractor shall utilize materials specific for the design of the valve and the effluent being handled as per the manufacturers service manual details.

Qty	**Name**	**Size**
3	Black water tank inlet valves	2" ball
1	Black water tank discharge	3" Gate
1	Black water discharge pump discharge check	3"
1	Black water discharge pump vacuum release check	1.5"
1	Black water bottom discharge overboard	2" Ball cock
1	Black water pump suction	4" Gate
3	Treatment plant compartment suction isolation valves	2" Gate Cast iron body Buna N

		Seal

3.1.15. Contractor shall fill the main tank with clean fresh water and check for leaks.

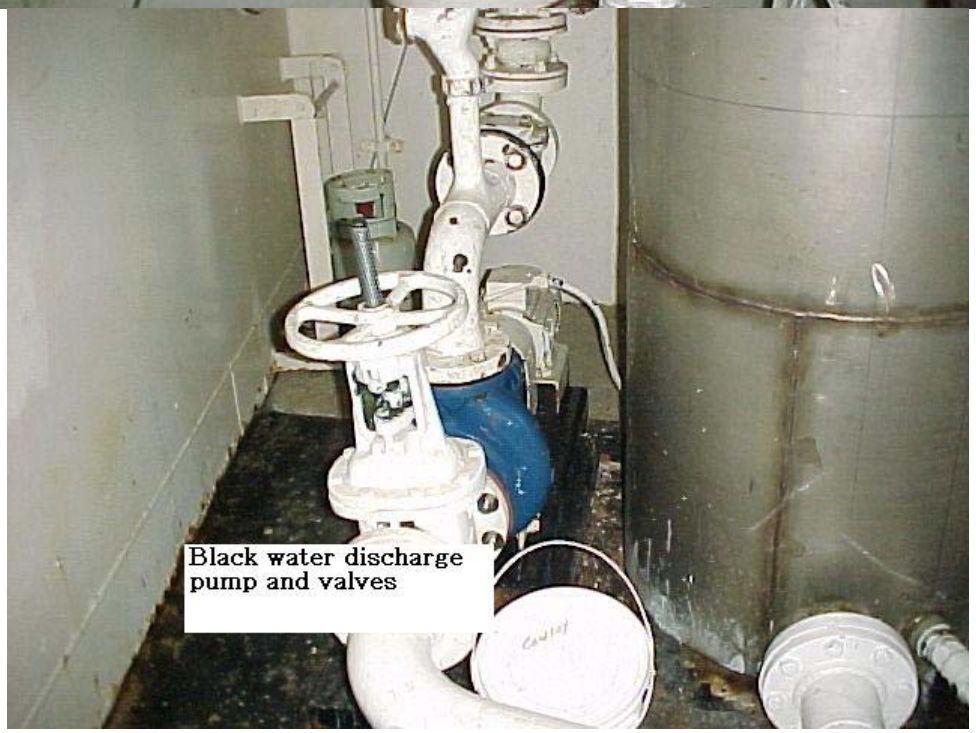
3.1.16. All work in this specification shall be satisfactory to the attending Chief Engineer.



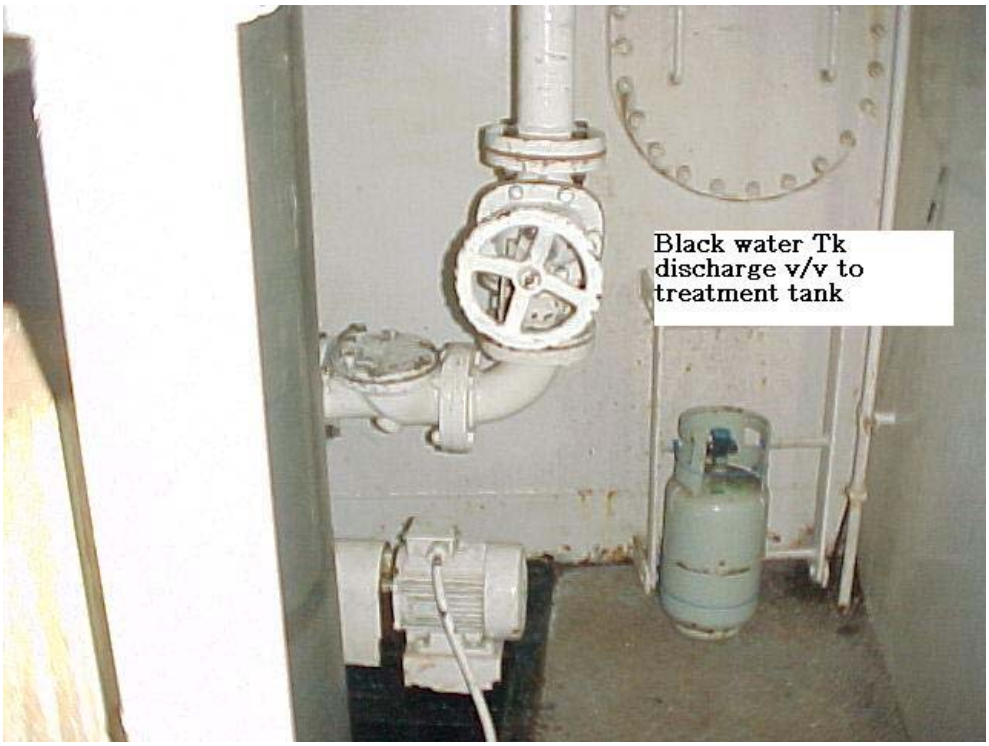
Spec item #: HD-13	**SPECIFICATION**	TCMSB Field #: N/A
HD-13 BLACKWATER SYSTEM		

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

HD-13 BLACKWATER SYSTEM



Spec item #: HD-13	**SPECIFICATION**	TCMSB Field #: N/A
HD-13 BLACKWATER SYSTEM		



Spec item #: HD-14	**SPECIFICATION**	TCMSB Field #: N/A
HD-14 GREY WATER TANK		

Part 1: SCOPE:

1.1 The intent of this specification is to open up tank for Lloyd's 5 year survey inspection and air pressure tested. Contractor shall arrange scheduling of the Lloyd's Surveyor's for inspection and testing.

1.2 Contractor shall clean 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.

2.1.3. Drawing #590 Revision 2 (for the location of the docking plugs).

2.2 Standards

2.2.1

2.3 Regulations

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

2.4 Owner Furnished Equipment

2.4.1 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. Tank level transducer shall be removed from the tank and a blank fitted to the flange plate of the tank while work and testing are being carried out. Upon completion the blank shall be removed and the transducer reinstalled using new gaskets. This work shall be completed by the Contractor.

3.1.2. The gray water tank shall be isolated from the inlet piping to the tank and by-passed to the overboard pipe. The contractor shall make provision for the removal of waste while tank is undergoing cleaning and inspection. The contractor shall make a connection to the overboard at the ships side to the contractor supplied removal/holding tank. The contractor shall bid on the removal of ten cubic meters of grey water and give a cost per cubic meter price and the final price shall be adjusted up or down based on the invoice for removal. Upon completion of all work in this specification the Contractor shall remove all blanks / by-passes that were fitted to isolate the tank.

3.1.3. 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.

3.1.4. All internal surfaces of the tank shall be cleaned by the Contractor.

3.1.5. The tanks shall be inspected by Lloyd's, Nace Inspector and the Chief Engineer or his delegate Engineer

3.1.6. 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.

3.1.7. 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.

3.1.8. 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 one docking plug in lathe.

3.1.9. 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** square meters. The contractor shall quote a unit price per square meter price and the cost shall be adjusted up or down by PWGSC 1379 action, base on the actual units (square meters) required for repair. Coating applied to the tanks internal surfaces shall follow the recommended procedure as set out in the Manufacture's Product Data Sheet.

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.

3.1.10. The tanks shall be inspected by the Chief Engineer or his delegate Engineer.

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

3.1.12. Sounding pipe shall be proven clear.

3.1.13. All float and level switches shall be cleaned.

3.1.14. 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.

3.1.15. 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

3.2.1. Shaft tunnel Frames No. 20 – 21.

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. Tanks shall be inspected by a Nace Inspector, Lloyd's Surveyor and the Chief Engineer.

4.2 Testing

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

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

4.3 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-15	**SPECIFICATION**	TCMSB Field #: N/A
HD-15-SLUDGE TANK		

Part 1: SCOPE:

1.1 The intent of this specification is to open up tank for Lloyd's 5 year survey inspection and air pressure tested. Contractor shall arrange scheduling of the Lloyd's Surveyor's for inspection and testing.

1.2 Contractor shall clean the tank and prove operational all of the level float switches. All work shall be inspected by the Chief Engineer including inspection after cleaning, and before the tank is closed up and to witness operational tests.

1.3 Ship repair facilities and / or contractors are to have in place Confined Space Entry Programs that meet the provincial requirements.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Capacity 11.2 cubic meters.

2.1.2. Drawing #590 Revision 2 (for the location of the docking plugs).

2.1.3. Drawing #590-79 Capacity Plan.

2.2 Standards

2.2.1

2.3 Regulations

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

2.4 Owner Furnished Equipment

2.4.1 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 sludge tank shall be isolated from the inlets and provision for the removal of waste while the tank is undergoing cleaning and inspection is the responsibility of the Contractor. Upon completion of all work in this

spec the Contractor shall remove all blanks / by-passes that were fitted to isolate the tank.

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

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

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

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

3.1.6. Sounding pipe shall be proven clear.

3.1.7. All float and level switches shall be cleaned.

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

3.1.9. After all work is completed the contractor shall replace manhole covers using new contractor supplied 1/4" neoprene gaskets gasket. Manhole securing studs are to be wire brushed cleaned and nuts shall be cleaned up and coated with anti seize compound.

3.1.10. Contractor shall conduct an air pressure test on the tank as per Lloyd’s rules and requirements Lloyd’s surveyors and the Chief Engineer witnessing all testing.

3.1.11. After all testing is completed the sounding pipes, suction pipes and vents (vent caps) shall be proven clear. The bolt threads on the Victaulic couplings shall be cleaned and coated with never seize prior to installation. The high level alarm shall be proven operational by the contractor.

3.1.12. All work is to be carried out to the satisfaction of the Chief Engineer.

3.2 Location

3.2.1. Shaft tunnel Frames No. 21 – 28.

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. Tanks shall be inspected by a sLloyd's Surveyor and the Chief Engineer.

4.2 Testing

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

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

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

5.2 Spares N/A

5.3 Training N/A

5.4 Manuals N/A

Spec item #: HD-16	**SPECIFICATION**	TCMSB Field #: N/A
HD-16 COOLING WATER DRAIN TANKS		

Part 1: SCOPE:

1.1 The intent of this specification is to open up Port and Stbd Main Engine Jacket Water Drains Tanks for Lloyd's 5 year survey inspection and air pressure tested. Contractor shall arrange scheduling of the Lloyd's Surveyor's for inspection and testing.

1.2 Also the contractor shall clean the tank and prove operational all of the level float switches. All work shall be inspected by the Chief Engineer including inspection after cleaning, and before the tank is closed up and to witness operational tests.

1.3 Ship repair facilities and / or contractors are to have in place Confined Space Entry Programs that meet the provincial requirements.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Capacity 1.3 cubic meters each.

2.1.2. Drawing #590 Revision 2 (for the location of the docking plugs).

2.2 Standards

2.2.1

2.3 Regulations

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

2.4 Owner Furnished Equipment

2.4.1 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 notify Chief Engineer prior to starting work.

3.1.2. The main engine cooling water drains tanks shall be isolated from the inlets. Upon completion of all work in this spec the Contractor shall remove all blanks / by-passes that were fitted to isolate the tank.

3.1.3. The contractor shall pump down the main engine cooling water drains tanks to there lowest level, the manhole cover removed, tank gas freed "safe for personal" certificate to be given to chief engineer, and posted by manhole for tank to be entered and on the vessel's gangway. Any remaining water and debris shall be disposed of in accordance with the provincial environmental regulations.

3.1.4. All internal surfaces of the tank shall be cleaned by the Contractor and wiped down using lint free wiper rags.

3.1.5. The tanks shall be inspected by Lloyd's and the Chief Engineer. The contractor shall be responsible for scheduling the inspectors for inspections.

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

3.1.7. Sounding pipe shall be proven clear.

3.1.8. All float and level switches shall be cleaned.

3.1.9. After all work is completed the contractor shall replace manhole covers using new contractor supplied 1/4" neoprene gaskets gasket. Manhole securing studs and nuts shall be cleaned up and coated with anti seize compound.

3.1.10. Contractor shall conduct an air pressure test on the tank as per Lloyd's rules and requirements. The Lloyd's surveyors and the Chief Engineer witnessing all testing.

3.1.11. After all testing is completed the sounding pipes, suction pipes and vents (vent caps) shall be proven clear. The high level alarm shall be proven operational by the contractor.

3.2 Location

3.2.1. Frames No. 41 -42 off vessel's centre line.

3.2.2. Port and Starboard inner main engine cooling double bottom tanks.

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. Tanks shall be inspected by a Lloyd's Surveyor and the Chief Engineer.

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

4.2 Testing

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

4.3 Certification
N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 Contractor to supply two typed 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 ANCHOR CHAINS AND CHAIN LOCKERS		

Part 1: SCOPE:

1.1 The Contractor shall remove both Port and Starboard anchors and anchor chains and prepare the chains and anchors and the Port and Stbd Chain Lockers for five year survey inspection by a Lloyd's Surveyor and the Chief Engineer.

1.2 This shall include cleaning, de-scaling, painting and inspection of anchors, anchor chains, chain lockers, and chain locker drain hats. Contractor shall contact Lloyd's to arrange scheduling of surveyor's for all inspection and testing.

1.3 Contractor shall inform Chief Engineer prior to start of work.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Drawing #590-81 Anchor arrangement as fitted

2.1.2. Drawing # 590-94 Anchor chain emergency release as fitted.

2.1.3. Drawing # 590- 36 Bilge Ballast and Fire system as fitted.

2.1.4. Chains are 220m in length each x 36mm Grade U3.

2.1.5. Anchors are 2100 Kg each.

2.1.6. Chain locker drain piping is 2 inch diameter schedule 40.

2.2 Standards

2.3

2.4 Regulations

2.3.1

2.5 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 shall remove the Port and Starboard anchors and anchor chains from the vessel under the supervision of the vessel's Chief Officer and lower from ship to wharf by contractor supplied crane. The Contractor

shall flake out the chains on the wharf or dock to allow for the work required and inspection by Lloyd's Surveyor.

3.1.2. The Contractor shall disconnect the "bitter end" of each anchor chain. The bitter ends are located in the Bosun's store and the engineer's room store port and stbd. respectively. The contractor shall disconnect the anchors from the chains and flake the Port and Stbd Anchor chains on the dock/wharf for cleaning and inspection. The chains are 220m in length each x 36 mm grade U3. Anchors are 2100 Kg each.

3.1.3. The Contractor shall de-scale port and starboard anchor chains, after de-scaling, the anchors and chains shall be inspected by a Lloyd's Surveyor and the Chief Engineer or Chief Officer. There shall be 20 measurements taken on each chain for a total of 40 measurements. The measurements shall be typed written in tablature form and a copy given to the Chief Officer. Prior to start of measurements, the Chief Officer shall be informed. The Chief Officer will determine where chain measurements shall be taken.

3.1.4. The contractor shall take measurements of both chains to determine chain wear down. Measurements of the chain will be taken in two places diametrical opposite of each other, their totals added and divided by 2 to obtain the diameter of the chain.

3.1.5. Then paint the chains bare areas with two coats of contractor supplied International add interprime red 3.5 mil DFT and two coats of interlac black CL 3.5 mil DFT to all chains.

3.1.6. Any defects found in the anchors or chain shall be immediately brought to the attention of the Chief Engineer. Six random links of chain shall be measured at the throat to check amount of wastage/wear. Original diameter of chain 36 mm grade U3. A typewritten copy of measurements is to be given to the Owner's Representative.

3.1.7. The Contractor shall change chains end for end, mark chains at every shot (27.432 M) with stainless steel wire and paint with white anti-corrosive paint the correct number of chain links either side of the wire to indicate the number of shots, starting from the anchor to the bitter end. Consult owner's representative for correct marking sequence.

3.1.8. The Contractor shall de-scale both anchors, bare areas apply two coats of contractor supplied International interprime red 3.5 mil DFT and two coats of contractor supplied inter-sheen black, 3.5 mil DFT, to total surface area of both anchors.

3.1.9. The Contractor shall open up both the port and stbd chain lockers for inspection and cleaning. The Contractor shall remove the false bottoms in each chain locker and prepare the chain locker for Lloyd's Inspection and inspection by the Chief Engineer. Contractor shall clean both chain lockers including false bottoms using wire brush. Contractor shall dispose of all debris and rust as per the provincial environmental regulations.

3.1.10. Port and stbd Chain lockers, Contractor shall quote on cleaning 100 m^2 and provide unit cost for cleaning per m2. Any rust areas and/or bare areas

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

3.1.11. The Contractor shall ensure that all bilge suction lines from the chain locker are proven clear and pump proven operational.

3.1.12. The Contractor shall reinstall the false bottoms in the chain locker and re-connect the anchor and chain (ensure pin on shackle secured with lead plug.) Bitter end is to be reconnected at respective positions onboard the ship and chain stowed in chain lockers.

3.1.13. Use of shipboard equipment to store anchor is to be carried out by Ship's Crew only. Contractor is to contact the Chief Engineer when anchors are to be lifted aboard.

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

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

3.2 Location

3.2.1. Chain lockers – FR 88-91.

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. The contractor shall insure that the Chains and chain locker are inspected by Lloyd's Surveyor

4.1.2. 100% visual By Chief Engineer, Lloyd's Surveyor.

4.2 Testing

4.2.1.

4.3 Certification

4.3.1.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

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

5.1.2 All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyds surveyor.

5.2 Spares
N/A

5.3 Training
N/A

5.4 Manuals N/A

Spec item #: HD-18	**SPECIFICATION**	TCMSB Field #: N/A
HD-18 LLOYD'S SPECIAL HULL SURVEY		

Part 1: SCOPE:

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

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

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Hull wind strake, water strake, keel, forepeak, aft peak, longitudinals and frames in mid-ship area.

2.2 Standards

2.3

Related Specifications

HD-3 DRY-DOCKING
HD-5 SACRIFICIAL HULL ANODES
HD-6 UNDER WATER HULL PAINTING
HD-7 HULL PAINTING ABOVE ICE BELT
HD-8 HULL BUTTS AND SEAMS
HD-9 FRESHWATER TANK COATING
HD-10 WATER BALLAST TANKS
HD-11 FUEL OIL TANKS
HD-12 BILGE KEELS
HD-14 GREY WATER TANKS
HD-15 SLUDGE TANKS
HD-16 COOLING WATER DRAIN TANKS
HD-19 TRANSDUCER, TUNNEL TANK COATING.

2.4 Regulations

2.3.1

2.5 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. Upon completion of hull inspection and cleaning the Contractor shall arrange the services of qualified NDT Technician to perform 500 ultrasonic shots to test the hull thickness as directed by Lloyd's Class Surveyor.

3.1.2. Contractor shall quote on 500 shots and unit price per additional shot for adjustment purposes.

3.1.3. The Contractor shall provide the services of a man lift and operator for minimum of eight hours, with a hourly rate for adjustment, to be completed to complete the wind and water strakes ultrasonic shots.

3.1.4. Areas to be surveyed are: wind and water strakes approximately 72 shots. Keel approximately 52 shots. Forepeak bulkhead approximately 8 shots. Aft peak bulkhead 8 shots. Longitudinals and frames in transducer compartment approximately 40 shots. All ballast tanks 40 shots. Approximately 20 shots in various other tanks

3.1.5. All expose main deck plating over full length of ship.

3.1.6. Exposed superstructure deck plating (i.e. Focle deck, bridge deck and superstructure, Main engine room stack).

3.1.7. Contractor to bid on gas free eight tanks, quote per one tank gas free.

3.1.8. Contractor to quote tank watch and assistance for total off 100hours.

3.1.9. Contractor shall provide the results of the testing in a service report format with three copies presented to the Chief Engineer.

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

3.1.11. All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyds surveyor.

3.2 Location

3.2.1. Ship's Hull

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

4.2 Testing

4.2.1. Ultrasonic testing 500 shots.

4.3 Certification

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

Part 5: DELIVERABLES:

5.1 Drawings/Reports

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

5.1.2 All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyds surveyor.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

Spec item #: HD-19	**SPECIFICATION**	TCMSB Field #: N/A
HD-19 TRANSDUCER TUNNEL COATING		

Part 1: SCOPE:

1.1 The intent of this specification item is to describe the work required for the contractor to open up the Fwd Pipe Tunnel, Transducer Compartment and Aft Tunnel for cleaning and coating repairs and for Lloyd's inspection.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Drawing #590-79 Capacity Plan.
2.1.2. Drawing # 590-56 Transducer Compartment arrangement.
2.1.3. Drawing #590-40-01, 590-40-03, Vents and sounding pipes
2.1.4. Drawing #590-54 Manhole and level transmitter locations.
2.1.5. Contractor to this work in conjunction with refit specifications:

i. HD-5 Sacrificial Anodes
ii. HD-8 Hull Butts and Seams
iii. HD-9 Freshwater Tank Coating
iv. HD-10 Water Ballast Tanks
v. HD-11 Fuel Oil Tanks
vi. HD-12 Bilge Keels
vii. HD-13 Black Water System
viii. HD-18 Lloyd's Special Survey

2.2 Standards

2.2.1

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

2.4.1 All materials and equipment to carry out the work in this spec shall be Contractor supply unless otherwise stated, including all ventilation and heating equipment to assist in drying out of space and to assist paint curing. The contractor shall provide copies of the material safety data sheets for the coatings that will be applied to the Chief Engineer prior to commencement of work.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1. Contractor shall open up the Fwd Pipe Tunnel, Transducer Compartment and Aft Tunnel for cleaning and coating repairs 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.

3.1.2. The contractor shall remove the manhole cover located in Fwd Auxiliary Room The pipe tunnel has one manhole cover as detailed on the Manhole and Level Transmitter Locations Dwg. 590-54 **Note:** The compartment can be entered from this manhole and/or from the Sewage/Transducer compartment through the deck plating.

3.1.3. Prior to entry, the compartment is to be certified "Safe for Workers" or "Safe for Hot Work" as required by Transport Canada Marine Safety TP3177E. Certificates are to be given to Chief Engineer and copies posted by the Pipe Tunnel manhole and gangway.

3.1.4. Contractor to quote on repairs / coating of 300 m^2 of surface area and rate per square meter. On two types of surface preparation (1) Power tooling to meet SSPC SP-11 with a suitable profile, (2) or SSPC SP-6/NACE 3 Commercial Abrasive Blast clean with an angular Surface Profile of 50-75 microns (2-3 mils). Adjustments will be made by PWGSC 1379 action.

3.1.5. Prior to Power tooling or Abrasive Blast cleaning the damaged areas of tank coatings has to be identified in agreement with Chief Engineer.

3.1.6. The method of surface preparations we be made by the Chief Engineer after the inspection of the Pipe Tunnel Fwd and Aft and Transducer Compartment.

3.1.7. The Transducer Compartment bilges 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 environmental regulations. Contractor shall quote unit cost per m3 for adjustments using PWGSC 1379 action. The contractor shall remove manhole cover, as detailed on Drawing #590-54 for Manhole and level transmitter locations.

3.1.8. All of the above listed spaces shall be inspected by a Lloyd's Surveyor, Chief Engineer and NACE inspector prior to coating repairs.

3.1.9. Prior to any surface preparation In Sewage Compartment all pump motors and fan motors and refrigeration condenser must be cover up with suitable covering to protect against (grit water or paint causing damage) all electrical control boxes, lighting fixtures and wire trays to be protected against damage Total enclosure of the Electrical Cable Trays in the Pipe Tunnel. All equipment in the Fwd machinery compartment to be protected against dust from sandblasting or power tooling and paint over spray.

3.1.10. For the duration of the sand-sweeping and painting, all openings to the ship's adjacent compartments, such as the sewage compartment and the forward auxiliary machinery space, and all ventilation ducts are to be masked with 6 mil polyethylene to prevent the material from entering. Particular care is to be paid to any machinery space vent.

3.1.11. Any damaged tanks coating to be cleaned down to bare metal by (1) Power tooling to meet SSPC SP-11 with a suitable profile or (2) of SSPC SP-6/NACE 3 Commercial Abrasive Blast clean with an angular Surface Profile of 50-75 microns (2-3 mils) with edges feathered out.

3.1.12. All debris shall be removed ashore by Contractor and properly disposed of in accordance with enviromental regulations.

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

3.1.14. Coating Specification for Application :

i. **Surface Preparation:** Steel surface shall be prepared to meet a minimum of (1) Power tooling to meet SSPC SP-11 with a suitable profile or (2) of SSPC SP-6/NACE 3 Commercial Abrasive Blast clean with an angular Surface Profile of 50-75 microns (2-3 mils) with edges feathered out.

ii. **Coating System:** 2 (two) coats: One primer coat Intershield ENA 300 – Bronze and one Top coat Intershield ENA 300 – White or approved equal product. Apply each coat (8-10 mils) dry film thickness (dft) directly on to the prepared steel surface.

1. 1st coat: Colour Bronze, followed by a stripe coat.
2. 2nd coat: Colour White, followed by a stripe coat.

Spec item #: HD-19	**SPECIFICATION**	TCMSB Field #: N/A
HD-19 TRANSDUCER TUNNEL COATING		

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

1.0 Description

1.1 Work Included

1.1.1 The work under this Section shall include the supply of all labour, supervision, materials, equipment, and transportation necessary for the supply, fabrication, surface preparation, and delivery to site required for the Work, as specified herein, and as directed by the Chief Engineer, complete in every respect.

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

(1) High pressure water cleaning at 3500 pounds per square inch (PSI) the Pipe Tunnel Fwd and Aft and Transduce Compartment surfaces.

(2) Contractor to collect the high pressure wash residue and remove from Site.

(3) Dehumidification of the Pipe Tunnel Fwd and Aft and Transducer Compartment surfaces to control the environment and ensure a non-stop work schedule.

(4) Surface preparation of areas to be painted. Collect all blasting residue and remove from Site.

(5) Painting of the Pipe Tunnel Fwd and Aft , Transducer Compartment and Pipes Surfaces with the specified coating system.

(6) Touch up of damaged applied coating.

(7) Testing and Inspection of the applied coating.

1.2 Codes, Standards, and, Related Documents.

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

1.2.1 Paint Manufacturer's Technical Bulletins:
(a) Product Data and Safety Data Sheets.
(b) Repair procedures for correcting damage to coated surfaces.

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

1.3 **Quality Assurance**

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

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

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

(a) Surface preparation including anchor profile and abrasive used.

(b) Wet and Dry film thicknesses.

(c) Surface temperature, ambient temperature, room temperature, relative humidity, dew point and coating temperature.

(d) Continuity of Paint to be checked using low voltate detector (Sponge Test) as specified by the Chief Engineer.

(e)

(f) Coating Batch Numbers.

1.4 Product Delivery, Storage, and Handling

1.4.1 Delivery

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

1.4.2 Storage

1.4.2.1 Only approved materials shall be stored at the job site, and these shall be stored only in suitable and designated areas restricted to the storage of paint materials and related equipment. Provide and maintain dry temperature control and weather proof storage. Store materials and equipment in a well ventilated area with temperature range 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.**

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

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

1.4.3 Combustion

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

1.4.4 Protection

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

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

2.0 PRODUCTS

2.1 Materials

2.1.1 General

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

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

2.1.1.3 The use of accelerators will not be permitted.

2.1.2 Compatibility

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

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

2.2 Application Equipment

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

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

2.3 Protective Coating systems

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

(1) 400-600 microns (16-24 mils) on flat and curved surfaces. Total dry film thickness applied in two (2) coats.

(2) Stripe coating shall be applied to all corners, crevices, rivets, bolts, welds, and other edges using the specified coating prior to application of the full coat on the interior structure. Such striping shall extend a minimum of 2.2 cm (1-inch) from the edge. The stripe coat shall set to touch before the full coat is applied. **Note: stripe coating is most effective on edges that are rounded by grinding.**

2.4 Shop and Field Touch-Up Painting

2.4.1 At the completion of the painting and as part of acceptance of the Work by the Chief Engineer, the Contractor shall, in the presence of the Chief Engineer, inspect the painting system for damage.

2.4.2 Damaged areas shall be clearly noted by the Chief Engineer and when requested by the Chief Engineer the Contractor shall repair the previously agreed upon damaged areas at no cost to the owner.

2.4.3 Procedure to determine applied coating discontinuity using ASTM D 5162-01, ASTM D4787, Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates. This procedure is carried out at the request of the Engineer.

2.5 Mixing

2.5.1 Painting materials shall be mixed and prepared in strict accordance with the manufacturer's recommendation.

2.5.2 Materials shall be stirred prior to and during application to produce a uniform mixture.

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

3.0 EXECUTION

3.1 Surface Preparation

3.1.1 Pipe Tunnel Fwd , Aft and Transducer Compartment

3.1.1.1 All surfaces to be coated shall be abrasive blast cleaned to a commercial blast finish according to Steel Structures Painting Council specification SSPC-SP 6/NACE 3, commercial blast. Steel shall be cleaned with a minimum surface profile of 50-75 microns (2-3 mils) sufficiently angular to obtain the required adhesion of the Intershield ENA 300 to the steel. The SSPC surface preparation, as specified, must be in evidence immediately before application of coating.

3.1.2 Determine level of cleanliness using International Standard ISO 8502-3, Part 3. Three random tests will be carried out, results put in the daily inspection report. **Note: acceptable level for dust quantity and dust particle size shall not exceed rating 2.**

3.1.3 Determine surface profile of blast cleaned steel using Replica Tape (ASTM D 4417) Method C. **Note: This Replica Tape provides an anchor profile and shall be affixed to final report. A NACE Certified Coating Inspector shall witness and record the Test Results.**

3.1.4 All sharp edges shall be ground prior to sand blasting to form a rounded contour of minimum edge radius of 2 mm. This 2 mm rounding may be achieved by minimum 2 or 3 strokes of a grinding disc as recommended by coating manufacturer.

3.1.5 The acceptable chloride ion level on prepared surface shall be less than 2ppm. Number of test is one. Coating shall not be applied until this level is achieved.

3.1.6 Weld joints which do not have a smooth ripple finish, shall be ground to a rounded contour.

3.2 Other Surface Preparations

3.2.1 Any major surface defects, particularly surface laminations or scales, and welding defects, as holes and very sharp transitions between layers detrimental to the protective coating shall be removed by suitable dressing and/or with repair welding as required. Where such defects have been revealed 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.

3.2.2 Steel surfaces shall not be blasted nor coated when:

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

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

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

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

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

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

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

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

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

3.2.9 All edges of areas to receive touch-up shall be feathered so as to produce a sound edge and to provide a roughened surface to act as a mechanical key. Contact Coating Manufacturer for additional instructions for this procedure.

3.2.10 Any contamination which has taken place since the surface was prepared shall be removed and any dust settlement removed by blowing down with oil-free, dry air.
Coatings shall not be applied to damp surfaces or to surfaces below -7°C or above 43°C. Consult coating manufacturer.

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

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

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

3.3 Chloride ion Testing

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

3.3.2 **On completion** of pre-surface preparation by SSPC-SP 1 to ensure the chloride ion are not imbedded into the substrate when cleaning Pipe Tunnel Fwd and Aft and Transducer Compartment surfaces SSPC-SP 6/NACE 3, commercial blast as specified. If chloride ion level, as specified is not attained, a rewash of the affected area shall be carried out using a soluble salt remover, such as Chlor-Rid Liquid Salt Remover at a dilution ratio of 1:100, sprayed on the affected area at a minimum of 20 mps (3000 psi).

3.3.3 **On completion** of substrate preparation by SSPC-SP 6/NACE 3 prior to coating application:

3.3.4 NACE Inspector shall witness and record these tests.

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

3.4 WORKMANSHIP

3.4.1 General

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

3.4.2 Inspection

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

3.4.3 Application

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

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

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

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

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

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

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

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

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

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

(1) Runs, sags, holidays or shadowing caused by inefficient application methods.

(2) Evidence of poor coverage at plate edges, lap joints, crevices, pockets, corners and re-entrant angles.

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

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

3.4.3.13 Coatings shall not be applied closer than 8 inches to a non-blasted area. Any subsequent blasting operation shall not result in sand particles embedded in the coating film.

3.5 INSPECTION

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

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

3.5.3

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

4.0 ENVIRONMENTAL AND SAFETY REQUIREMENTS

4.1 General

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

4.2 Final Clean-Up

4.2.1 General Requirements, during application of the coating systems the Contractor shall prevent spillage of coating materials and, in the event of such spillage, shall immediately advise the 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 Engineer at no additional cost to the Owner.

4.2.2 Upon completion of the application work, the Contractor shall visually inspect all surfaces and remove all coatings and traces of coatings from surfaces not scheduled to be coated.

3.1.15. All Compartments shall be inspected by Chief Engineer before closing up Pipe Tunnel. Manhole 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.

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

3.2 Location

3.2.1. Transducer/Tunnel Compartment - Frs. 44-82 (aft tunnel section Frs. 44-52, Transducer section compartment Frs. 52-58 and the forward tunnel section Frs. 58-82).

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

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

4.2 Testing

4.3 Certification

Part 5: DELIVERABLES:

5.1 Drawings/Reports

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

5.1.2 Contractor supply Chief Engineer two 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 #: HD-20	**SPECIFICATION**	TCMSB Field #: N/A
HD-20 #4 PORT FUEL OIL TANK TOP REPAIR		

Part 1: SCOPE:

1.1 The number four fuel oil tank top in the engine room has wastage around an old sensor penetration next to the sounding pipe. This plating in a two inch diameter around the penetration is to be cropped out and renewed with steel plate. The penetration pipe will not be renewed.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. #590-54 Manhole and level transmitter locations.

2.1.2. Related specification HD-11 FUEL OIL TANKS.

2.1.3. Manholes covers are located Port Engine room forward.

2.2 Standards

2.3

2.4 Regulations

2.3.1

2.5 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. This specification must be done prior to and in conjunction with HD-11 FUEL AND LUBE OIL TANKS.

3.1.2. Contractor prior to any work being carried out, the fuel oil tank must be gas freed and certified for hot work.

3.1.3. The contractor shall use proper lock-out tag out and Hot Work procedures, Fire Watch to be kept on both side of the tank and a watch kept for one hour after welding is completed.

3.1.4. The contractor shall crop out the deck penetration and a two inch diameter of steel around the penetration.

3.1.5. The new steel is to be blasted and primed with a weld-able primer

3.1.6. The contractor shall weld an insert into the two inch hole using the same thickness and grade of steel as per existing tank top. Welding is to be carried out on both sides.

3.1.7. All welds and heat affect areas are to be power tooled and coated with primer.

3.1.8. Contractor to ensure all debris has been removed after repair has been completed.

3.1.9. The complete external area, new steel and heat effected steel is then to be coated with one complete coat of primer. This process is to ensure that all steel in the repair area is completely primed.

3.1.10. Contractor shall provide temporary lighting, fire watch as required.

3.1.11. Contractor on completion of work is to carry out an air test as per Lloyd's Surveyor requirements.

3.1.12. All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyd's Surveyor.

3.2 Location

3.2.1. Main Engine room Port side fwd

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

4.2 Testing

4.2.1. 100% Magnetic Particle Inspection (MPI).

4.2.2. The contractor is responsible for all air quality testing to ensure hot work and entry is permitted are carried out as per Provincial regulations. Signage is post for hot work and testing tank for a confined space.

4.3 Certification

4.3.1. Welding in accordance with CSA W47.1 & W59.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

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

5.1.2

All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyds surveyor.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

Spec item #: HD-21	**SPECIFICATION**	TCMSB Field #: N/A
HD-21 DOCKING PLUGS		

Part 1: SCOPE:

1.1 The intent of this specification is to remove all docking plugs as list in drawing No. 590-96 Rev 2. for draining and cleaning tanks.

1.2 All work shall be to the satisfaction of the Chief Engineer, and Lloyd's Surveyor.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. For location of docking plugs see docking plan drawing No. 590-96 Rev 2.

2.1.2. Related Specifications:

i. HD-10 WATER BALLAST TANKS
ii. HD-11 FUEL AND LUBE OIL TANKS
iii. HD-14 GREY WATER TANK
iv. HD-15 SLUDGE TANK
v. HD-16 COOLING WATER DRAIN TANKS

2.2 Standards

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. Contractor shall notify Chief Engineer prior to starting work.

3.1.2. Contractor to note docking plugs for water ballast and void tanks are 1" square recessed. Docking plugs for fuel oil/lube oil tanks are 3/4" square recessed.

3.1.3. No docking plugs are to be removed from any tanks, until tanks have been pumped as low as possible by ship's personnel and is okayed by Chief Engineer.

3.1.4. Contractor is to remove all docking plugs as list in drawing No. 590-96 Rev 2. for draining and cleaning tanks.

3.1.5. All docking plugs removed shall be tagged immediately after removal, stored in a suitable container to prevent damage to the threads and given to the Chief Officer or Chief Engineer.

3.1.6. Chief Officer or Chief Engineer shall be present when docking plugs are removed and re-installed.

3.1.7. Contractor shall supply and fit all docking plugs openings with wooden plugs to prevent ingress of dirt during operations such as sandblasting, painting, etc. which could cause contamination of tanks.

3.1.8. After all tank work is completed, Contractor is to prior to installing the docking plugs run a tap over threads in hole. Docking plug threads shall be cleaned on a lathe if required. All docking plugs shall be installed using new sealing thread and white lead. Contractor to quote on thread cleaning ten docking plugs in lathe. And quote unit price for one. Contractor to quote on replacing 6 docking plugs and quote unit price to supply one.

3.1.9. Contractor shall secure all docking plugs as per approved method to Lloyd's classification rules after completion of the work in this specification.

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

3.2 Location

3.2.1. As list in drawing No. 590-96 Rev 2.

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

4.2 Testing

4.2.1. When tanks are test as per Lloyd's requirement under five year survey for tank inspection were an air test and or hydrostatic test depending on the type of tank are carried out.

4.3 Certification

4.3.1.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

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

5.1.2

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

Spec item #: H-1	**SPECIFICATION**	TCMSB Field #: N/A
H-1 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

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

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1. 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 who is very experienced and worked on the related systems: Steering gear systems, CPP system, rudder, thruster and clutches.

3.1.2. Contractor to carry out Dock trails prior to sea trails for a period of two (2) hours.

3.1.3. Sea trials will last a minimum of two (2) hours.

3.1.4. Sea Trials will contain ahead and astern movements at various power levels.

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. 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

Function test off all equipment that was overhauled during this Dry-Docking, related to the propulsion and control off the vessel.

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-2	SPECIFICATION	TCMSB Field #: N/A
H-2 FIXED FOAM AND WET CHEMICAL		

Part 1: SCOPE:

1.1 The purpose of this spec is to carry out the annual safety inspection 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 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. The contractor shall perform annual maintenance on the Two (2) fixed fire fighting 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. 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.

3.1.4. 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-3	**SPECIFICATION**	TCMSB Field #: N/A
H-3 LIFEBOATS AND DAVITS		

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 An Authorized Schat Technician shall perform the annual inspection on the lifeboats and davit winches. Contractor in the work description below refers to the Schat Technician.

1.4 All defects found shall be reported to the Chief Engineer as soon as possible when discovered.

1.5 The systems shall be thoroughly examined and serviced by an Authorized Schat Technician.

1.6 All work carried out in this specification shall be inspected by the Chief Engineer and Lloyd's. The same parties mentioned herein shall witness all tests and trials.

Part 2: REFERENCES:

2.1 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

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 commencement of work the Contractor shall inform the Chief Engineer so an equipment lock out can be conducted.

3.1.2. Vessel's crew shall secure Lifeboat(s) to prevent accidental lowering.

3.1.3. Contractor shall renew hydrostatic release diaphragm c/w cover retaining screws with a vessel supplied diaphragm

3.1.4. Contractor shall inspect the fwd and aft hook assembly, hook tails and hook tail bearings components for wear / damage. Contractor shall clean and lubricate all components after inspection is completed.

3.1.5. After inspection of lifeboats the Contractor shall complete annual maintenance of the lifeboat davit winches.

3.1.6. Contractor with the assistance of the ship's crew shall drain oil from winch gear case and remove gear case cover. Contractor shall prove the gear case vent is free. Contractor shall inspect the gear case for wear and damage. Contractor shall measure and record all backlash with respect to gearing of the winch.

3.1.7. The ships crew shall flush the gear case and refill crank case to the correct operating level with ship supplied oil. Contractor shall install and secure the gear case cover with correct cover seal.

3.1.8. Contractor 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 Contractor shall renew brake linings.

3.1.9. Contractor shall clean all parts including any brake dust from brake housing and de-glaze the brake running surface.

3.1.10. Contractor shall re-assemble brake and centrifugal assembly. After re-assembly the brakes shall be adjusted to correct setting.

3.1.11. Contractor shall remove two sheave, pin and bushing assembly for inspection to get a general idea of the condition of wear.

3.1.12. Contractor shall prove grease fittings, grease channels and holes are clear.

3.1.13. Contractor shall include in their bit unit cost per sheave, pin and bushing removal, inspection and re-installation.

3.1.14. Contractor shall inspect for damage and wear all davit mounting hardware, davit arms, falls, falls wires, turnbuckles, shackles and foundation

3.1.15. Contractor 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.

3.1.16. Contractor shall carry out an inspection of the Port and Stbd lifeboat davit falls and wires including all associated equipment.

3.1.17. Contractor shall inspect and check for correct operation the operation of the hand crank, limit switches and davit arm track rollers.

3.2 Location

3.2.1. N/A

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

4.2 Testing

4.2.1. N/A Contractor 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. Contractor 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, the Contractor 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 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 #: H-4	**SPECIFICATION**	TCMSB Field #: N/A
H-4 MIRANDA DAVIT		

Part 1: SCOPE:

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

1.2 Running contact surfaces of the centrifugal brake drum housing and the hand brake inner cone clutch rotor have to be machined to true them.

1.3 All components and wear measurements shall be inspected by the Chief Engineer and the attending Lloyd's surveyor.

1.4 Contractor shall arrange the scheduling of the Lloyd's surveyor for all inspections and trials and notify the Chief Engineer prior to them being conducted.

1.5 Contractor shall record all wear measurements and clearances taken and provide the Chief Engineer with three type written copies of the measurements.

1.6 All work carried out in this specification shall be to the satisfaction of the Chief Engineer and Lloyd's.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1 <u>Miranda Fast rescue Craft Davit MIR/R122</u>

Serial No. PW471
Type MW 4500
Mark F.C.L.
Year of build 1984
Winch No. 648
S.W.L. 3950 kG
Manufactured by Watercraft Ltd.

2.1.2 <u>Boat Cradle name plate Info:</u>

CCGS LJ Cowley
Van.07.25
August 23, 2007
S.W.L. 3950 Kgs.
2.5 x S.W.L. = S.T.L. 9875 Kgs.
Serial No. CE.007.1779

2.1.3. <u>Drawing and Manuals</u>

Binder No. 17 Chief Engineer's cabin contains the following:
1. Report on repairs to the MIR/R12 Miranda davit by fga Consultants

2. FGA Consultants Dwg. No. 07.10.19 "Upper sheave housing of Port Miranda davit"
3. Watercraft Miranda davit manual
4. All manuals & drawings shall be made available to the successful bidder

2.2 Standards

2.2.1

2.3 Regulations

2.3.1.

2.4 Owner Furnished Equipment

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

Part 3: TECHNICAL DESCRIPTION:

3.1 General

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

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

3.1.1. Contractor shall carry out all work in this specification as per the manufacturers overhaul instructional manual working within the limits and tolerances specified.

3.1.2. Contractor shall drain oil from the winch gear case and remove gear case cover. Contractor shall inform the Chief Engineer if there is any water content showing in the used oil. Contractor shall inspect the gear case for wear and damage. Contractor shall measure and record all backlash on all internal gears.

3.1.3. Contractor shall prove that the gear case vent is free and clear and functioning properly to prevent internal pressure. Contractor shall flush the gear case with new oil until all residue water and dirt is removed. Contractor shall fit the gear case oil drain plug with pipe sealant and fill the gear case to the correct operating level with ship supplied oil. Contractor shall replace the gear case cover with a new gasket. Oil shall be vessel supply.

3.1.4. Contractor shall dismantle the winch brake assemblies to gauge wear and check for signs of heat. This will include dismounting the manual hand brake and centrifugal brake assembly from its shaft. Brake linings and centrifugal brake pads to be inspected for wear and damage. Brake lining retaining screws shall be inspected. Centrifugal brake springs shall be inspected for wear and damage. Wear measurements of the brake linings shall be recorded and compared to manufactures specifications, if measurements are below specifications Contractor shall renew brake linings.

3.1.5. Contractor shall clean all parts including any brake dust from brake housing. Contractor shall de-glaze the running contact surfaces of the centrifugal brake drum housing and the hand brake inner cone clutch by machining them true. Contractor shall check with the manufacturer to obtain the minimum rotor thickness tolerance.

3.1.6. Contractor shall re-assemble brake assemblies using lock tite on the all brake lining securing screws. After re-assembly the breaks shall be adjusted to correct setting. Davit shall be lowered under load to test operation of the brakes.

3.1.7. Contractor shall remove the davit cradle roller wheels. There are a total of twelve roller wheels. Contractor shall gauge all roller wheel bushings inside diameters and all pin outside diameters and gauge the clearance between the roller bushing and pin of each roller. Contractor shall take measurements along the vertical and horizontal axis along the pin and bushing diameters. Contractor shall prove that all grease ways are clear on all roller wheels. Contractor shall re-assemble all rollers and install them back on the cradle as per original position.

3.1.8. Contractor shall prove to the Chief Engineer that all grease fittings and hoses are clear on all davit and cradle components.

3.1.9. Contractor shall 100% visually inspect all securing and lifting lugs that are welded to the davit structure and boat cradle assembly. Contractor shall inspect lug holes for wear and ovalitity. Contractor shall inspect lugs for cracks and signs of corrosion in welds where they are welded to the davit frame and cradle.

3.1.10. Contractor shall remove the three sheave, pin and bushing assemblies from the davit sheave brackets. Contractor shall tag sheaves and bushings as to what bracket they were removed from. Note * all three sheave pins have a different size outside diameter O.D. Contractor shall note that each sheave is fitted with brass wear washers either side of the sheave to prevent premature wear of sheave and bracket.

3.1.11. To determine serviceability the Contractor shall gauge the as fitted sheave pins and bushings for wear and compare measurements to the original readings. Contractor shall carry out a N.D.T. (100% MPI) on all sheave pins to check for cracks and other defects.

i. Contractor shall gauge wear on all as fitted sheave brass wear washers for comparison to the original readings.

ii. Contractor shall prove that all sheave assembly grease channels and holes are clear.

iii. Contractor shall include in their bid a unit price to fabricate / machine one sheave pin, one bushing and two wear washers, material shall be owner supply. Price shall also include unit cost to fit and ream the new sheave bushing to provide the correct pin to bushing running clearance. Material is owner supply.

iv. Prior to re-installation of all sheave assemblies the Contractor shall provide the Chief Engineer with two type written copies of the following measurements.

1. All Pin diameters taken uniformly along the axis in the horizontal and vertical planes.
2. All sheave bushing inside diameters uniformly along the axis in the horizontal; and vertical planes.
3. All three sheave support bracket pin bores.
4. All wear washer thicknesses at four equidistant points

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

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

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

3.2 Location

3.2.1. N/A

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

4.2 Testing

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

4.2.2. Ship's crew shall test the davit operation with the Contractor's representative in attendance. The cradle shall be allowed to free fall without a Fast Rescue Craft (FRC) to test winch and brake unit is functioning correctly.

4.2.3. After all parties agree the davit functions correctly the davit shall be tested under full load condition.

4.2.4. Contractor shall be responsible for all adjustments and the repair of all defects that are a direct result of the work carried out within this specification.

4.2.5. Contractor to megger test electrical motor.

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 #: H-5	**SPECIFICATION**	TCMSB Field #: N/A
H-5 WINDLASS, PORT AND STBD		

Part 1: SCOPE:

1.1 The intent of this specification shall be to carry a scheduled 5 year surveyor on both the Port and Stbd Anchor Windlass as required by Lloyd's.

1.2 The purpose of this spec is to completely dismantle the windlass including the gear case shafting, bearings, bush/gear wheel and bearing assembles, sliding clutch assembly and bull wheel shafting and the outboard pedestal for inspection and renewal of wear components.

1.3 This spec will also cover the inspection of the anchor chain fairlead roller and the chain stopper assemblies.

1.4 This spec will also cover the renewal of the windlass brake pads and machining of the running surface as well as inspection of pins, bushings on the brake band pivots and linkages.

1.5 Brake lining, roller bearings, bushings are vessel supply.

1.6 Contractor supply all parts, tools, equipment and rigging to carry out this specification.

1.7 All work in this specification shall be carried out as per manufacture's overhaul manual including the shaft bearing clearances

1.8 Contractor shall take note that the windlass has components that are shimmed to provide correct alignment.

1.9 Contractor shall ensure correct alignment of all components on re-assembly of the windlass.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2.1.1. Manufacture by Burrard Iron Works Limited

i. Model number H6

ii. Port Windlass Serial number 840707

iii. Stbd windlass Serial Number 840708

2.1.2. Parts and overhaul manual #62 in Chief Engineers Cabin

2.1.3. Sectional arrangement drawing #840603

2.1.4. Anchor chain fairlead roller details dwg #590-Sk19

2.1.5. Related Specifications:

i. HD-17 ANCHOR CHAINS AND CHAIN LOCKERS

2.1.6.

2.2 Standards

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. Contractor will carry out this specification when both chains and anchors have been lower to the Dry-dock floor. As required by Specification HD-17 ANCHOR CHAINS AND CHAIN LOCKERS.

3.1.2. Contractor shall be responsible for contacting the Lloyd's Surveyor and Chief Engineer when items are ready for the inspections

3.1.3. Contractor shall lock out power to anchor handling windlasses.

3.1.4. Contractor shall drain oil from the gear case and dispose of it as per Provincial Environment regulations. The gear case shall be wipe out with lint free rags on completion of all the work in this spec the Contractor shall top up the gear case to the correct working level with vessel supplied.

3.1.5. Contractor shall carry out all the necessary removals of the associated windlass equipment including outboard bearings, pedestals, shafting, clutches, wildcat assembles and hydraulic drive motors to gain access for the removal of the main shafts/clusters shaft and drive pinion shafts together with the gearing.

3.1.6. Contractor shall clean up the bearing housings and polish any scores on the shafting.

3.1.7. Contractor shall take and record measurement on all shafting bearing bushes.

3.1.8. Contractor shall conduct N.D.T. (LPI) testing on all gear wheel teeth and check gear wheel bushings or wear.

3.1.9. Contractor shall inspect the sliding clutch components for wear.

3.1.10. Contractor shall renew all grease fitting on both windlasses/chain stopper and anchor chain fairlead rollers. Contractor to prove all grease passages are free. Contractor to grease all fittings with 130-AA lubriplate or equivalent.

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

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

3.1.13. Contractor shall remove the brake assembly and remove all brakes linings and dispose off as per Provincial Environment regulations.

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

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

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

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

3.1.18. Contractor shall box up the windlass with new gaskets on inspection covers.

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

3.2 Location

3.2.1. Fwd Bow on Focle Deck

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

4.1.2. All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyd's inspector

4.2 Testing

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

4.3 Certification

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

Part 5: DELIVERABLES:

5.1 Drawings/Reports

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

5.1.2

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

Spec item #: ED-1	**SPECIFICATION**	TCMSB Field #: N/A
ED-1 RUDDER, PROPELLER,SHAFTS AND BEARINGS		

Part 1: SCOPE:

1.1 Contractor to open up the following equipment and do all necessary removals to carry out the following Lloyd's inspection surveys for the tail shaft, intermediate shafting, intermediate shaft bearing, fore and aft stern tube bushings, propeller / hub and mechanism, stern tube fore and aft mechanical seals and the oil distribution box. Contractor shall unship the vessel's rudder and re-install the rudder on completion of all the work in this specification. Contractor shall conduct N.D.T. as detailed in the work description. Contractor supply labour to assistance all FSR's in this spec item.

1.2 This specification shall also cover draining, flushing, cleaning, inspection and filling of the controllable pitch propeller (C.P.P.) hydraulic oil system and the stern tube lubrication system.

1.3 This specification shall also cover dismantling, cleaning, inspection and pressure testing of the stern tube lube oil heat exchanger and the C.P.P. hydraulic oil heat exchanger. The exchangers are shell and tube type.

1.4 Contractor to strictly adhere to manufacturer's specifications for all work carried out in this specification.

1.5 Contractor shall be responsible for contacting and arranging scheduling of all Lloyd's surveys involved in carrying out the work in this specification.

1.6 All manuals / drawings shall be made available to successful bidder.

<u>Field service representative (F.S.R.)</u>

Contractor shall supply the services of a FSR to dismantle and re-build the propeller hub and mechanism, inspect and gauge stern tube bushings, overhaul CPP Oil distribution box, removal and re-assembly of SKF shaft coupling and inspection of both the fore and aft stern tube seals. The FSR shall be responsible for all system(s) component adjustments required to bring the system within the operational functional requirements as per the manufacturer's tolerances and recommendations.

Suggested FSR :
Mr. Ron Van der Linden 902-468-1264, E-Mail: ron.vanderlinden@wartsila
Wartsila Canada Inc.

Contractor shall supply the services of a Tenfjord Steering FSR for removing and re-installation of the steering gear actuator to rudder stock lock rings. This FSR shall also inspect the rudder stock sea water seal.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data/Manuals

<u>Equipment / Manuals</u>

<u>Lips CPP Order No. H02185 / CP 142</u>
Manual No. 4 Contents include instructions, assembly drawings and parts lists for

shafting arrangement / propeller, hub & blades / SKF sleeve coupling / Intermediate shaft bearing and Stern tube bush(s) one each fwd and aft.

Tenfjord steering gear Type SR 722, SER# 15123-92,
Manual No. 9 Contents include assembly drawing for actuator to rudder lock rings / Tolerances and torque values / Instructions and parts lists

Stern Tube Seals
Inboard stern tube seal
John Crane – Lips Simplex type 330 MK2 C1 HSG Viton seal
Tail Shaft S.S. liner O.D. 330mm

Outboard stern tube seal
John Crane MN 337 Modified 335 Membrane
Manual No. 50 Includes Instructions / drawings / Parts for both seals
Tail Shaft S.S. liner O.D. 335mm

Tail shaft Dia. 328mm x 9486mm Long Frame No. 2 – 17/18

Intermediate shaft bearing Wausheka – Lips B.V. Order No. W03163
Weight 150 Kg. L.O. Capacity 1.5 liters Cooling Water capacity 1.1 liters

SKF Sleeve coupling Type OK 270HB 480 Kg. 440mm Dia x 705mm L

Schilling Rudder 2800mm x 2965mm
For details see Industramar Ltd. drawing No. 8321 3 sheets
Upper Thordon bearing to rudder stock diametrical clearance 1.5mm
Lower pintle to Thordon bearing diametrical clearance 1.5mm

Parts / Materials
All parts and materials shall be Contractor supply unless otherwise stated.

Drawings

Manual No. 9	Tenfjord H-6254
File No. 28	Dwg No.590-28 2/2 “Stern Tube Arrangement / Aft Bearing”
Lips Manual No. 4	Dwg. No. W006205045 “Intermediate shaft bearing”
Lips Manual No. 4	Dwg. No. W000400759-A1 “Assembly of oil distribution unit”
Lips Manual No. 4	Dwg. No. W000100627-AO Fig. No. 2 “Arrangement of shafting” {Details weights of shafting}
Shafting Layout	Dwg. No. 590-31

Rudder & Stock Arrangement 590-20

Lubrication type(s) & Quantities

Stern tube	Hydrex AW68	Quantity 1600 Liters
C.P.P.	Harmony HVI- 36	Quantity 1200 Liters

Intermediate shaft bearing Energol DS3 Quantity 1.1 Liters

2.2 Standards
2.3

2.4 Regulations
2.3.1

2.5 Owner Furnished Equipment

2.4.1 The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated. This will include scaffolding is to be erected in way of propeller to allow access for the above inspections and removed upon completion of all work and rigging for pulling and installing rudder and tailshaft.

Part 3: TECHNICAL DESCRIPTION:
3.1 General

3.1.1. Prior to commencing any work the contractor shall perform the following.

i. Check and record the tail shaft run out axially and radially with a dial gauge, before and after docking vessel and prior to dismantling and subsequent re installation of all components in this specification.
ii. Check the tail shaft wear down with the Lloyd's surveyor's present.
iii. Check centering mark on propeller blade to centering mark on propeller hub.
iv. Take and record the clearance between rudder stock and thordon bush, also the lower pintle and bushing clearance and jumping collar clearance. The Lloyd's surveyor's to witness.
v. Proof mark all shafting flanges.
vi. Proof mark rudder stock to actuator assembly.
vii. Check and record thrust clearance at Mitchell thrust block.
viii. Contractor shall remove the drain plugs from the rudder, kort nozzle and skeg and replace plugs and secure them after completion of the work in this specification.
ix. Prior to and after all work is completed in this specification the Contractor shall verify / test with the Chief Engineer that the following temperature and alarm transducers are working correctly:
    1. Fore and aft stern tube bearing temperature transducers on the VTS Alarm and monitoring system in the Motor Control room.

2. Alarm and temperature unit for the intermediate shaft bearing and inboard stern tube seal.
3. Contractor shall take precautions to prevent damage to these transducers and associated wiring for (1) & (2) above during the work in this spec.
4. Chief Engineer to witness all of the above.

3.1.2. Prior to removal of blades, the hydraulic oil shall be drained from CPP system, contractor shall dispose of oil approx. 1200 liters as per the provincial environmental regulations. The complete oil system shall be flushed with new oil until all signs of dirt and water are removed. The CPP header tank located in the tank room stbd side upper deck shall be opened up and cleaned using lint free rags. After cleaning the header tank shall be inspected by the Chief Engineer prior to closing up with new gaskets fitted to the manholes / inspection covers. All system filters shall be renewed from vessel's inventory. System shall be filled by Contractor with new oil using a filter cart with a micron rating of 3 microns absolute. Contractor supply oil and filter cart. System shall be purged of all air and system run up to check for leaks and to prove satisfactory pitch operation to the Chief Engineer.

3.1.3. Prior to the removal of the tail shaft the stern tube lubrication system shall be drained and disposed of as per the provincial environmental regulations. The complete oil system shall be flushed with new oil until all signs of dirt and water are removed. The stern tube header tank located in the port side foc'sle deck shall be opened up and cleaned using lint free rags. After cleaning the header tank shall be inspected by the Chief Engineer prior to closing up with new gaskets fitted to the manholes / inspection covers. All system filters shall be renewed from vessel's inventory. System shall be filled by Contractor with new oil using a filter cart with a micron rating of 3 microns absolute. Contractor supply oil and filter cart. System shall be purged of all air and system run up to test operation and to check for leaks. Chief Engineer to witness run up.

3.1.4. Contractor shall remove the aft shaft seal rope guard and fit it back on after completion of all work in this specification. The rope guard is secured by welding.

3.1.5. Contractor shall unship the rudder to gain access for removal and re-installation of the tail shaft. Contractor with the Chief Engineer shall verify the rudder position when set amidships from the Wheelhouse steering control stand. This shall be verified again after the rudder is fitted. Contractor shall proof mark the rudder stock to steering hydraulic actuator relationship for subsequent re-installation. The steering gear actuator is secured to the rudder stock with two sets of lock rings, refer to Tenfjord steering gear manual for removal / installation of the lock rings. After

completion of all work in this spec the Contractor shall ship the rudder and secure the lock rings as per the manufacturer's procedures and torque values. The rudder palm bolts are to be hardened up and secured with locking bars welded in place and final inspection by Lloyd's shall be carried out. Contractor shall once again take all the clearances as previously mentioned in paragraph **3.1.1.**

3.1.6. The contractor shall proof mark each set of coupling flanges at adjacent sections of all shafting including the SKF sleeve coupling for alignment prior to disassembly. The fitted bolts and nuts on each coupling are to be marked for identification purposes and the contractor is to ensure that each bolt is placed back in its original hole upon final coupling. Coupling bolts, nuts, and holes are to be cleaned and examined for wear/defects.

3.1.7. In conjunction with the propeller survey, the contractor shall remove the propeller tail shaft. The tail shaft is coupled to the intermediate shaft through a SKF sleeve coupling. The owner will supply the high injection pump necessary for withdrawal and installation of the coupling. The contractor shall remove the SKF coupling, strictly following the manufactures procedures and withdraw the tail shaft. Note** the pitch must be adjusted to the full astern position before dismantling the SKF coupling. The tail shaft shall be cleaned prior to inspection by Lloyd's surveyors. Contractor shall ensure the tail shaft is protected at all times from damage, deflection and corrosion due to the elements while it is unshipped. The tail shaft shall be supported at all times during removal, inspection and re-installation. Contractor shall also support the internal oil feed supply and return piping for pitch actuation at all times. This has to be accomplished as soon as the SKF sleeve coupling is released and the tail shaft is first moved back by fitting support pieces for the internal pipes and covering the opening to prevent ingress of foreign matter.

3.1.8. Once the tail shaft is withdrawn, the contractor shall remove the SKF coupling from the intermediate shaft. The coupling shall be thoroughly cleaned and prepared as per the manufactures procedures prior to replacement. The coupling shall be protected against the ingress of dirt and moisture while removed from the shaft.

3.1.9. Contractor shall remove the four propeller blades. Contractor to install owner supplied spare set of crated blades. Contractor will use same crating and secure old ones in. The FSR in conjunction with the contractor shall dismantle the propeller hub and mechanism for survey by the classification surveyors. All components shall be inspected for wear. Contractor shall re-build the unit with new seals. New blade foot o-ring seals are to be installed. Propeller blade bolts shall be torqued and bolts shall be locked up as per original method. Refer to Lips drawing No.

W00001150-AO "Propeller hub" for welding instructions for propeller blade bolt locking bars. Contractor to quote on 100 hours for machining for this specification.

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

3.1.11. Contractor in conjunction with the FSR shall open up the oil distribution box (O.D. Box) as part of the CPP system for cleaning and inspection of all components. The O.D. Box shall be re-built using all new seal and o-rings supplied with the overhaul kit. Contractor / FSR to open up the O.D. box feed back transmitter and check for worn components and to check condition of potentiometers, bushings and linkages.

3.1.12. The stern tube shall be cleaned prior to inspection by attending surveyors and chief engineer. Measurements shall be taken on the bore of each stern tube bearing in the vertical and horizontal direction at four equal points along the length of each bearing to check for ovality and uneven wear patterns.

3.1.13. Contractor shall open up the intermediate shaft bearing for cleaning and inspection by the classification society surveyors. Contractor shall gauge the bearing wear to shaft clearance for Lloyd's surveyors. Contractor shall remove cooling water passage inspection cover bolted to the bottom of the lower bearing housing and clean the passage of all scale. To access the cooling water passage inspection cover the bearing housing complete has to be unbolted and moved ahead to turn the unit to remove the cover. Contractor shall mark alignment shims for correct re-installation. The intermediate shaft and SKF coupling is to be supported at all times during removal and re-installation of the bearing housing to prevent any deflection in the same. After cleaning, the bearing housing assembly has to be fitted in place and bolts torqued to manufactures specs. Refer to Waukesha – Lips B.V. drawing No. W006205045 manual No. 4 for details of bearing. Upon completion of inspection the shaft bearing is to be closed up with new gaskets and the oil in the base renewed, oil shall be owner supply.

3.1.14. Contractor in conjunction with the FSR shall dismantle the inboard and outboard stern tube seals for inspection by the attending surveyor's and the Chief Engineer. The seal assemblies shall be re-built renewing any worn components, all new seals and o-rings shall be fitted. Parts are owner supply.

3.1.15. Upon completion of all inspections, the rudder, O.D. box, intermediate shaft bearing, SKF sleeve coupling, tail shaft, stern tube seals, propeller

and hub assemble including propeller blades, shall be installed in good order with all fasteners being torqued as required and all locking put in place. Contractor shall prove to the Chief Engineer and Lloyd's surveyors that all system components in this specification including all shafting, couplings, flanges, bearings and seals are within the manufacturer's alignment tolerances.

3.1.16. Contractor shall open up the CPP and stern tube heat exchangers for cleaning, inspection and pressures testing. Contractor shall chemically clean and de-scale the tube nests internally and externally including the internal shell and end bells on each exchanger. Heat exchangers shall be pressure tested to the name plate data test pressure for a minimum of 30 minutes to check for leaks. The heat exchangers shall be re-built using all new gaskets and seals. Contractor shall renew the sacrificial zinc anodes on the sea water side of the exchangers. Contractor is responsible for removal and re-installation should exchangers have to be transported to Contractors facilities for the work / testing in this specification. All disturbed piping, flanges and brackets shall be re-installed in good order with new gaskets and pipe sealant applied as required. All fasteners shall be cleaned and anti seize compound applied. Lloyd's surveyor's to witness inspection and pressure testing of exchangers.

3.1.17. After all work on CPP system is completed, the contractor shall check that all valves are in the correct position, start CPP pumps and check complete system for leaks, check movement of propeller blades in the full ahead and full astern positions and that the blades line up on centering marks on hub.

3.1.18. All piping, fixtures, wiring, removed or disturbed during the work in this specification shall be replaced in good order.

3.1.19. After installation of the tail shaft and stern tube seal assemblies the Contractor shall pressure test the stern tube seals to 15 p.s.i. to verify the static integrity. The test shall be applied for 30 minutes. The lube system shall be filled prior to this test as per paragraph (3.1.3.). The Chief Engineer shall witness this test.

3.1.20. Dockside trials shall be conducted to test the operation of the CPP, stern tube system and rudder operation to the satisfaction of the Chief Engineer. Contractor shall check for overheating at the intermediate shaft bearing and inboard seal.

3.1.21. A two hour sea trial shall be conducted to prove the all systems operational to the satisfaction of the Chief Engineer working from no load to full load in 15 minute intervals while recording temperatures and pressures.

3.1.22. Contractor shall supply the Chief Engineer with four typed copies of their work report including all wear measurements and readings, parts used with corresponding part numbers.

3.1.23. All work in this specification shall be carried out to the satisfaction of the Chief Engineer and Lloyd's.

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

4.1.1. All work is to be done to the satisfaction of the Chief Engineer, Wartsila Propulsion FSR representative and attending Lloyd's Surveyor.

4.1.2. 100% visual By Chief Engineer and Lloyd's Surveyor.

4.2 Testing

4.2.1.

4.3 Certification

4.3.1. This specification is to be carried out in order to obtain Lloyd's Survey credit. The Contractor shall be responsible for contacting the Lloyd's surveyor when items are ready for the inspections.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 Contractor shall take stern tube wear-down readings prior to drawing the propeller and shafting. Upon completion of all work, a second set of wear-down readings is to be taken and recorded.

5.1.2 The pressure required for release of the SKF coupling halves is to be recorded.

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

5.1.4 All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyds surveyor.

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

Spec item #: ED-2	**SPECIFICATION**	TCMSB Field #: N/A
ED-2 STEERING GEAR		

Part 1: SCOPE:

1.1 To carry out the 5 year survey required by Lloyd's.
1.2 Contractor shall adhere to manufacture's specifications for all test and work carried out.

Part 2: REFERENCES:
2.1 Guidance Drawings/Nameplate Data/Manuals

2.1.1. STEERING GEAR TENFJORD TYPE SR 722, ORDER #12006.
2.1.2. TENFJORD INSTRUCTIONS BOOKLET

EQUIPMENT INFORMATION
Steering gear:
TENFJORD Type SR 722
SER# 15123-92,
MAX. WORKING PRESS=100 BAR
TEST PRESS=188 BAR

HYDRAULIC PUMP UNIT (2)
TYPE PU 50 T6C B14
SER #684, 1992.
CAPACITY 77 LITRES/MINUTE.

ELECTRIC MOTOR:
ABB TYPE NORM IEC 160M,
1750 R.P.M.
18 KW, 3 PHASE 440 V.A.C., 60 HZ.

MANOEUVRING VALVE
TYPE:S45P
SOLENOID VOLTAGE: 24 V.D.C

2.2 Standards

2.3 Regulations
2.3.1

2.4 Owner Furnished Equipment

2.4.1 **Parts / Materials / Equipment / Rigging** Parts and materials shall be contractor supply unless otherwise stated. Contractor to supply 1000 liters, hydraulic oil of oil type-harmony HVI-60.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1. The contractor shall open up and ready for inspection the listed steering gear components for Lloyd's inspection. Upon completion of the work, the system shall be reassembled in its entirety and tested as per procedures outlined in the manufacturer's instruction book.

3.1.2. The contractor shall supply the services of a Tenfjord Field Service Representative to carry out the following work. Contractor supply labour to assistance Rolls Royce FSR for this spec item.

3.1.3. Contractor shall lock out and tag all electrical power to the steering gear prior to commencing work. On completion of all work the contractor shall remove locks.

3.1.4. Contractor shall drain hydraulic oil from the rudder actuator & both pump sump tanks & header tank and associated piping and dispose of at contractors facility, bid to include cost of removal of 1,000 litres of hydraulic oil. Both power pack tanks and the header tank and rudder actuator to be wiped clean using lint free rags. Replace gaskets or seals suitable for steering oil, on equipment or covers that had to been taken off to clean power pack tanks and header tank.

3.1.5. Contractor to dismantle rudder actuator for inspection by the classification societies. Any worn parts beyond maker's specifications to be replaced with new. Contractor shall install all new seals and "o" rings during reassembly.

3.1.6. Both manoeuvring valves to be dismantled for inspection and rebuilt with new overhaul kits and re-installed.

3.1.7. Contractor shall open up for inspection both hydraulic pump units. Contractor shall clean all parts and shall display all parts for inspection. Contractor to reassemble units with new overhaul kits

3.1.8. Contractor to dismantle the two (2) electric drive motors for the hydraulic pumps for inspection. Contractor to reassemble motors with new bearings.

3.1.9. The rudder actuator locking rings are to be replaced with owner supply units. The rings are to be removed and installed and torqued as per manufacturer's specifications and instructions. The rudder and rudder stock have to be supported for this operation.

3.1.10. Contractor to install new rudder stock seal against sea water, seal supply by owner.

3.1.11. After completion of all work the contractor shall fill the steering gear system to correct levels with new oil. New return oil filter elements are to be installed in each hydraulic power unit. Contractor shall purge all air from the entire system.

3.1.12. Contractor shall test the steering gear system after all work has been completed to the satisfaction of Lloyd's Surveyor and Chief Engineer.

3.2 Location

3.2.1. In Steering compartment aft main deck.

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

4.1.2. All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyd's inspector

4.2 Testing

4.2.1. Upon completion of all work, the steering is to be tested, rudder hard to port then hard stbd.

4.2.2. Sea trials: Steering is to be tested at various angles while vessel is in operation also rudder hard to port then hard stbd.

4.2.3. Contractor to carry out a function test to the satisfaction of the Chief Engineer and the attending Lloyd's Surveyor. Contractor shall be responsible for contacting the Lloyd's surveyor when items are ready for the inspections.

4.3 Certification

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

Part 5: DELIVERABLES:

5.1 Drawings/Reports

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

5.1.2

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

Spec item #: ED-3	**SPECIFICATION**	TCMSB Field #: N/A
ED-3 TRANSVERSE BOW THRUSTER		

Part 1: SCOPE:

1.1 To carry out manufacture recommended maintenance.
1.2 Contractor to change out all seals and bearings and change oil.
1.3 Contractor shall adhere to manufacture's specifications for all test and work carried out.
1.4 A visual inspection of Bow Thruster unit shall be carried out by Chief Engineer and Lloyd's Surveyor.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data/Manuals

2.1.1. Ulstein type 90 TV-A, Plant No.T
2.1.2. Service and Instruction manual, parts list, & Drawings all on board vessel for successful bidder.

Hydraulic Thruster Make and type

Ulstein type 90 TV-A, Plant No.T 972
Four blades Variable Pitch @ 390 R.P.M.
Drawing No. 62200 P00087-Y

Electric drive motor:
Siemens type 1RA6 310-4SB98-2, IEC315S 1MV1, 1984
31097401/1
440 V.A.C., 310 Amps, 1800 R.P.M.
Full Load Eff. = 250 h.p.

Oil type and quantity for Gearbox and Propeller hub:
Ultima EP-150
Quantity 150 Litres

2.2 Standards

2.3 Regulations
2.3.1

2.4 Owner Furnished Equipment
2.4.1 Contractor shall supply all material, rigging, equipment, transportation, required to carry out all work in this specification. Owner will supply all bearings and seals

Spec item #: ED-3	**SPECIFICATION**	TCMSB Field #: N/A
ED-3 TRANSVERSE BOW THRUSTER		

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1. Contractor shall remove the transverse tunnel grids to gain access to the unit and the contractor shall re-install them on after completion of all work and operational testing of blades is confirmed.

3.1.2. Contractor shall drain system oil and dispose of as per the provincial regulations.

3.1.3. Contractor to remove electrical motor in bow thruster compartment to gain access to the hold down bolts for the hydraulic unit.

3.1.4. Contractor support the thrust unit in the tunnel and then un bolt unit. When unit has been dis connected under the supervision of the FSR then Contractor is to bring complete unit to their facilities'.

3.1.5. Contractor under supervision of a Field Service Representive (FSR) is to overhaul the unit and replace all seals and bearings.

3.1.6. Contractor on completion off overhauling unit, Contractor to re-install unit following steps in reverse under the supervision of the FSR.

3.1.7. Contractor to installed drain plug with new seal and secured drain plug from coming loose due to vibration.

3.1.8. Contractor shall refill the complete oil system with new Ultima EP-150 oil that is heated filtered with 3 micron absolute filtration and as per manufacturers recommendations.

3.1.9. After re-assembly and re-installation of the thruster gear unit the Contractor shall have Lloyd's Surveyor and the Chief Engineer to witness the blade operation to full pitch port and starboard checking for leaks and bleeding any entrapped air

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

3.2 Location

3.2.1. Electric drive motor is located foreward Bow Thruster Compartment

3.2.2. Bow Thruster hydraulic gear unit is located in transverse thruster tunnel Frame No.83-85.

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

4.1.2. All work to be inspected by Lloyd's Surveyor and Chief Engineer.

4.1.3. .Contractor shall arrange scheduling of inspections, trials and tests with Lloyd's Surveyors and Chief Engineer.

4.1.4. All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyd's Surveyor.

4.2 Testing

4.2.1. After re-assembly and re-installation of the thruster gear unit the contractor shall have the classification societies and the Chief Engineer to witness the blade operation to full pitch port and starboard checking for leaks and bleeding any entrapped.

4.2.2. Sea trials: Bow Thruster to be tested at various pitch angles and full pitch port and starboard while vessel is in operation.

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

4.3 Certification

4.3.1. .

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 The Contractor shall supply the Chief Engineer with two typed copies and one electronic of the FSR report off overhaul / work report which shall include all wear measurements, clearances and operational tolerances for comparison.

5.1.2 Contractor shall also include a list of all new parts fitted including their corresponding position / part numbers and quantities.

5.1.3

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

Spec item #: E-1	**SPECIFICATION**	TCMSB Field #: N/A
E-1 PORT MAIN ENGINE CLUTCH		

Part 1: SCOPE:

1.1 The Intent of this specification shall be to carry out a scheduled 5 year survey required by Lloyd's classification societies. Remove the clutch from the main engine and dismantle it in entirety and check all component wear. Re-build clutch with all new seals / gaskets /clutch linings and install unit back on engine. To record axial and radial run out and alignment measurements before and upon completion of work for comparison to the manufacturer's specifications. Conduct dockside and sea trials.

1.2 Contractor shall supply a Rexroth Field Service Representative (FSR) kevin Sanford phone number 902-468-4500 to supervise the overhaul and record all wear measurements. Contractor shall include in the bid costs for FSR labour, travel and accommodations. Contractor shall have the FSR prepare 2 copies of work report with all wear measurements.

1.3 Contractor shall supply all parts, materials, Tools, equipment and rigging to carry out the work in this specification.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data/Manuals

2.1.1. Clutch particulars

2.1.2. Pneumaflex Highly Elastic Double Cone Friction Clutch.

2.1.3. Manufactured by Lohmann and Stolterfoht

2.1.4. Type and Size: KAP 240/design 1000/1251 & 125

2.1.5. Hardness degree of Rubber elements "W"

2.1.6. Input speed 750 R.P.M.

2.1.7. Order No. 12/321 176

2.1.8. Weight: approx. 690 kg.

2.1.9. No. 16B Lohmann & Stolterfoht "Installation – Operation – maintenance – Including Parts and drawings

i. Installation Drawing No. 3/1182/5007/0
ii. Spare Copy on board vessel for Contractors use.

2.1.10. Related specification ED-1 RUDDER, PROPELLER, SHAFTS AND BEARING.

2.2 Standards

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

2.4.1 **Parts / Materials / Equipment / Rigging** Contractor shall supply consumables, tools, equipment and rigging to carry out the work in this specification unless otherwise stated in the description of work. Owner will supply seal kits and a set of "Spiroflex" elements and linings if required.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1. The Ship's crew will isolate and lockout control/supply air to the clutch.

3.1.2. Contractor shall remove the guard housing and step that covers the clutch. The contractor shall remove any necessary piping, wiring, etc. to facilitate the removal of the clutch assembly.

3.1.3. Prior to commencing and again after all the work in this specification is completed the Contractor shall record the axial and radial run out with the clutch engaged and dis-engaged. Contractor shall record the readings starting from the same point and in the same direction of rotation as per the work history data contained in the vessel's maintenance program for comparison to check if current readings are still within the manufacturer's tolerances. Check condition of all magnetic pins and pickups for the clutch slippage unit, there are four pins on the input and four on the output. Check clearance between pins and pick ups. Chief Engineer shall witness this check.

3.1.4. Prior to uncoupling the clutch from the engine the Contractor shall check and record the thickness of all friction pad linings on the input and output sides of the clutch by following the manufacturer's detailed instructions outlined in the service manual. Minimum thickness of friction linings is 5 mm, if thickness readings of the friction linings are below the manufactures recommended value the Contractor shall replace the friction linings. The friction linings will be Owner supplied. Chief Engineer shall witness this check.

3.1.5. The four spiroflex elements are to be inspected visually for cracks and wear. Contractor shall also check by measuring that all elements have not reached their tensional angle of twist limitation as set out in the service manual. Maximum allowable twist10 degrees.

3.1.6. Prior to uncoupling the clutch from the engine and gearbox, the contractor shall ensure that all faces of the associated flanges and spacer plates are properly "proof" marked for subsequent reassembly and correct orientation.

3.1.7. Contractor shall also proof" mark all coupling bolts. The sizes of the bolts are different this will save time when re- assembling. Contractor to bid on reaming of 10 holes for new fitted bolts allowing a minimum of 4 thousands off one inch per hole to be removed. And quote per one reamed hole as above.

3.1.8. The contractor shall remove the clutch from the engine and reduction gearbox to the engine room deck plates. The clutch is to be dismantled and all components to be cleaned and inspected for wear or damage. All parts to be inspected by Lloyds Surveyor. All measurements and clearances to be checked and recorded as per the manufacturers service manual.

3.1.9. The magnetic pins (8) four on the input side and four on the output side for the clutch slippage unit are to be checked and any damaged or missing pins shall be replaced. Contractor shall check clearance between magnetic pick ups (2) and all magnetic pins and adjust to within service manual tolerances.

3.1.10. Contractor shall re-build the clutch with all new seals, o-rings, clutch linings and gaskets.

3.1.11. Upon completion of reassembly of the clutch pack, the contractor is to perform an air pressure test of 100 P.S.I. on the clutch to demonstrate that all components are tight and that all seals are operating correctly. All of the testing shall be carried out in the presence of the Chief Engineer.

3.1.12. Contractor is to re-install the clutch in good order using newly machined fitted bolts. Machined bolts shall be Contractor supplied. Once installed, the radial and axial alignment of the clutch is to be checked and recorded with the clutch engaged and disengaged. The contractor shall check the working air pressure and engagement time, making adjustments if required, as stated in the manufacturer's instruction manual. **Note: Contractor is to quote on the replacement of 10 fitted bolts and provide a price per bolt to be adjusted up or down by PWGSC 1379 action.**

3.1.13. After the clutch is installed the Contractor shall check the friction cone travel at four points on the periphery to ensure equal travel of both friction cones to equalize the axial reaction forces of the pre-stressed elastic rubber ring elements "Spiroflex". Refer to page 5/6 of the service manual.

3.1.14. All guards, as well as any disturbed piping, wiring, and metal work are to be replaced in good order upon completion of the above work.

3.1.15. Dock trials: Upon completion of all work, the clutch shall be tested with the engine running and clutch engaged. Contractor shall adjust slippage time for engagement if required. Contractor shall record the clutch temperature for one hour while alongside the dock taking temperature

readings throughout the hour. Contractor shall use a hand held digital infra red temperature unit to monitor temperature as there is no permanent transducer in place. Contractor shall supply proof of accuracy for the instrument.

3.1.16. Sea trials: After clutch operation and temperature proves acceptable during the dock trials the vessel shall carry out a two hour sea trial with the Contractor in attendance witnessing the engine / clutch operation through various load conditions up to 100% load. Contractor shall continue to monitor and record the clutch temperature at 15 minute intervals throughout the sea trials.

3.1.17. All work and testing to be carried out to the satisfaction of attending surveyors Lloyds and Chief Engineer.

3.2 Location

3.2.1. Main Engine room

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

4.1.2. All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyd's inspector

4.2 Testing

4.2.1. Dock trials: Upon completion of all work, the clutch shall be tested with the engine running and clutch engaged. Contractor shall adjust slippage time for engagement if required. Contractor shall record the clutch temperature for one hour while alongside the dock taking temperature readings throughout the hour. Contractor shall use a hand held digital infra red temperature unit to monitor temperature as there is no permanent transducer in place. Contractor shall supply proof of accuracy for the instrument.

4.2.2. Sea trials: After clutch operation and temperature proves acceptable during the dock trials the vessel shall carry out a two hour sea trial with the Contractor in attendance witnessing the engine / clutch operation through various load

conditions up to 100% load. Contractor shall continue to monitor and record the clutch temperature at 15 minute intervals throughout the sea trials.

4.2.3. Contractor to carry out a function test to the satisfaction of the Chief Engineer and the attending Lloyd's Surveyor. Contractor shall be responsible for contacting the Lloyd's surveyor when items are ready for the inspections.

4.3 Certification

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

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 The Contractor shall supply the Chief Engineer with two typed copies and one electronic of the Contractors overhaul / work report which shall include all wear measurements, clearances and operational tolerances for comparison, engine to gearbox alignment readings, clutch axial and radial run out readings and the clutch temperature readings log sheet with Engine R.P.M. and pitch taken during trials. Contractor shall also include a list of all new parts fitted including their corresponding position / part numbers and quantities.

5.1.2

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

Spec item #: E-2	**SPECIFICATION**	TCMSB Field #: N/A
E-2 STBD MAIN ENGINE CLUTCH		

Part 1: SCOPE:

1.1 The Intent of this specification shall be to carry out a scheduled 5 year survey required by Lloyd's classification societies. Remove the clutch from the main engine and dismantle it in entirety and check all component wear. Re-build clutch with all new seals / gaskets /clutch linings and install unit back on engine. To record axial and radial run out and alignment measurements before and upon completion of work for comparison to the manufacturer's specifications. Conduct dockside and sea trials.

1.2 Contractor shall supply a Rexroth Field Service Representative (FSR) kevin Sanford phone number 902-468-4500 to supervise the overhaul and record all wear measurements. Contractor shall include in the bid costs for FSR labour, travel and accommodations. Contractor shall have the FSR prepare 2 copies of work report with all wear measurements.

1.3 Contractor shall supply all parts, materials, Tools, equipment and rigging to carry out the work in this specification.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data/Manuals

2.1.1. Clutch particulars

2.1.2. Pneumaflex Highly Elastic Double Cone Friction Clutch.

2.1.3. Manufactured by Lohmann and Stolterfoht

2.1.4. Type and Size: KAP 240/design 1000/1251 & 125

2.1.5. Hardness degree of Rubber elements "W"

2.1.6. Input speed 750 R.P.M.

2.1.7. Order No. 12/321 176

2.1.8. Weight: approx. 690 kg.

2.1.9. No. 16B Lohmann & Stolterfoht "Installation – Operation – maintenance – Including Parts and drawings

i. Installation Drawing No. 3/1182/5007/0
ii. Spare Copy on board vessel for Contractors use.

2.1.10. Related specification ED-1 RUDDER, PROPELLER, SHAFTS AND BEARING.

2.2 Standards

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

2.4.1 **Parts / Materials / Equipment / Rigging** Contractor shall supply consumables, tools, equipment and rigging to carry out the work in this specification unless otherwise stated in the description of work. Owner will supply seal kits and a set of "Spiroflex" elements and linings if required.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1. The Ship's crew will isolate and lockout control/supply air to the clutch.

3.1.2. Contractor shall remove the guard housing and step that covers the clutch. The contractor shall remove any necessary piping, wiring, etc. to facilitate the removal of the clutch assembly.

3.1.3. Prior to commencing and again after all the work in this specification is completed the Contractor shall record the axial and radial run out with the clutch engaged and dis-engaged. Contractor shall record the readings starting from the same point and in the same direction of rotation as per the work history data contained in the vessel's maintenance program for comparison to check if current readings are still within the manufacturer's tolerances. Check condition of all magnetic pins and pickups for the clutch slippage unit, there are four pins on the input and four on the output. Check clearance between pins and pick ups. Chief Engineer shall witness this check.

3.1.4. Prior to uncoupling the clutch from the engine the Contractor shall check and record the thickness of all friction pad linings on the input and output sides of the clutch by following the manufacturer's detailed instructions outlined in the service manual. Minimum thickness of friction linings is 5 mm, if thickness readings of the friction linings are below the manufactures recommended value the Contractor shall replace the friction linings. The friction linings will be Owner supplied. Chief Engineer shall witness this check.

3.1.5. The four spiroflex elements are to be inspected visually for cracks and wear. Contractor shall also check by measuring that all elements have not reached their tensional angle of twist limitation as set out in the service manual. Maximum allowable twist10 degrees.

3.1.6. Prior to uncoupling the clutch from the engine and gearbox, the contractor shall ensure that all faces of the associated flanges and spacer plates are properly "proof" marked for subsequent reassembly and correct orientation.

3.1.7. Contractor shall also proof" mark all coupling bolts. The sizes of the bolts are different this will save time when re- assembling. Contractor to bid on reaming of 10 holes for new fitted bolts allowing a minimum of 4 thousands off one inch per hole to be removed. And quote per one reamed hole as above.

3.1.8. The contractor shall remove the clutch from the engine and reduction gearbox to the engine room deck plates. The clutch is to be dismantled and all components to be cleaned and inspected for wear or damage. All parts to be inspected by Lloyds Surveyor. All measurements and clearances to be checked and recorded as per the manufacturers service manual.

3.1.9. The magnetic pins (8) four on the input side and four on the output side for the clutch slippage unit are to be checked and any damaged or missing pins shall be replaced. Contractor shall check clearance between magnetic pick ups (2) and all magnetic pins and adjust to within service manual tolerances.

3.1.10. Contractor shall re-build the clutch with all new seals, o-rings, clutch linings and gaskets.

3.1.11. Upon completion of reassembly of the clutch pack, the contractor is to perform an air pressure test of 100 P.S.I. on the clutch to demonstrate that all components are tight and that all seals are operating correctly. All of the testing shall be carried out in the presence of the Chief Engineer.

3.1.12. Contractor is to re-install the clutch in good order using newly machined fitted bolts. Machined bolts shall be Contractor supplied. Once installed, the radial and axial alignment of the clutch is to be checked and recorded with the clutch engaged and disengaged. The contractor shall check the working air pressure and engagement time, making adjustments if required, as stated in the manufacturer's instruction manual. **Note: Contractor is to quote on the replacement of 10 fitted bolts and provide a price per bolt to be adjusted up or down by PWGSC 1379 action.**

3.1.13. After the clutch is installed the Contractor shall check the friction cone travel at four points on the periphery to ensure equal travel of both friction cones to equalize the axial reaction forces of the pre-stressed elastic rubber ring elements "Spiroflex". Refer to page 5/6 of the service manual.

3.1.14. All guards, as well as any disturbed piping, wiring, and metal work are to be replaced in good order upon completion of the above work.

3.1.15. Dock trials: Upon completion of all work, the clutch shall be tested with the engine running and clutch engaged. Contractor shall adjust slippage time for engagement if required. Contractor shall record the clutch temperature for one hour while alongside the dock taking temperature

readings throughout the hour. Contractor shall use a hand held digital infra red temperature unit to monitor temperature as there is no permanent transducer in place. Contractor shall supply proof of accuracy for the instrument.

3.1.16. Sea trials: After clutch operation and temperature proves acceptable during the dock trials the vessel shall carry out a two hour sea trial with the Contractor in attendance witnessing the engine / clutch operation through various load conditions up to 100% load. Contractor shall continue to monitor and record the clutch temperature at 15 minute intervals throughout the sea trials.

3.1.17. All work and testing to be carried out to the satisfaction of attending surveyors Lloyds and Chief Engineer.

3.2 Location

3.2.1. Main Engine room

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

4.1.2. All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyd's inspector

4.2 Testing

4.2.1. Dock trials: Upon completion of all work, the clutch shall be tested with the engine running and clutch engaged. Contractor shall adjust slippage time for engagement if required. Contractor shall record the clutch temperature for one hour while alongside the dock taking temperature readings throughout the hour. Contractor shall use a hand held digital infra red temperature unit to monitor temperature as there is no permanent transducer in place. Contractor shall supply proof of accuracy for the instrument.

4.2.2. Sea trials: After clutch operation and temperature proves acceptable during the dock trials the vessel shall carry out a two hour sea trial with the Contractor in attendance witnessing the engine / clutch operation through various load

conditions up to 100% load. Contractor shall continue to monitor and record the clutch temperature at 15 minute intervals throughout the sea trials.

4.2.3. Contractor to carry out a function test to the satisfaction of the Chief Engineer and the attending Lloyd's Surveyor. Contractor shall be responsible for contacting the Lloyd's surveyor when items are ready for the inspections.

4.3 Certification

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

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 The Contractor shall supply the Chief Engineer with two typed copies and one electronic of the Contractors overhaul / work report which shall include all wear measurements, clearances and operational tolerances for comparison, engine to gearbox alignment readings, clutch axial and radial run out readings and the clutch temperature readings log sheet with Engine R.P.M. and pitch taken during trials. Contractor shall also include a list of all new parts fitted including their corresponding position / part numbers and quantities.

5.1.2

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals N/A

Spec item #: E-3	**SPECIFICATION**	TCMSB Field #: N/A
E-3 MAIN ENGINE GEARBOX		

Part 1: SCOPE:

1.1 The Intent of this specification shall be to carry out recommendations from manufacture that all four main engine input shafts roller bearings in the main engine gearbox be changed out.

1.2 Contractor shall supply a Rexroth Field Service Representative (FSR) Kevin Sanford phone number 902-468-4500 to supervise the overhaul and record all wear measurements. Contractor shall include in the bid costs an allowance of $10,000.00 for FSR labour, travel and accommodations. Contractor shall have the FSR prepare 2 written and 1 electronic copy of work reports with all wear measurements.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data/Manuals

2.1.1. Gearbox particulars

2.1.2. Manufactured by Lohmann and Stolterfoht

2.1.3. Input speed 750 R.P.M.

2.1.4. Related specification E-1 & E-2 Port and Stbd Main Engine Clutches and ED-1 Rudder, Propeller, Shafts and Bearings.

2.2 Standards

2.3 Regulations

2.3.1

2.4 Owner Furnished Equipment

2.4.1 Parts / Materials / Equipment / Rigging Contractor shall supply consumables, tools, equipment and rigging to carry out the work in this specification unless otherwise stated in the description of work. Owner will supply seal kits and four roller bearings required.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1. Contractor must ensure that the FSR be present and supervise all work carried out by Contractor in this specification.

3.1.2. Contractor is to carry out this item after the main engine E-1 Port clutch and E-2 Stbd clutches are taken out. The port and stbd clutches are not to be put in until this specification item is finished.

3.1.3. Contractor will isolate and lockout all associate equipment: Main Engine starting air supply and gearbox stand-by pump.

3.1.4. Contractor must complete the following work prior to the removal of the main engine gearbox top half cover.

3.1.5. Contractor shall remove all necessary covers, rails, platforms, piping and wiring required to carry out this specification.

3.1.6. Contractor must capped off all piping ends on all piping that has been taken off to prevent the ingression of dirt.

3.1.7. All opening on the gearbox must be capped off to prevent the ingression of dirt. All piping must be marked and tabulated and a copy given to the Chief Engineer prior to dismantling.

3.1.8. Contractor to remove approximately 12 meters of 50 mm gearbox lube oil piping. Note ends off all lines must be capped off.

3.1.9. Contractor shall remove tubing/piping from 6.23mm to 50mm piping of various sizes approximately 18.3m total length. Note ends off all lines must be capped off.

3.1.10. All locations were pipes/tubing has been taken off has to be plugged, capped or blanked off.

3.1.11. Piping to gearbox standby pump has to be removed and capped off.

3.1.12. Contractor to remove lube oil header column for alarm and control board.

3.1.13. Contractor to remove support tubing above the gearbox that support for alarms and Controllable Pitch Propellers (CCP) filters, that are connected to the support bracket on the fwd side of the top gearbox cover.

3.1.14. All wiring proven to have no power prior to dismantling. All wiring must be marked and tabulated and a copy given to the Chief Engineer prior to dismantling.

3.1.15. Contractor to remove wiring for the controls and alarms on the support bracket on the stbd side of the top gearbox cover and then remove support bracket itself.

3.1.16. Contractor to mark and remove two electrical temperature probes in the Thrust block housing.

3.1.17. Contractor let go wiring for gearbox standby pump and then remove pump itself contractor note the location and number of shims underneath pump and motor for re- installation of the pump for alignment.

3.1.18. Contractor to move Port and Stbd aft wire trays and electrical control boxes. The support brackets can be disconnected and move out ward to allow the top cover off the gearbox to be able to move directly aft.

3.1.19. Contractor has to remove gearbox turning gear and renew gasket on installation.

3.1.20. Contractor must remove fwd intermediate shaft bearing cap cover on the fwd section of the gearbox.

3.1.21. Contractor must remove the aft thrust block seal and the upper half thrust block cover.

3.1.22. Contractor must remove all railing behind the gearbox and also the platform and steps accessing the aft tunnel. When all interference items are cleared from the top gearbox cover the top cover is to be un bolted and rigging equipment installed to lift the cover.

3.1.23. Contractor must notify Chief Engineer when they are ready to lift the cover. The FSR must be present and supervise all work carried out by Contractor in this specification.

3.1.24. Once the cover is lifted it has to brought direct aft. The cover has to be support on mounting blocks away from the gearbox. The exact location is to be determined by the Chief Engineer.

3.1.25. Contractor with the guidance of the FSR must rig the two input shaft out off vessel to Contractor's facilitates.

3.1.26. Contractor has to change out a total of four roller bearing for the two main engine input shafts.

3.1.27. Contractor must after shafts are put ashore rig the top cover back on to the gearbox and secure cover with a total of six bolts.

3.1.28. Contractor must re-install aft stairway steps and platform until the input shafts are ready to come back.

3.1.29. After input shafts have new bearings installed and are ready to be re-installed in the gearbox again. Contractor is to re-install all equipment the same as it came out.

3.1.30. Contractor is to renew all gaskets and seals which are owner supplied.

3.1.31. All guards, railing, platforms as well as any disturbed piping, wiring, and metal work are to be replaced in good order upon completion of the above work.

3.1.32. Contractor on completion of other association refit specifications the gearbox turning gear is to be engaged and the gearbox to be turned over to make sure there is no issues prior to floating vessel.

3.1.33. Dock trials: Upon completion of all work, Contractor shall record the bearing temperature for one hour while alongside the dock taking temperature readings throughout the hour. Contractor shall use a hand held digital infra red temperature unit to monitor temperature.

3.1.34. Sea trials: After bearing operation and temperature proves acceptable during the dock trials the vessel shall carry out a two hour sea trial with the Contractor in attendance witnessing the engine / clutch /Gearbox operation through various load conditions up to 100% load. Contractor shall continue to monitor and record the clutch temperature at 15 minute intervals throughout the sea trials.

3.1.35. All work and testing to be carried out to the satisfaction of attending surveyors Lloyds and Chief Engineer.

3.2 Location

3.2.1. Main Engine room

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. 100% visual By Chief Engineer and Lloyd’s Surveyor.

4.1.2. All work shall be completed to the satisfaction of the Chief Engineer and the attending Lloyd's inspector

4.2 Testing

4.2.1. Dock trials: Upon completion of all work, the gearbox bearings shall be tested with the engines running and clutches engaged. Contractor shall record the gearbox input shaft bearing temperatures for one hour while alongside the dock taking temperature readings throughout the hour. Contractor shall use a hand held digital infra red temperature unit to monitor temperature.

4.2.2. Sea trials: After gearbox operation and temperature proves acceptable during the dock trials the vessel shall carry out a two hour sea trial with the Contractor in attendance witnessing the engine / clutch/ Gearbox operation through various load conditions up to 100% load. Contractor shall continue to monitor and record the clutch temperature at 15 minute intervals throughout the sea trials.

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

4.2.4. Contractor shall be responsible for contacting the Lloyd's surveyor when items are ready for the inspections.

4.3 Certification

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

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 The Contractor shall supply the Chief Engineer with two typed copies and one electronic of the Contractors overhaul / work report which shall include all wear measurements, clearances and operational tolerances for comparison, taken during trials.

5.1.2 Contractor shall also include a list of all new parts fitted including their corresponding position / part numbers and quantities.

5.1.3 Contractor to ensure that all piping be marked and tabulated and a copy given to the Chief Engineer prior to dismantling.

5.1.4 Contractor to ensure that all wiring must be marked and tabulated and a copy given to the Chief Engineer prior to dismantling.

5.2 Spares

N/A

5.3 Training
N/A

5.4 Manuals N/A

Spec item #: L-1	**SPECIFICATION**	TCMSB Field #: N/A
L-1 FIRE SYSTEMS		

Part 1: SCOPE:

1.1 National & Marine Fire Services Inc. to continue on going test and upgrades to (1) Test & Certification of 15 FM200 Systems and 1 CO 2 System. (2) Test & Certification Fire Alarm System & all Devices. We are in contact agreement with National & Marine Fire Services Inc. previous to dry-docking. This work to continue while in shipyard.

1.2

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 labour as stated.

Part 3: TECHNICAL DESCRIPTION:

3.1 General

3.1.1. Shipyard, to supply one Electrician for a period of 3 days, 8 regular working hours per day, to assist National & Marine Fire Services Inc. carry out there work stated above.

3.1.2. All work carried out in this specification shall be inspected by the Chief Engineer

3.2 Location

3.2.1. Through out vessel

3.3 Interferences

3.3.1 N/A

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. To the satisfaction of the Chief Engineer.

4.2 Testing
4.2.1.

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