
CCGS Henry Larsen

Annual Drydocking and refit

Canadian Coast Guard
Vessel Support Services
Atlantic Region
PO Box 5667
St. John's, Newfoundland and Labrador
A1C 5X1



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1. SHIP'S PARTICULARS

Length O.A.:	99.80 m
Length B.P.:	93.80 m
Breadth Overall:	19.78 m
Depth Moulded:	8.08
Mean Draft, Extreme:	7.24 m
Displacement, Extreme:	8290 tonnes
Displacement, Docking:	6800 tonnes

2. PREAMBLE

3. INTENT

This specification outlines the work required for the 2018 Docking and annual refit of CCGS Henry Larsen . The period of work is May 7th – July 23rd , 2018.

All work specified herein and all repairs, inspections and renewals are to be carried out to the satisfaction of the Owner's Representative and, where applicable, the attending Transport Canada Ship Safety Surveyor. Unless otherwise specifically stated, the Owner's Representative is the Chief Engineer.

4. 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. The surface preparation, ambient limitations and coating applications shall be as per the manufacturer's instructions and specifications.

5. TESTING AND RECORDS

All test results, calibrations, measurements and readings are to be recorded. All tests are to be witnessed by the Inspection Authority, Technical Authority and where required, Transport Canada Marine Safety. The Contractor is responsible for contacting TC-MS when their presence is required for inspections or testing. The Contractor shall advise the Technical Authority in every case when Marine Safety arrives onsite for inspection of vessel's equipments or structure. The recorded test results, calibrations, measurements and readings from the entire refit specification shall be provided in 3 typewritten binded reports on 8.5" X 11" paper. The binded reports shall be tabbed as per table of contents in the refit specification. The binded reports shall be provided to the Chief Engineer prior to the end of refit.

The Contractor shall also provide reports/measurements/readings per individual specification item within the timeline indicated to the Chief Engineer.

6. WORKMANSHIP

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

7. FACILITIES

Quotation shall include all of the necessary labor and equipment required for the erection of access staging, rigging, lighting, tugs, pilotage, necessary crange and line handling.

8. MATERIALS AND SUBSTITUTIONS

All material shall be supplied by the contractor and all materials shall be new and unused unless otherwise specified. All replacement material in the form of jointing, packing, insulation, small hardware, oils, lubricants, cleaning solvents, preservatives, paints, coatings, etc., 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.

9. REMOVALS

Any items of equipment to be removed and subsequently reinstalled in order to carry out 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.

10. EXPOSURE AND PROTECTION OF EQUIPMENT

The contractor shall provide adequate temporary protection for any equipment or areas affected by this refit. The contractor shall take proper precautions 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. Government furnished equipment and materials shall be received by the contractor and stored in a secure warehouse or storeroom having a controlled environment appropriate to the equipment as per the manufacturer's instructions.

11. LIGHTING AND VENTILATION

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

12. CLEANLINESS

The contractor shall at all times, maintain the work areas in which his 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 in any system or location placed there as a result of this refit. The contractor shall provide adequate temporary protection for any equipment or areas affected by 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 any refit work detailed in this specification.

13. ASBESTOS

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

14. ENTRY INTO ENCLOSED SPACES

The contractor shall abide by the Coast Guard Enclosed Space Entry Policy. The policy is listed in the Coast Guard's Safety Management System, section 7.B.3. Entry certificates shall clearly state the type of work permitted and shall be renewed as required by the regulations. Additional

copies of these certificates shall be posted in conspicuous locations for the information of ship and contractor personnel.

A fire zone shall be established and naked lights shall not be used within this zone until “gas-free” certification has been issued.

The Contractor is to ensure that any work carried out in confined spaces as defined by the Canada Labor Code Part II and complies fully with all provisions of the code.

A number of spaces onboard the vessel are designated as Enclosed Spaces; these spaces are to be entered only under safe and controlled circumstances. The Contractor shall have in place an Enclosed Space Entry Permit system, equal to or better than the procedure contained in the Coast Guard’s Safety Management System, section 7.B.3. Ship’s breathing apparatus and EEBD’s are not to be used except in an emergency.

15. SUSPENSION OF WORK

The Technical Authority reserves the right to suspend work immediately when that work is being performed in contravention of the Coast Guard’s Safety Management System. Work shall be allowed to resume when the Technical Authority, in consultation with the Contractor and PWGSC, is satisfied that the agreed-upon procedures are in place and being adhered to.

16. 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 shall be responsible for maintaining a competent and properly equipped fire watch during and for one full hour after all hotwork. The fire watch 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 shall not be used except in an emergency. The Contractor shall abide by the Coast Guard Hotwork Policy. The policy is listed in the Coast Guard’s Safety Management System, section 7.B.4. The contractor shall be responsible to ensure the contractor’s personnel including any subcontractors shall follow the policy.

17. LOCKOUT AND TAGOUT PROCEDURES

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

- a. electrical currents
- b. hydraulic
- c. pneumatic
- d. gas or stem pressure and vacuum
- e. high temperatures
- f. cryogenic temperatures
- g. radio frequency emissions
- h. potentially reactive chemicals
- i. stored mechanical energy
- j. equipment actuation

2. The contractor, under the supervision of the Chief Engineer and or the Electrical Officer, shall be responsible for the Lockout and Tagout of equipment and systems listed in the specification.
3. The Contractor shall supply and install all locks and tags and shall complete the Lockout Tagout Log sheet provided by the Vessel.
4. The Contractor shall remove all locks and tags and complete the Lockout Tagout Log sheet provided by the Vessel.

18. PAINTING

All new and disturbed steelwork that will not be on the underwater wetted surface of the ship's hull is to be protected with two coats of Contractor supplied primer. Unless otherwise stated in the individual specification item, the primer is to be International Paints, Interplate Zinc Silicate NQA262/NQA026 red. The paint is to be applied as per the manufacturer's instructions on their respective product data sheets. Finish coats are described in individual specification items.

19. WELDING

A. Steel Structures

- i. All welding contractors shall be certified by the CWB to CSA Standard W47.1 Division 1 or 2 for new construction and work packages other than new construction.

B. Aluminum Structures

- i. All welding contractors shall be certified by the CWB to CSA Standard W47.2 Division 1 or 2 for new construction and work packages other than new construction.

C. Welding Procedures

- i. All welding procedure specifications and/or welding procedure data sheets shall be reviewed and approved by CCG prior to use.

D. Welding Personnel

- i. All welding personnel shall be approved by the CWB prior to their commencing any welding work.

E. Limitations Prior to Commencing Welding Work

- i. All Contractors shall submit their welding personnel qualification records and approved welding procedures to the Delegated Representative prior to commencing any welding work.

F. Governing Standards for Welding

- i. For structural steels > 3 mm in thickness, welding shall meet the requirements of CSA Standards W47.1 and W59, except as modified by this Specification.

- ii. For structural aluminum > 3 mm in thickness, welding shall meet the requirements of CSA Standards W47.2 and W59.2, except as modified by this Specification.

G. Inspections

- i. All welds shall be visually examined along 100% of their length for correct size, profile and the presence of visible defects. Unacceptable conditions or defects shall be repaired to the satisfaction of the Delegated Representative.
- ii. Full penetration welds shall be selectively sampled. Radiographic inspection shall be used for full penetration groove welds in butt joints. Ultrasonic inspection shall be used for full penetration groove welds in tee and corner joints.
- iii. Fillet welds shall be selectively sampled by liquid penetrant and/or magnetic particle inspection.

H. Acceptance Criterion

- i. The visual inspection acceptance criterion shall be in accordance with Clauses 5.11 and 6.29.1 of AWS D1.6
- ii. The liquid penetrant inspection acceptance criterion shall be in accordance with Clauses 6.7.6 and 6.29.4 of AWS D1.6.
- iii. The magnetic particle inspection acceptance criterion shall be in accordance with Clauses 6.7.7 and 6.29.2 of AWS D1.6
- iv. The radiographic inspection acceptance criterion shall be in accordance with Clauses 6.9, 6.10 and 6.29.2 of AWS D1.6.
- v. The ultrasonic inspection acceptance criterion shall be in accordance with Clause 6, Part “C” and Clause 6.29.3 of AWS D1.6.

20. SMOKING

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

21. RESTRICTED AREAS

The following areas are out of bounds to shipyard personnel except to perform work as required by the specifications: all cabins, offices, Wheelhouse, Control Room, Engineer’s office, public washrooms, cafeteria, dining room and lounge areas.

22. ELECTRICAL STANDARDS

Any electrical installations or renewals shall be in accordance with the latest editions of the following marine standards:

- A. TP 127E-TC Marine Safety Electrical Standards.
- B. IEEE Standard 45 - Recommended Practice for Electrical Installation on Shipboard

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

23. 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. For example, drawings that have been lettered and dimensioned in a professional manner shall not be updated using freehand. Prints and reproductions that a contractor is required to provide shall be made on one piece of paper.

Sign off and acceptance of jobs will not occur until any and all drawings are updated to the satisfaction of the Owner's representative.

24. TRANSDUCERS

The contractor shall not paint the transducers and all transducers shall be afforded the necessary protection during hull cleaning, blasting, burning, welding and coating operations.

25. OWNER'S REPRESENTATIVE

Throughout this document, there is made reference to the Owner's Representative. For the purpose of this document, the Owner's representative is defined as the Chief Engineer of the Vessel.

26. Regulatory Authority Inspections

The Contractor shall confirm a schedule of inspections with the regulatory authority (TCMS) for all work described in this specification and shall be responsible for calling them when inspections are required and for ensuring the work is credited by the regulatory authority in the Chief Engineer's 'Hull and Machinery Survey Book'.

The contractor shall ensure the Chief Engineer is informed when the regulating authority is onsite such that the Chief Engineer can witness the inspections by the regulating authority. Notwithstanding any errors, omissions, discrepancies, duplication or lack of clarity in these project requirements, it shall be the responsibility of the Contractor to ensure that the execution of the work specified herein is to the satisfaction of the Technical Authority and the Inspection Authority. Inspection of any item by the Technical Authority does not substitute for any required inspection by Transport Canada Marine Safety (TC-MS) or by the Inspection Authority.

27. Waste Oil Products

Disposal of waste oil products shall be carried out by the Contractor, or subcontractor, who has been licensed by provincial authorities for the disposal of petroleum products. Copies of certificates must be produced upon request. This must be in accordance with the Coast Guard Policy for Handling Fuel, Oil, and Waste Oil Products, which is part of the Fleet Safety Manual, section 7.E.1. a copy of which is in the attached safety annex.

28. WHMIS

The contractor shall provide current MSDS sheets for any WHMIS-controlled products used onboard or around the vessel at the start of the work period before the products are used. This includes at the minimum MSDS sheets for any solvents, cleaners, chemicals, coatings and blasting grits to be used. Any neutralizing chemicals or specialized protective equipment required shall be provided by the Contractor at all times these WHMIS-controlled products are onboard the vessel.

29. SAFETY ANNEX

Prior to the pre-refit meeting, the successful contractor is to provide his company Safety Plan pertaining to this contract and addressing the CCG Safety regulations and the Canada Labour Code in place.

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

The contractor shall note that Canadian Coast Guard ships are presently working under the ISM code and each ship has a Fleet Safety Manual onboard. The Fleet Safety Manual will be adhered to when contract work involves CCG personnel and any other Public Service Employee during the contract period. Following are the listings of the applicable work instructions:

FSSM Procedures	Title
1.0	Safety Management System
7.A.10	Vessel Specific - Asbestos Management Plan
7.A.12	Potable Water Quality
7.B.2.	Fall Protection
7.B.3	Entry into Confined spaces
7.B.4	Hotwork
7.B.5	Lockout and Tagout
7.B.6	Electrical Safety – energized Circuits
7.E.1	Handling petroleum Products
7.E.5	Handling, Storage & Disposal of Hazardous Material
7.E.6	Handling and Discharge – Solid Waste
7.E.8	Use of Hydrocarbons
10.A.6	Paint and Other Coatings
10.A.7	Contractor Safety and Security

**** Note*****

1) The contractor shall maintain a log recording all personnel entering confined spaces. The log shall record times of entry, departure and names of all persons involved.

2) The contractor is to ensure that their rescue equipment and breathing apparatus is aboard ship as stated in the contractor’s safety plan.

Specification items

Spec item #: H-01	SPECIFICATION	TCMSB Field # N/A
HD-01 :PRODUCTION CHART AND SUBCONTRACTOR ALLOWANCES		

Part 1: SCOPE:

1.1 The intent of this item is to provide a means for tracking the progress of the refit.

Part 2: REFERENCES:

N/A

Part 3: TECHNICAL DESCRIPTION:

3.1 The successful Contractor shall supply three copies of a detailed bar chart showing the planned work schedule for the ship's refit. This bar chart shall show, for each spec. item, the start date, the manpower loading, the duration and the completion date. The chart is also to highlight any critical paths.

3.2 The production chart shall be updated weekly or for each production meeting to reflect the actual production on the refit and changes to the anticipated completion dates of each individual item.

3.3 The production chart shall clearly indicate the arrival/departure dates of any Subcontractors/Field Service Representatives.

3.4 The production chart shall include the status and production on each 1379 arising.

3.5 Three copies of the production chart shall be given to the Chief Engineer **the day prior** to each Production Meeting. A copy shall be emailed to the Project Authority, mike.chaisson@dfo-mpo.gc.ca the day prior as well.

3.6 A copy of the original bar chart shall be provided via email to the PWGSC contracting Officer and Project Authority before the close of business on the day of the ships arrival at the Contractors premises.

Subcontractors with Allowances

3.7 The Contractor shall provide a weekly update of the hours billed by the subcontractors along with their hourly rates.

3.8 The results shall be tabulated in an excel spreadsheet clearly indicating the Subcontractor, date(s), hours worked and hourly rate for the hours worked.

3.9 The update is to be emailed to, Contracting Officer and Project Authority the day prior to the weekly scheduled Progress Meeting.

Part 4: PROOF OF PERFORMANCE:

N/A

Part 5: DELIVERABLES

5.1 Contractor shall provide a weekly production chart and excel spreadsheet for subcontractor allowances every week on the timelines indicated.

Spec item #: H-02	SPECIFICATION	TCMSB Field # N/A
HD-02 : CONTRACTOR NOTIFICATION AND ACKNOWLEDGEMENT		

1) General Requirements:

2) References: Complete Title, drawing number and revision number.
DFO 5737 Fleet Safety and Security Manual sect 7.A.10 CONTROLLING
ASBESTOS-CONTAINING MATERIAL
CCGS Henry Larsen Asbestos Management Program

3) Government Furnished Equipment.

4) Contractor Furnished Equipment.

5) Regulatory Requirements.

DFO 5737 Fleet Safety and Security Manual sect 7.A.10
Handling and containing asbestos materials
CCGS Henry Larsen Asbestos Management Program

6) Coordination with other Specification Items.

This item will apply to all items in the Specification.

7) Safety Precautions

CGG has identified the presence of various nonfriable asbestos materials in the CCGS Henry Larsen.

An asbestos inventory report showing the locations and amounts of these materials is available for viewing from the Asbestos Coordinator (AC) or their designate.

8) Statement of Work (include detailed location information i.e. frame number, compartment etc.)

The attached **Contractor Notification And Acknowledgement Form** is to be completed and signed by the Contractor and delivered to the Asbestos Coordinator (AC) before any work commences.

The Contractor is responsible to ensure the Contractor's workers and sub-contractors and subcontractor's workers are aware of the presence of various non-friable asbestos materials in the CCGS Henry Larsen and inform the AC before undertaking any work described in the **Contractor Notification and Acknowledgement Form**.

Asbestos Management Program
CCGS Henry Larsen
Appendix J – Contractor Notification

CONTRACTOR NOTIFICATION AND ACKNOWLEDGEMENT FORM

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBRES CAN CAUSE VARIOUS TYPES OF LUNG DISEASE INCLUDING CANCER. SMOKING INCREASES THE RISK OF LUNG CANCER FROM ASBESTOS EXPOSURE.

CCG has identified the presence of various non-friable asbestos materials in the CCGS Henry Larsen. An asbestos inventory report showing the locations and amounts of these materials is available for viewing from the **AC OR THEIR DESIGNATE**.

The Newfoundland Asbestos Regulation 111/98 applies to all maintenance and renovation work that may disturb asbestos materials. Contractors who have received training in asbestos-related precautions shall only undertake the disturbance of asbestos vessel materials. The following activities may disturb friable asbestos materials (All classifications of work). The **AC OR THEIR DESIGNATE** must be notified prior to performing the following:

- Ceiling entry which may disturb asbestos;
- Any other operation that may generate airborne asbestos.

There are also non-friable asbestos materials in the vessels, including gaskets and packings, etc.

As a condition of our contract to provide services and materials, this company will not disturb asbestos-containing materials without prior notification to the **AC OR THEIR DESIGNATE**. This firm and its workers, will follow all procedures specified by CCG and/or the applicable provincial/federal regulation. All asbestos waste will be packaged and disposed of in accordance with Ministry of the Environment requirements.

COMPANY NAME: _____

SIGNATURE: _____ DATE: _____

NAME AND TITLE: _____

Spec item #: H-03	SPECIFICATION	TCMSB Field # N/A
HD-03 : Contractor Basic Familiarization and PJSA		

Part 1: SCOPE:

The Contractor shall ensure that they disclose any pertinent information, agree to follow all applicable laws, and comply with the requirements of the FSSM; and in particular that Contractor’s employees and/or subcontractors engaged in general housekeeping, maintenance and/or repair activities must not commence work until they have received the familiarization contained in Annex B and completed a pre-job safety assessment (PJSA).

Part 2: REFERENCES:

Standards: Fleet Safety and Security Manual sect 10.A.2

Owner Furnished Equipment

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

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The Contractor will arrange with the vessel for a Contractor Basic Safety Familiarization for the Contractor’s supervisory staff to be given by Coast Guard before any work commences. The familiarization will consist of a basic tour of the vessel in locations where the Contractor will be working.
- 3.2 Following the initial Contractor Basic Safety Familiarization it will be the Contractor’s responsibility to provide the Contractor’s workers and any subcontractors and the subcontractors workers with a Contractor Basic Safety Familiarization.
- 3.3 The Contractor will ensure completed copies of all Contractor Basic Safety Familiarization forms are provided to Coast Guard.
- 3.4 The Contractor is to ensure the Contractor’s workers and any subcontractors and the subcontractors workers complete a pre-job safety assessment (PJSA). The Contractor’s or subcontractors own PJSA may be used provided it meets the requirements of the attached PJSA.
- 3.5 The Contractor will ensure completed copies of all PJSA forms are provided to Coast Guard.

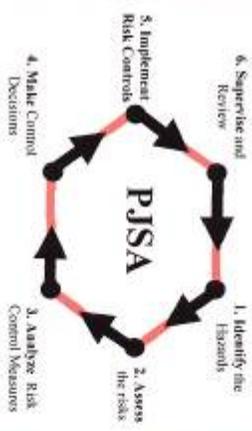
Part 4: PROOF OF PERFORMANCE:

Inspection Coast Guard reserves the right to monitor Contractor compliance.
 All work shall be completed to the satisfaction of the Chief Engineer.

Part 5: DELIVERABLES:

Completed Contractor Basic Safety Familiarization forms.
 Completed Pre Job Safety Assessments (PJSA) forms

10.0 MAINTENANCE OF THE SHIP AND EQUIPMENT	CCG FLEET SAFETY AND SECURITY						
ANNEX "B" FSSM 10.A.2 CONTRACTORS BASIC SAFETY FAMILIARIZATION (This record shall be kept for a period of two years)							
<p>The Commanding Officer or the Competent Person Designated Responsible is to ensure that contractors receive a basic shipboard or shore facilities safety familiarization and should include, but is not limited to, knowledge of the following items:</p> <ul style="list-style-type: none"> a) Fire alarm and conduct to follow in case of fire or other emergency situations, and b) Off limit spaces, and c) Hazards encountered at the worksite (asbestos, fire fighting systems, hazardous material etc. 							
Date Basic Safety Familiarization completed _____ <div style="display: flex; justify-content: space-around; width: 100%;"> mm dd yyyy </div>							
Brief description of contract or work to be completed:							
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> From: _____ <div style="display: flex; justify-content: space-around; width: 100%;"> mm dd yyyy </div> </td> <td style="width: 50%; border: none;"> To: _____ <div style="display: flex; justify-content: space-around; width: 100%;"> mm dd yyyy </div> </td> </tr> <tr> <td style="border: none;"> Name (Print) _____ Contractor Representative </td> <td style="border: none;"> Name (Print) _____ Competent Person, Designated Responsible </td> </tr> <tr> <td style="border: none;"> Signature: _____ Contractor Representative </td> <td style="border: none;"> Signature: _____ Competent Person, Designated Responsible </td> </tr> </table>		From: _____ <div style="display: flex; justify-content: space-around; width: 100%;"> mm dd yyyy </div>	To: _____ <div style="display: flex; justify-content: space-around; width: 100%;"> mm dd yyyy </div>	Name (Print) _____ Contractor Representative	Name (Print) _____ Competent Person, Designated Responsible	Signature: _____ Contractor Representative	Signature: _____ Competent Person, Designated Responsible
From: _____ <div style="display: flex; justify-content: space-around; width: 100%;"> mm dd yyyy </div>	To: _____ <div style="display: flex; justify-content: space-around; width: 100%;"> mm dd yyyy </div>						
Name (Print) _____ Contractor Representative	Name (Print) _____ Competent Person, Designated Responsible						
Signature: _____ Contractor Representative	Signature: _____ Competent Person, Designated Responsible						

PRE-JOB SAFETY ASSESSMENT (PJSA) ANNEX A			
PRE-JOB SAFETY Assessment (PJSA)			
			
<p>Review the following at the work site and ONLY check the items which apply to the task. List all the hazards you have checked on the back of the card. In the third column detail your methods of CONTROL.</p>			
Job Description: _____ Date: _____ Worker/Contractor: _____ Location: _____		Slip/Stair: _____ Immediate Supervisor's Name: _____	Number of workers: _____
Shutdowns/Permits-signed / posted	Respiratory Hazard	Working at Heights Hazards	
Hot Work	Silica / Concrete	Barricades / Tagging and signs	
HVAC	Asbestos	Dangerous openings	
Sprinkler	Mould	Protected from falling items	
Fire Suppression Systems	Fibreglass/insulation	Powered platforms (man lift)	
Electrical	Smoke	Others working above or below	
Water (valves)	Airborne particles- chipping	Fall arrest	
Hydraulic (valves)	Spray Painting	Ladders	
Compressed Gases	MSDS Reviewed	Other:	
Lockout procedure in place	Other	Ergonomics Hazards	
Confined Space	Activity Hazards	Working in tight area	
Asbestos	Sensitive equipment in area	Part of body in line-of-fire	
Other:	Burn / Heat sources	Working above your head	
Environmental Hazards	Energized Equipment in area	Pinch points identified	
Spill potential	Welding / Grinding	Repetitive motion	
Weather Conditions	Electrical cords / tools-condition	Repetitive work in awkward position	
Ventilation Required	Equipment / tools – inspected	Other:	
Heat stress / cold exposure	Housekeeping	Personal Limitations / Hazards	
Other workers in area	Other	Trained to use tool / perform work	
Inadequate lighting	Access / Egress Hazards	Clear instructions	
Noise levels	Partially obstructed	Insufficient number of workers	
Biohazards	Slip / trip potential identified	Physical irritations	

Other:	Other:	Other:
TASKS	HAZARDS	CONTROLS
<p>All waste cleaned up and removed (y/n) _____ All tools/equipment removed (y/n) _____ Task area cleaned at shifts end (y/n) _____</p> <p>All member(s) of the work team MUST BE briefed about the information identified on the PJSA.</p>		
Special Instructions:	Communications	Personal Protective Equipment
	Radio (Type and channel)	Hear protection
	Contact Person (Emergencies)	Safety footwear
	Other	Eye protection (safety glasses, face shields)
	Other	Respirator / SCBA
	Supervisor (print)	Hearing protection
	Supervisor (sign)	High Voltage protective equipment
	Comments:	Gloves
		Tyvek coveralls and shoe covers
		Life jacket
		Welding Apron and face shield
		Cold Weather Face Mask
		Other:

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Spec item #: H-04	SPECIFICATION	TCMSB Field # N/A
HD-04 : PRE-REFIT SAFETY MEETING		

Part 1: SCOPE:

The intent of this specification shall be to have a Pre-Refit Safety Meeting with the Contractor to discuss and agree on the methodology to be used by the Contractor and vessel to meet the requirements of the Canada Labour Code and Canadian Coast Guard Fleet Safety and Security Manual with regard to Safety during the refit period.

Part 2: REFERENCES:

Standards

Canada Labour Code

Canadian Coast Guard Fleet Safety and Security Manual

Owner Furnished Equipment

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

Part 3: TECHNICAL DESCRIPTION:

- 3.1** Prior to the pre-refit meeting, the successful contractor is to provide his company Safety Plan pertaining to this contract and addressing the CCG Safety regulations and the Canada Labour Code in place.
- 3.2** The contractor shall comply with the work requirements as outlined in the Canada Labour Code and applicable provincial regulations.
- 3.3** The contractor shall note that Canadian Coast Guard ships are presently working under the ISM code and each ship has a Fleet Safety Manual onboard. The Fleet Safety Manual will be adhered to when contract work involves CCG personnel and any other Public Service Employee during the contract period. Following are the listings of the applicable work instructions:

FSSM Procedures	Title
1.0	Safety Management System
7.A.10	Vessel Specific - Asbestos Management Plan
7.A.12	Potable Water Quality
7.B.2.	Fall Protection
7.B.3	Entry into Confined spaces
7.B.4	Hotwork
7.B.5	Lockout and Tagout
7.B.6	Electrical Safety – energized Circuits
7.E.1	Handling petroleum Products
7.E.5	Handling, Storage & Disposal of Hazardous Material
7.E.6	Handling and Discharge – Solid Waste
7.E.8	Use of Hydrocarbons
10.A.6	Paint and Other Coatings
10.A.7	Contractor Safety and Security

3.4 Prior to any work beginning the Contractor’s Safety person and Coast Guard Safety Person representatives including Coast Guard Loss Prevention, the technical authority, Commanding Officer will meet to agree on how the requirements will be met and how the paperwork will be handled.

3.5 This will include but may not be limited to the items listed above.

3.6 All work is to be to the satisfaction of the Chief Engineer.

Part 4: PROOF OF PERFORMANCE:

Inspection

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

Part 5: DELIVERABLES:

Completed Safety Management Systems forms delivered to Chief Engineer.

Spec item #: H-05	SPECIFICATION	TCMSB Field # N/A
HD-05 : SERVICES		

The following services are to be supplied and connected to the vessel in drydock and afloat during 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 crantage/scaffolding required for connection/disconnection. The Contractor will be responsible for any additional connections required as a result of the ship being shifted between berths and to the drydock. Global and daily rates are to be quoted.

The bid price is to be broken down by item.

- .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.
 - i. 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.
 - ii. The contractor is to note that once the refit starts the vessel cannot move or turn around under her own power.

- .2 Gangways: Labour and services to be supplied to rig and supply on board two (2) gangways while in drydock, complete with safety nets and handrails. While alongside, one (1) gangway is required. Gangways are to be maintained safe and structurally suitable for the passage of ship's crew and workmen as per MOSH Regulations, Section 2.

- i. Gangways to be well lighted at night.
 - ii. The gangways are to be at opposite ends of the vessel as directed by the Commanding Officer.

- .3 Potable Fresh Water: Potable water shall be supplied through a fresh water filling line with a pressure reducing valve and pressure gauge at the ship's fresh water filling connection located on the Upper Deck, frame 29, port or stbd side.
 - i. Approximately eight cubic meters of fresh water per day shall be provided.
 - ii. Contractor to supply any fresh water used for cleaning, testing or flushing of tanks as required by the specification in addition.
 - iii. The contractor is to provide test results from within the past month indicating that the water meets provincial drinking water standards before the connection is made to the vessel.

- .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, using two (2) hoses. The hoses shall be connected to the ship's international shore connection located on the Upper Deck, frame 100 (port and starboard side).
 - i. A pressure reducing valve with pressure gauge shall be fitted before the shore connection valve on board the ship.
 - ii. Water flow shall be sufficient such that fully opening any 2 fire station hoses on the ship will result in no noticeable reduction in flow.

- .5 Cooling Water Connections: While the ship is in drydock, the Contractor is to connect and fit three (3) 38mm (1½") dia. cooling water connection hoses, to the Central Cooling

System. One supply hose to be connected to the 1-1/2" SW connection located at the P&S Fuelling Stations, Upper Deck. Another supply hose is to be run between the 1-1/2"-3-way changeover valve located on the Portside AG1 Room (labeled Drydock Central Cooling Supply) and the 2-1/2" inlet valve located in way of AG1 Stbd, side. An outlet hose is to be run from the Central Cooling plate coolers outlet piping to overboard in the most convenient location.

- i. Pressure to be supplied through a pressure reducing valve with gauge at 350 kPa (50 psi).
 - ii. Hoses to be removed ashore upon completion of drydocking.

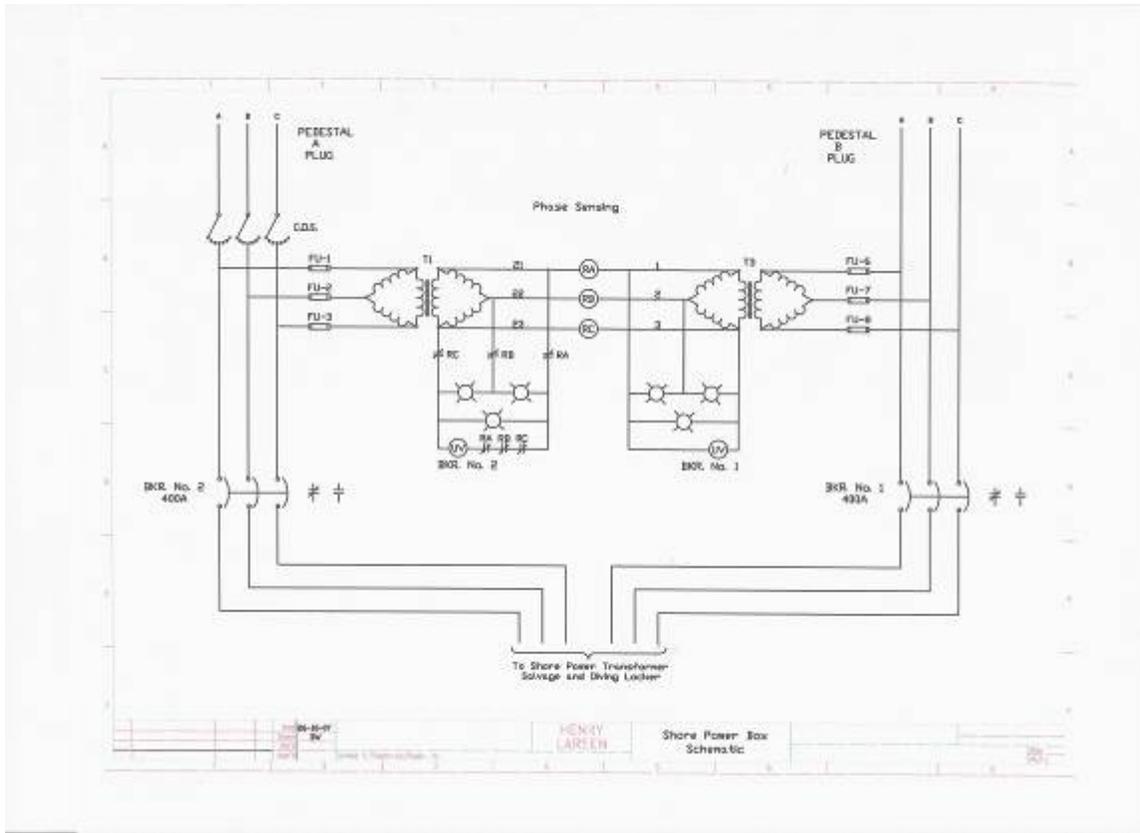
- .6 Sewage Connection: a 100mm diameter sewage overboard discharge, located at frame 85 starboard side, requires to have a connection pipe welded to the shell with hose attached on free end to lead sewage away from the ship's side to Contractor's sewage outlet.

- .7 Oily Bilge Water: Contractor to quote on removing from ship's bilges approximately twenty cubic meters of oil/water mixture. Quote unit cost for each additional cubic meter. For estimation purposes, quote as 25% oil, and 75% water.
 - i. 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 the Contractor's requirements for completion of items in this specification.
 - ii. Contractor to provide identity of firm(s) licensed for pumping and disposal of waste oil.

- .8 Electrical Shore Power: Shore power facilities to be supplied to ship through two parallel fed 600 VAC, 60 hz., 3 ph., 400 ampere cables fed from a single minimum 800 amp source. Contractor supplied cables and fittings are to be used. Cables to be spliced

into two (2) owner supplied female shore power plugs and insulated. Cables and connections are to be Megger tested prior to hook up. Plugs to be connected to two (2) male plugs at the shore power connection box on the aft end of the Upper Deck.

- i. Contractor to quote for supplying 8,000 KW hours per day times (X) the number of days scheduled for refit. Contractor to quote KWH unit rate for adjustment purposes.
- ii. Upon completion of refit and removal of shore power, the plugs are to be disconnected from cables and turned over to the ship's Electrical Officer.
- iii. Pigtails on plugs are not to be cut when disconnecting from shore power cables.
- iv. 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.
- v. Contractor is advised that the ship requires shore power from the starting date to the completion date of the contract. The power quoted is for the vessel's own use.
- vi. The contractor is to provide prior to the closing of bids, written proof of capability of providing shore power requirements as stated in the specification for the duration of the drydock period.
- vii. NOTE: If Contractor is supplying power to the ship by means of a diesel generator set on the dock, contractor is responsible for any watchkeeping personnel or fuel for the generator unit.



.9 Garbage Removal: Garbage containers of 215 cu. ft. (6 m³) minimum capacity shall be provided and used. Contractor to remove garbage from work areas on the ship on a daily basis. This includes all sludge and scale from tank cleaning. The Contractor is responsible for provision of suitable containers and any costs associated with waste disposal regulations that may be in place. This will include hazardous materials. The Contractor is to advise of any such provincial or federal regulations or practices at the Pre-Refit Meeting.

- i. Cost of crange 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.

.10 Telephones: Four (4) independent and private telephone lines are to be supplied. Cost of connection, service and removal to be included in bid price. The telephone connections shall be supplied to the ship and connected at the Quartermaster Stations located at the Upper Deck, frame 137, port & starboard side. Telephone connections to be installed as follows:

- i. One connection to ship's telephone exchange;
- ii. One connection to Commanding Officer's telephone;
- iii. One connection to the Chief Engineer's telephone.
- iv. One connection to the Logistics Officer's telephone.
- v. All telephones to be active 24 hours a day for the duration of the contract. Lines are to have long distance dialing capabilities, the costs of which will be dealt with upon proof of separate invoice.
- vi. Should landlines not be available, the Contractor is to provide sufficient cellular phones in lieu.

- vii. The Contractor shall be responsible for giving notice for connection/disconnection times to Telephone Company as required for any ship movements during the drydocking period.
- viii. Contractor to supply listing of shipyard telephone numbers, fire, police and emergency telephone numbers to Chief Engineer when vessel arrives in Contractor's yard.

- ix. Long distance charges to be billed directly to:
 - Canadian Coast Guard
 - P.O. Box 5667
 - St. John,s, NF
 - A1C 5X1
 - Attn: CCGS HENRY LARSEN

.11 Deck Protection: Alleyways throughout the ship including the Wheelhouse and all stairways shall be covered with (3mm) masonite panels or a suitable alternative (Flame Retardant Magafilm 15LS-FR, or equal. Contact: Milrail Inc., 1812 Gagnon, Lachine, Quebec, H8T 3M6, Tel. (514)633-8710).

- i. All edges and joints are to be securely taped down. Any deck coverings damaged during the course of the refit are to be replaced.

- ii. Areas to be covered:
 - 1. Main Deck: starting at frame 30 up to frame 165, both sides including all cross alleyways and cabin entranceways, excluding Galley, Crew's Cafeteria and Pantry area. Total area = 200 sq. m. (2150 sq. ft.).

2. Upper Deck: starting at frame 121 up to frame 139, both sides and including all cross alleyways and Engineer's Office. Total area = 117 sq. m. (1264 sq. ft.).
 3. Boat Deck: starting at frame 121 to frame 139, both sides and cross alleyways. Total area = 31 sq. m. (336 sq. ft.).
 4. Officers' Deck: starting at frame 121 up to frame 139 both sides and cross alleyway. Total area = 28 sq. m. (305 sq. ft.).
 5. Navigation Bridge Deck: Starting at frame 113 to frame 149 including complete carpeted area of Wheelhouse and passageway to Special Navigation Room. Total area = 100 sq. m. (1100 sq. ft.).
 6. Stairways: Total area = 40 sq. m. (430 sq. ft.).
 7. Cabins: Contractor to quote on covering the decks in six cabins: Commanding Officer, Chief Engineer, Senior Engineer, Senior Electrician, Chief Officer and Spare Cabin. Total area for cabins = 35 sq. m.
- iii. Contractor to quote a unit price per square meter for adjustment purposes.
- iv. All deck coverings are to be removed from the ship and taken ashore on completion of work. Contractor to ensure all tape marks on deck caused by securing protective coverings to deck are cleaned from all decks and stairs.
- .12 Cranage: Crane and operator usage for vessel's purpose; quote for 50 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 1379 action

.13 Television: One cable television connection to the ship's internal system to be connected as directed by the ship's Electrical Officer. Cost of connection, service and removal to be included in quote. In the event that cable television is not available, the contractor is to provide a home satellite television system, complete with service costs, for the duration of time cable television is unavailable.

Spec item #: H-06	SPECIFICATION	TCMSB Field # N/A
HD-06 : SEA TRIALS		

Part 1: SCOPE:

The intent of this item is to provide for a test of worked on equipment under operational conditions.

Part 2: REFERENCES:

Specification items

Part 3: TECHNICAL DESCRIPTION:

- 3.1 On completion of all specification items, sea trials will be carried out as a functional test of the ship's propulsion and other systems.
- 3.2 PWGSC Acceptance form 1205 will indicate any deficiencies found during the sea trials. Final payment will not be completed until the deficiencies are addressed.

Part 4: PROOF OF PERFORMANCE:

- 4.1 Sea trials will last a minimum of four (4) hours.
- 4.2 Trials will contain ahead and astern movements at various power levels.
- 4.3 Trials will be carried out to the satisfaction of the Chief Engineer. Acceptance will not be signed off by CCG until these trials are successfully completed.
- 4.4 The Contractor is to have sufficient supervisory staff on board, during these trials to witness the operation of machinery which he has worked on during this refit.

Part 5: DELIVERABLES

- 5.1 The Contractor shall provide a report of the readings and findings during the seal trial period.

Spec item #: H-07	SPECIFICATION	TCMSB Field # N/A
HD-07 : DRYDOCKING		

Part 1: SCOPE:

1.1 The intent of this specification is for the contractor to provide all required services to dock and undock the vessel including all tugs, and handling of ships lines.

Part 2: REFERENCES:

2.1 Docking Plan 13-0078-01

2.2 Vessel Particulars:

Length O.A.	99.80 m
Length B.P.	93.80 m
Breadth Overall	19.78 m
Depth Moulded	8.08 m
Mean Draft, Extreme	7.24 m
Displacement, Extreme	8290 tonnes
Displacement, Docking	6200 tonnes

Part 3: TECHNICAL DESCRIPTION:

3.1 A docking and a blocking plan are available on board the vessel, and can be made available prior to the vessel docking. Contractor will be responsible to ensure drawing is returned to vessel upon completion of work.

3.2 Drydocking is to take place immediately upon the ship arriving at the shipyard to commence refit.

3.3 Contractor to prepare blocks and necessary shoring to maintain true alignment of the vessel's hull and machinery throughout the drydocking period. Contractor to dock and undock vessel and allow sufficient laydays to perform both the work described in this specification with reasonable time allowance to deal with any work arisings. Contractor is to quote total number of laydays and unit cost per layday.

- 3.4** 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' (1.22 m) 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.
- 3.5** 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 Master. The Contractor is to include in his bid, tug and/or pilotage, and ice clearing services as required. All costs for line handling and Qualified Docking Master are the responsibility of the contractor.
- 3.6** The Contractor must provide a ground cable between the vessel and the dock while the vessel is docked as per TCMS Ship Safety Bulletin 6/89.
- 3.7** The Contractor shall supply the services of a diver to confirm that the vessel is settling evenly on the bilge and keel blocks.
- 3.8** Within four hours of docking, the underwater hull up to the Main Deck level (8.08m above keel) including rudder and rudder trunk are to be cleaned by Hydro-blast (high pressure water blast, 5000 psi minimum) to remove all marine growth, loose material and salt deposition.
- 3.9** Prior to commencing hydro blasting, all hull mounted equipment and openings are to be fully protected.
- 3.10** Prior to docking, all tanks on vessel to be sounded and contents recorded. Copy to be signed by the ship's Commanding Officer, the Chief Engineer and Contractor's Docking Master.
- 3.11** On docking, all tanks emptied to be listed, and copies held by Contractor and Chief Engineer.
- 3.12** 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 Commanding Officer and the Chief Engineer.
- 3.10** During undocking, the Contractor is to have sufficient personnel in attendance to standby any sea connections, stern tubes, seachests, etc. that were opened up during the drydocking period to correct any deficiencies that may arise.
- 3.13** The Contractor is not to remove or transfer any tank contents without first discussing same with the Chief Engineer. At least four hours notice is to be given.

Part 4: PROOF OF PERFORMANCE:

- 4.1** All work to be completed to the satisfaction of the Chief Engineer and attending TC/MS Inspector.

Part 5: DELIVERABLES:

- 5.1

Spec item #: H-08	SPECIFICATION	TCMSB Field # N/A
HD-08 : DOCKING PLUGS		

Part 1: SCOPE:

1.1 The intent of this specification is to remove and replace various docking plugs while the vessel is on drydock.

Part 2: REFERENCES:

2.1 Docking Plan 13-0078-01

Part 3: TECHNICAL DESCRIPTION:

3.1 Contractor shall remove the following docking plugs to drain water accumulation. All docking plugs removed shall be tagged immediately after removal, stored in a suitable container and given to the Chief Officer. A ship's Officer is to be present when docking plugs are removed and reinstalled. Location of plugs are shown on docking plan:

- a) Discharge Sea Bay (Fr. 84, centerline);
- b) Suction Sea Bay (Fr. 87, centerline);
- c) Fore Peak Tk. (Fr. 185);
- d) Aft Peak Tk (Fr G)
- e) Aft. Heeling Tk. (Fr. 90, port and starboard);
- f) Fwd. Stability Tk (Fr.140 P & S)
- g) Aft Stability Tank (Fr.127 P & S)
- h) Fwd Heeling Tk. Fr. 109 centerline)
- i) Fwd. Trim (Fr. 176)
- j) Aft Trim Tank (Fr. 16)

3.2 Note: Docking plugs for water ballast and void tanks are 25mm (1") square recessed. Docking plugs for fuel oil/lube oil tanks are 19mm (3/4") square recessed.

3.3 After tanks have been drained, and at the direction of the Chief Engineer, all docking plugs are to be installed using new sealing thread and white lead. Tap to be run over threads in hole. Docking plug threads to be cleaned on a lathe if required. Contractor to quote on thread cleaning 6 docking plugs in lathe. No docking plugs are to be removed from water ballast tanks until tanks have been pumped as low as possible by ship's personnel.

3.4 Any docking plugs removed will require openings to be temporarily filled with wood plugs during operations such as sandblasting, painting, etc. which could cause contamination of tanks to occur.

- 3.5** All docking plugs removed are to be reinstalled before undocking using new seals. Once plugs are reinstalled plugs are to be vacuum tested to ensure a proper seal. All vacuum testing to be witnessed and verified by the Chief Engineer.

Part 4: PROOF OF PERFORMANCE:

- 4.1** All work to be completed to the satisfaction of the Chief Engineer.
- 4.2** Docking plugs shall be verified in place by Chief Engineer prior to the vessel being floated.

Part 5: DELIVERABLES:

- 5.1 N/A

Spec item #: H-09	SPECIFICATION	TCMSB Field # N/A
HD-09 : HULL BUTTS AND SEAMS		

Part 1: SCOPE:

- 1.1 The Hull plate welding butts and seams to be repaired will be determined at the time of the hull survey by the TCMS representative and the Chief Engineer.

Part 2: REFERENCES:

- 2.1 Shell Expansion Drawing 12-0016-01
- 2.2 Shell Expansion Drawing 12-0016-02
- 2.3 Specification item to be completed in conjunction with Hull coating specification.
- 2.4 Welding shall be in accordance with the Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.5 The Contractor shall be currently certified by the Canadian Welding Bureau (CWB) in accordance with CWB 47.1 latest revision Division I, II or III at the time of bid closing.
- 2.6 The Contractor shall provide a current letter of validation from the CWB indicating compliance with standard CSA W47.1, Division I, II or III. (latest revision)
- 2.7 The Contractor may be required to provide approved procedure data sheets for each type of joint and welding position that will be involved in this refit.
- 2.8 The Contractor may be required to supply a current Welders Certification for each individual welder that will be involved in this refit.

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The Contractor is to be responsible for all inspections and is to consult with TCMS, prior to commencement of work, to determine an inspection schedule; at each inspection point, the Contractor is to advise the Owner’s representative, in advance, to allow his/her attendance.
- 3.2 After the contractor has pressure washed the hull the Chief Engineer, TCMS inspector and a contractor representative shall inspect the hull butts and seams. All seams and butts selected for repair are to be marked.
- 3.3 Seams and butts selected for repair are to be marked, cleaned to sound metal by air arc or grinding and brought up to original level by approved welding techniques and materials

- 3.4 The Contractor is to bid on 1000 linear feet of gouging and 1000 feet of grinding and a unit cost for each. Amount of gouging and grinding will be adjusted by 1379 action.
- 3.5 Contractor to use suitable welding rods and welding procedure for Grade EH-36 steel. Contractor to bid on 5000 bead feet of weld. Contractor to provide a rate per bead foot of welding for adjustment purposes.
- 3.6 Butts and seams falling in way of any fuel tanks will require fuel tank to be gas freed and certified safe for hot work. If required this will be addressed by PWGSC 1379 action.
- 3.7 Butts and seams falling in ballast/void tanks that are painted will require interior paint work to be touched up in way of damage. This will be addressed by PWGSC 1379 action.
- 3.8 Following any seam repairs the surface profile must be prepared for hull coating as per The Hull coating specification item.
- 3.9 The Contractor is to include the cost of 5 non-destructive tests on the new welds; these tests will be as directed by the attending TCMS Surveyor. The Contractor shall provide a unit cost for each additional x-ray and the cost shall include travel expenses for the NDT testing company.

Part 4: PROOF OF PERFORMANCE:

- 4.1 All work to be completed to the satisfaction of the Chief Engineer and attending TC/MS Inspector.

Part 5: DELIVERABLES:

- 5.1 N/A

Spec item #: H-10	SPECIFICATION	TCMSB Field # N/A
HD-10 : HULL COATING		

1 SCOPE:

- 1.1 The intent of this specification is to repair and coat the vessel's underwater and above water hull.
- 1.2 This item is to be completed in conjunction with the following: Drydocking

Part 2: REFERENCES:

2.1

Drawing Number	Description	Electronic Number
13-0072-01	General Arrangement Profile	
12-0016-02	Shell Expansion (Fore)	
12-0016-01	Shell Expansion (Aft)	

Part 3: TECHNICAL DESCRIPTION:

- 3.1 Within four hours of docking, the underwater hull up to the Main Deck level (8.08m above keel) including rudder and rudder trunk are to be cleaned by Hydro-blast (high pressure water blast, 5000 psi minimum) to remove all marine growth, loose material and salt deposition.
- 3.2 Prior to commencing hydro blasting, all hull mounted equipment and openings are to be fully protected.
- 3.3 All staging, crantage, screens, heaters and other environmental control equipment, lighting and any other support services, equipment and material necessary to perform the tasks set out in this specification shall be supplied by the Contractor.
- 3.4 Contractor shall include hoarding in the vessel to carry out the paint application as per Manufacturer guidelines. The contractor will include any necessary heating to ensure the coating manufacturers recommended ambient conditions and surface conditions are achieved during coating and cure times.
- 3.5 Suitable storage facilities for the materials and equipment shall be provided close to the work site. These facilities shall be maintained at a temperature recommended by the paint manufacturer as necessary to ensure ease of preparation and application of the paint.

- 3.6** The area to be dealt with is 2700 m². After completion of cleaning the underwater area is to be inspected for loose paint and bare areas.
- 3.7** The above water hull from the waterline to the top of the bulwarks, 1120m² is to be cleaned by high pressure wash to remove all loose rust and peeling coatings.
- 3.8** After completion of Hydro-blast entire hull area is to be inspected by the Chief Engineer, NACE Inspector and the attending TC Marine Safety Inspector.
- 3.9** Entire hull area as referenced in 3.6 is to be abrasive grit blasted using screened slag to SSPC-SP-7 standard (Brush Off Blast) to remove all loose material and to provide necessary surface profile to allow for proper bonding of new coating to existing material.
- 3.10** After completion of sweep blast, areas of bare steel shall be abrasive grit blasted to SSPC-SP-10 (Near White) standard. Contractor is to bid upon 810 m² for blasting bare steel to SSPC-SP-10. If oxidation occurs between blasting and application of the coating, the surface must be re-blasted to the specified surface preparation standard. Edges of intact hull coating bordering on bare areas are to be feathered back to a minimum of 15 cm. Surface profile is to have a minimum roughness of 3 mils.
- 3.11** Contractor is to quote a unit cost per square meter for blasting bare steel to near white metal condition for adjustment purposes.
- 3.12** The Contractor shall ensure that no damage, unnecessary cleaning or repairs, result from abrasive blasting and/or the application of coatings. Grit used for blast cleaning shall not be permitted to enter into any part of the vessel. The Contractor is to ensure that each and every opening into the vessel where sand or grit may gain ingress and cause damage shall be suitably protected, including the following:
- a) stern tubes;
 - b) sea bays, sea chests;
 - c) all overboard discharge valves;
 - d) 3 main engine air intake plenums;
 - e) engine room supply & exhaust fans;
 - f) tank vents (note - caution to be used on any tanks that are being cleaned and vented during this time);
 - g) rudder gland in rudder trunk void.
- 3.13** Measures shall also be taken to ensure that application of coatings does not take place to surfaces or equipment other than those areas specified, and that any inlets or discharges in the shell shall not be blocked by the coating. All deck machinery shall be protected against grit, dust and coatings where necessary.
- 3.14** The Contractor shall plug deck scuppers and discharges or take any measures necessary to prevent water or other liquids from contaminating the areas of plating being coated or prepared for coating.

- 3.15** The following are to be suitably protected against damage during cleaning of the hull, abrasive blasting and application of new coatings. The Contractor will be responsible for repair/replacement of any damaged items at the Contractor's expense to the satisfaction of the Owner's Representative.
- 3.16** All hull mounted equipment including:
- a) anodes (4),
 - b) reference electrodes (2),
 - c) echo sounders (2),
 - d) speed log (1),
- 3.17** The area around the four impressed current anodes, (approx. 3 metre diameter each) is to be blasted to the required Sa 2-1/2. These areas then shall have a stripe coat of Inerta 160 or equivalent applied of 300 microns dft to fair the hull to as near as practicable to the face of the anode. This area is then to be covered as per the rest of the hull as detailed in the specification.
- 3.18** Contractor to renew missing fairing compound in way of port and starboard echo sounder transducer mounts. (Fr. 132, port and starboard) before start of hull painting. Fairing compound to be compatible with existing compound and refinished surface to be made as smooth as possible to minimize surface irregularities. Fairing compound to be completely cured before being painted.

Coating Application – Underwater Hull Area

- 3.19** All bare areas of steel between the keel and the deep load water line are to be coated with one coat of Intershield 163 Inerta 160 Black, 20 mils DFT.
- 3.20** Similarly all bare areas in the bow area, between the deep load water line at frame 170 to the upper edge of the anchor pocket and around the stem to the same position on the opposite side, are to be coated with one coat of Intershield 163 Inerta 160 Red at 20 mils DFT Minimum.
- 3.21** Contractor to bid on touching up 810m² (30%) of bare hull. Contractor is to provide a unit cost per square meter for applying one touch up coat of Intershield 163 Inerta 160 at 20 mils DFT minimum.
- 3.22** After application of touch up to bare areas, the entire underwater hull areas referenced in 3.21 is to be coated with one full coat of Intershield 163 Inerta 160 Black to achieve 10 mils DFT minimum.
- 3.23** Upon completion of underwater hull full coat, the Contractor is to apply a full coat of Intershield 163 Inerta 160 Red from 30cm below the waterline to 70 cm above the waterline to achieve a DFT of 10 mils minimum. Contractor is to apply coating to fair straight line above and below the waterline along the hull's waterline.

3.24 Similarly, the stem area as detailed in Section 3.22, the Contractor is to apply a full coat of Intershield 163 Inerta 160 Red to achieve a DFT of 10 mils minimum.

Coating Application Above the Waterline

3.25 The contractor is to bid on preparing the area to be repaired to a minimum SSPC-SP-10 by abrasive cleaning. Feather or chip back surrounding area to a sound edge. Ensure that the area is clean and dry prior to application of Interprime 198. Overlap the primer onto existing coatings by approximately 2-3cm.

3.26 For bidding purposes quote on 10% of area from the load waterline to the top of the bulwarks, (112 m²). Contractor is to quote on applying two coats of contractor supplied primer to the bare areas. The first coat is to be Interprime CPA 098 Grey, the second being Interprime 099 Red.

3.27 A further two coats of Intersheen 579 Acrylic Topcoat (CG Hull Red) is to be applied, the first to coat the primed 112 m² and the second to coat the total area from the load waterline to the top of the bulwarks. Total area 1120 m².

3.28 In addition the contractor is to apply one coat of Intersheen White 579 top coat to the following hull markings:

- .1 Ship's name P&S, Bow & Stern
- .2 Draft and Load lines, P&S
- .3 Thruster and Propeller Symbols, P&S
- .4 Government Identification Logos, P&S (to use ship supplied stencils)

Note: The contractor is to clean and re-crete the vessel's stencils upon completion of the work. Loss or damage too stencils are solely the responsibility of the Contractor to immediately replace.

3.29 The Contractor shall remove from the vessel all traces of sand and/or grit used for blast cleaning. He shall be responsible for ensuring that the hull is clear and clean, prior to, during and immediately after the application of the coating

Part 4: PROOF OF PERFORMANCE:

4.1 Coast Guard will be retaining the services of an independent consultant to verify that the surface preparation, coating storage, coating preparation and application are as per this specification and the manufacturer's instruction.

4.2 Payment for the consultant will be directly by Coast Guard outside of this contract.

- 4.3** The Contractor will provide the services of a manlift for inspections for CCG personnel (including CCG Nace inspector) for 10 hours with a per hour cost to be used for adjustment purposes. The Contractor will supply man lift operator and contractor supplied safety harness for the NACE inspector and CCG personnel.
- 4.4** The Contractor is to allow safe and ready access to the consultant to all areas of work under this specification including storage, and mixing areas as the consultant deems necessary for the purpose of verifying that the surface preparation and coating storage, preparation, and application are as per the specification.
- 4.5** NACE Inspector will be required to inspect the all components for surface preparation and for each of the applications of the coating system including environmental conditions, equipment, mixing and application processes. It is the contractors responsibility to arrange for the NACE inspector to be present at the required times to inspect the preparation and applications. Coating at each stage will also be to the satisfaction of the chief engineer or designate.
- 4.6** After completion of cleaning the underwater area is to be inspected for loose paint and bare areas.
- 4.7** After completion of sweep blast and prior to blasting of bare metal areas, Contractor Representative, Chief Engineer or his delegate and NACE Inspector will inspect the vessel's hull to determine actual bare areas of the hull for appropriate adjustment of the bid price. All work to be to the satisfaction of the Chief Engineer.

Spec item #: H-11	SPECIFICATION	TCMSB Field # 3L002 & 3HH010
HD-11 : RUDDER STOCK, RUDDER & RUDDER TRUNK SURVEY		

Part 1: SCOPE:

1.1 The intent of this item is to survey the rudder and rudder stock for TCMS credit and survey the rudder trunk for TCMS credit..

Part 2: REFERENCES:

Drawing Number	Description	Electronic Number
15-0615-03	Rudder and stern frame	
15-0615-04	Rudder stock	
15-0205-06	Rudder Casting	

- Rudder Trunk TCMS Field No 3L002
- Steering Gear Components No 3HH010
- Rudder Casting Weight 8397 KG
- Trailing End Casting Bar Weight 370 KG
- Rudder Stock Forging Weight 8340 KG

Rudder Stock Head is fastened using a hydraulic pilgrim nut
 Rudder Pintles are fitted using hydraulic pilgrim nuts.

Part 3: TECHNICAL DESCRIPTION:

- 3.1 Contractor is responsible for all ancillary services necessary to complete the specification item. This includes, but is not limited to, strip out, crantage, staging , cleaning, debris removal and disposal, etc.
- 3.2 With the ship’s Electrical Officer the contractor is to ensure the Lockout/Tagout is in place. The contractor is to supply his/her own locks and tags but complete the vessel’s Lockout/Tagout procedure.
- 3.3 The rudder vent and drain plugs (25mm/1" square head) to be removed and any accumulated water drained. Plugs to be re-installed in good order using new thread sealant and white lead. Rudder must be turned off the centerline to remove plugs.
- 3.4 Upper and lower fairwater plates are to be removed and lowered to the dock. Upper fairwater plate is in 2 halves and welded to the casting. The 2 halves are bolted together on the vertical seam. Welds are to be air-gouged off. Landing faces on plates and rudder

casting are to be dressed. Vertical seam bolt holes to be taped and new countersunk stainless steel screws, 3/4" dia x 1 7/8" long to be used for reassembly.

- 3.5** NOTE: When removing and installing fairwater plates, Contractor to take extreme care not to damage or burn Thordon bearing pads bolted to stern frame at each pintle location.
- 3.6** Pintles and gudgeons to be high pressure water-washed to remove accumulated marine growth.
- 3.7** The following measurements to be taken with 3 typewritten copies to Chief Engineer before disassembly.
- a) Clearance of Thordon Pads at back of pintle bosses (total of three).
 - b) Clearance of the three pintle bushes taken at four positions at 90 degree intervals.
 - c) Rudder stock liner clearance in four positions at 90 degree intervals with first position at the forward side of liner.
 - d) Clearance between rudderstock and carrier bearing in four positions at 90 degree intervals.
- 3.8** Pilgrim nuts to be removed from pintles and pintles removed from the stern frame. Note that a removal tool for use with the top pintle is available on the ship. The rudder and stock are to be removed to the dock bottom.
- 3.9** Rudder angle transmitters located in steering flat (two in number) to be removed
- 3.10** Note: The steering gear tiller shall be removed. To prepare for this, solid support must be placed under the rudder to support the rudder stock and tiller. Order of work is to first remove the tiller, then sling the stock and lower rudder and stock to the dock floor.
- 3.11** It is necessary to solidly support the weight of the rudder and stock assembly while working the steering gear tiller.
- 3.12** Pilgrim nut on steering gear tiller is to be removed and set aside. Note working pressure for removal of pilgrim nut is 1450 kg/cm². This pressure is not to be exceeded.
- 3.13** Sling the weight of the rudderstock to the dock bottom.
- 3.14** Rudderstock to be checked for true and defects. Condition of liner to be noted and liner cleaned and polished.
- 3.15** Carrier bearing to be opened out. Rudderstock gland neck bush to be removed and packing removed. Packing is 25mm square, five turns, on a rudderstock liner 545 mm in diameter. Carrier bearing grease lines to be purged and proven clear in the presence of a Ship's Officer. Condition of carrier bearing to be noted.

- 3.16** Upon completion of the above, rudder and stock to be replaced in ship and all removed parts reassembled in good order, using new contractor supplied packing in rudder stock gland.
- 3.17** The following measurements to be taken with a Senior Ship's Officer in attendance, with 3 typewritten copies to Chief Engineer, after completion of work.
- a) Clearance of shim at middle pintle, taken at four positions at 90 degree intervals.
 - b) Clearance at bottom pintle.
 - c) Clearance of Thordon Pads at back of pintle bosses (total of three).
 - d) Clearance of the three pintle bushes.
 - e) Rudder stock liner clearance in four positions at 90 degree intervals with first position at the forward side of liner.
- 3.18** Fairwater plates are to be re-welded using E8018-C1 electrodes. Ensure preheat and interpass temperatures in the range of 140°C to 204°C are maintained during welding operations in way of the shaft bracket castings. Contractor to use 12mm intermittent fillet welds 600mm long spaced 300mm from the start of a new weld length.
- 3.19** All rudder and rudder trunk surface areas to be painted as per Specification HD-10 Hull Coatings
- 3.20** Contractor to remove any existing zinc anodes from the rudder. Contractor to supply and install 10 EFL Z-26 anodes on the rudder.
- 3.21** Operation and function of the steering gear and rudder to be verified through operation of the equipment. This will be done by Ship's Officers, with the Contractor and the Technical Inspector in attendance. Following operations and verifications, the Contractor will make any adjustments required in order to establish correct operation of the steering gear.
- 3.22** Remote rudder angle indicator readings to correspond with the mechanical readings.

Part 4: PROOF OF PERFORMANCE:

- 4.1 All work to be completed to the satisfaction of the Chief Engineer and attending TC/MS inspector
- 4.2 All Operation and function of the steering gear and rudder to be verified through operation of the equipment. This will be done by Ship's Officers, with the Contractor in attendance. Following operations and verifications, the Contractor will make any adjustments required in order to establish correct operation of the steering gear.
- 4.3 Remote rudder angle indicator readings to correspond with the mechanical readings.
- 4.4 Any removed interference items are to be reinstalled and proven operational upon completion of all work.

Part 5: DELIVERABLES:

- 5.1 Copies of all readings in paper and electronic formats.

Spec item #: H-12	SPECIFICATION	TCMSB Field # 3LL110
HD-12 : SHIP SIDE DISCHARGE VALVES & SUCTION VALVES		

Part 1: SCOPE:

1.1 The intent of this item is to open up, overhaul and reassemble and reinstall the vessel's ship side discharge valves and sea suction valves for survey and credit from TCMS.

Part 2: REFERENCES:

Overboard discharges	Location	Size (mm)	Type	Field#
R.O. Overboard/Distiller	Port 85/86	100mm	G-SDNR	01
Oily Bilge Pp OB	Port 85/86	50mm	G-SDNR	03
Fw Evaporator OB	Stbd 85/86	100mm	G-SDNR	05
Sewage OB	Stbd 85/86	100mm	G-SDNR	07
Bilge/Ballast Pp OB	Stbd 71/72	150mm	G-SDNR	09
Sub. Fire Pp OB	Port 53/54	100mm	G-SDNR	11
Stg Flat Bilge Pp OB	Stbd 0/1	50mm	G-SDNR	13
Chain Locker OB	Port Foc'sle	50mm	G-SDNR	14
Disch Sea Bay OB	Port 84/85	350 mm	Butterfly	18
Disch Sea Bay OB	Stbd 84/85	350mm	Butterfly	22
Sea Suction Valves				
Sea Inlet ISO	Port 87/88	450mm	Butterfly	15
Sea Inlet ISO	Stbd 87/88	450mm	Butterfly	
Suction Sea Bay Inlet	Port 87/88	450mm	Butterfly	
Suction Sea Bay Inlet	Stbd 87/88	450mm	Butterfly	19
Sea Strainer Inlet	Port 87/88	450mm	Butterfly	
Sea Strainer Inlet	Stbd 87/88	450mm	Butterfly	
Distiller Sea Bay RO Suct	Stbd 80/81	32mm	SL Angle	23
Distiller Sea Bay FW Suct	Stbd 80/81	100mm	SL Angle	24
Distiller Sea Bay*	Port 87/88	100mm	SL Angle	
Submersible Suction	Port 60/61	125mm	Butterfly	27
#1 SW Pump Suct	Stbd Fr. 87	250mm	SL Angle	
#2 SW Pump Suct	Stbd Fr. 87	250mm	SL Angle	
#3 SW Pump Suct	Stbd Fr. 87	250mm	SL Angle	
B/B Pump #1 Suction	Fr. 87 C/L	125mm	SL Angle	
B/B Pump #2 Suction	Fr. 87 C/L	125mm	SL Angle	
Fire Pump #1 Suction	Fr. 87 C/L	125mm	SL Angle	
Fire Pump #2 Suction	Fr. 87 C/L	125mm	SL Angle	
FW Cooler Discharge	Port Fr 83	350mm	Butterfly	
JW Cooler Discharge	Fr 83 C/L	200mm	Butterfly	
Foam Pump Suction	Fr 87 C/L	200mm	SL Angle	
F/Main Constant P/P	Fr 87 C/L	75mm	SL Angle	
SB Stripping Suction	Fr 85 C/L	75mm	SL Angle	
Air Connections				
Air connection for 01	Port 85/86	13mm	G-SDNR	02

Air connection for 03	Port 85/86	13mm	G-SDNR	04
Air connection for 05	Stbd 85/86	13mm	G-SDNR	06
Air connection for 07	Stbd 85/86	13mm	G-SDNR	08
Air connection for 09	Stbd 71/72	13mm	G-SDNR	10
Air connection for 11	Port 53/54	13mm	G-SDNR	12
Air connection chest	Port 87/88	20mm	G-SDNR	17
Air connection chest	Stbd 87/88	20mm	G-SDNR	21
Air connection Dist SB	Stbd 80/81	20mm	G-SDNR	26
Air connection Sub	Port 59/60	20mm	G-SDNR	29
Vent Valves				
Sea Box Vent	Port 87	150mm	Butterfly	16
Sea Box Vent	Stbd 87	150mm	Butterfly	20
Distiller Sea Bay Vent	Stbd 80/81	75mm	Butterfly	25
Submersible SB Vent	Port 60/61	75mm	Butterfly	28
Suction SB Vent	Port 88	150mm	Butterfly	
Suction SB Vent	Stbd 88	150mm	Butterfly	
Discharge SB Vent	Port 85	150mm	Butterfly	
Discharge SB Vent	Stbd 85	150mm	Butterfly	
Port Stern Tube	Port / 34	1.5"	G-SDNR	
Stbd Stern Tube	Stbd / 34	1.5"	G-SDNR	
Port Stern Tube sight glass in	Port / 40	2.5"	G-SDNR	
Port Stern Tube sight glass out	Port / 40	2.5"	G-SDNR	
Port Stern Tube sight glass bypass	Port / 40	2.5"	G-SDNR	
Stbd Stern Tube sight glass in	Stbd / 40	2.5"	G-SDNR	
Stbd Stern Tube sight glass out	Stbd / 40	2.5"	G-SDNR	
Stbd Stern Tube sight glass bypass	Stbd / 40	2.5"	G-SDNR	

Note: Sea Box Vent Port located in Stewards cabin 133 Main Deck, Fr. 87; Sea Box Vent Stbd. located in P.O.'s lounge Main Deck Fr.87

Part 3: TECHNICAL DESCRIPTION:

- 3.1 Contractor is responsible for all ancillary services necessary to complete the specification item. This includes, but is not limited to, strip out, crantage, staging , cleaning, debris removal and disposal, etc.
- 3.2 The above list (58 total) of sea suction valves, overboard discharge valves, vent valves, air connection valves and ship side valves that are to be overhauled and surveyed for TCMS credits. Valves shall be removed, dismantled and all parts thoroughly cleaned, seating surfaces lightly ground in (where applicable) and all parts laid out in good order for survey.

- 3.3 The Distiller Sea Bay suction valve (*) is to be removed and a new owner supplied valve installed in its place. Old valve to be returned to the vessel.
- 3.4 After inspection, valves are to be reassembled in good order using new jointing and packing material intended and approved for the application by the jointing and packing material manufacturer.
- 3.5 Any disconnections or other removals necessary for access to the valves to carry out this work is to be included in the quotation and all to be reassembled in good order on completion of work. This includes extended spindles, hydraulic connections, etc.
- 3.6 Contractor to exercise extra care when reinstalling butterfly valves such that rubber insert pieces are not bent or crimped between flanges, and that flanges are tightened down evenly.
- 3.7 P.O.'s lounge and Stewards cabin 133 to be left in a clean, as found condition

Part 4: PROOF OF PERFORMANCE:

- 4.1 All work to be completed to the satisfaction of the Chief Engineer and attending TC/MS inspector
- 4.2 All valves are to be functionally tested for proper operation and water tightness to the satisfaction of the Chief Engineer
- 4.3 Any removed interference items are to be reinstalled and proven operational upon completion of all work.

Part 5: DELIVERABLES:

- 5.1 Copies of all readings in paper and electronic formats.

Spec item #: H-13	SPECIFICATION	TCMSB Field # N/A
HD-13 : VOID SPACES		

Part 1: SCOPE:

1.1 The intent of this specification shall be to clean, inspect and obtain TC/MS survey credit for the listed tanks.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

Tank	Capacity M ³	Location	Field Number
Aft Cofferdam	92.07	Fr 13-30	3L010
No 2 Void Port	29.54	Fr 127-140	3L037
No 2 Void Stbd	29.54	Fr 127-140	3L036
No 3 Void Port	17.25	Fr 140-150	3L039
No 3 Void Stbd	17.25	Fr 140-150	3L038
No 4 Void Port	92.02	Fr 150-165	3L044
No 4 Void Stbd	92.02	Fr 150-165	3L043
Cofferdam	19	Fr 120-127	3L035
Pipe Tunnel		Fr 122-167	3L042

Tank	Manhole Locations
Aft Cofferdam	Prop Mtr Room Aft Bulkhead
No 2 Void Port	Pipe Tunnel
No 2 Void Stbd	Pipe Tunnel
No 3 Void Port	Pipe Tunnel
No 3 Void Stbd	Pipe Tunnel
No 4 Void Port	Lower Bubbler Compt
No 4 Void Stbd	Lower Bubbler Compt
Cofferdam	Eng Room Fwd
Pipe Tunnel	Eng Room Fwd

2.2 Owner Furnished Equipment

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

Part 3: TECHNICAL DESCRIPTION:

3.1 The tanks are considered confined spaces under the Safety Management System.

- 3.2** Prior to entry, all identified Tanks are to be certified gas free and “Safe for Workers” or “Safe for Hot Work” by a marine chemist and certificates posted in conspicuous locations as required by SSB TP3177E.
- 3.3** Contractor to supply any temporary lighting required. Lighting to be removed upon completion.
- 3.4** Tanks are to be opened up and cleaned internally by hosing down surface with fresh water (350 psi at nozzle maximum). Space to be pumped dry and wiped down with clean lint-free rags.
- 3.5** Voids are to be inspected by TCMS inspector and Owner’s representative upon completion of cleaning. . Contractor to arrange scheduling of TCMS inspector.
- 3.6** All valves, controls, transducers etc. and related equipment are to be protected prior to and during washing and cleaning.
- 3.7** In conjunction with ship’s Electrical Officer and TCMS inspector, level alarms in each tank to be proven operational.
- 3.8** All dirt and debris found in void spaces shall be removed ashore and disposed of by the Contractor in an approved manner. Surrounding areas affected by the cleaning to be left in an ‘as found’ condition.
- 3.9** Strum boxes to have strainers cleaned and replaced in good order. Strum box wells to be cleaned of all dirt and debris.
- 3.10** All sounding pipes are to be proven clear.
- 3.11** Tanks to be inspected by Owner’s representative prior closing up. Tanks to be closed up in good order, using new ¼” neoprene gaskets. All fasteners are to be coated with an approved anti-seize compound.
- 3.12** The vent head assembly for each tank is to be disassembled for inspection by TCMS and the Chief Engineer. Following inspection the vent head assembly(s) for each tank is to be reassembled using anti-seizing compound on all fastener threads.
- 3.13** The Contractor is to perform an air test on all tanks using an open ended manometer to the satisfaction of the TCMS inspector. The contractor will be responsible to seal/blank all penetrations to the tested tank(s) and make any necessary isolations. The contractor is to remove all such seals/blanks and isolations following successful testing.

3.14 Vent heads to be replaced in good order.

Part 4: PROOF OF PERFORMANCE:

4.1 All work is to be to the satisfaction of the Chief Engineer and attending TCMS Surveyor.

Spec item #: H-14	SPECIFICATION	TCMSB Field # N/A
HD-14 : FUEL OIL TANKS		

Part 1: SCOPE:

1.1 The intent of this specification shall be to clean, inspect and obtain TC/MS survey credit for the following tanks.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

Name	Location (Frame)	Capacity (m3)	TCMS Field #
No 2 FO Wing Tank Stbd	30 – 61	200.39	3L011
No 3 FO DB Tank Port	30-61	82.64	3L013
No 3 FO DB Tank Stbd	30-61	81.27	3L014
No 4 FO DB Tank Stbd	61-83	67.02	3L015
No 4 FO DB Tank Port	61-83	59.03	3L016
No 5 FO Wing Tank Stbd	61-83	115.57	3L017
No 6 FO DB Tank Stbd	89-120	93.54	3L027
No 6 FO DB Tank Port	150-165	93.54	3L028
Settling FO Tank	127-150	175.66	3L055

Manhole Locations

No 2 FO Wing Tank Stbd	(2) Prop MTR room upper level, fore and aft
No 3 FO DB Tank Port	Prop Mtr Room under shaft coupling
No 3 FO DB Tank Stbd	Prop Mtr Room under shaft coupling
No 4 FO DB Tank Stbd	Aux Mach Space aft of sewage tank.
No 4 FO DB Tank Port	Aux Mach Space aft of sewage tank
No 5 FO Wing Tank Stbd	Heating Compartment Stbd Side
No 6 FO DB Tank Stbd	Eng Room fwd of aft bulkhead
No 6 FO DB Tank Port	Eng Room fwd of aft bulkhead
Settling FO Tank Port	Eng Wkshp fwd

2.2 Owner Furnished Equipment

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

Part 3: TECHNICAL DESCRIPTION:

- 3.1** Tanks will be pumped as low as possible by ship's staff. Contractor to remove tank residuals and transfer the tank residuals to another fuel tank(s) as directed by the Chief Engineer.
- 3.2** For bidding purposes quote on 20 m³ of tank residuals, actual amount to be adjusted by 1379 action. Contractor is to supply a unit cost to be used for adjustment purposes.
- 3.3** Prior to the commencement of cleaning, all tanks are to be certified gas free for worker entry by a marine chemist and certificates posted in conspicuous locations as required by the CLC. All Contractor workers entering any tanks are to be qualified as per CLC.
- 3.4** Contractor shall supply any ventilation equipment required for the gas free Certificate and the certificate's continued validity for the duration of the work.
- 3.5** Contractor shall supply any temporary lighting required. Lighting to be removed upon completion
- 3.6** The tanks are to be thoroughly cleaned; all scale, dirt and debris is to be removed ashore. Any rusty areas are to be power tool cleaned. All vent, sounding and overflow pipes are to be proven clear.
- 3.7** Tanks shall be wiped dry with lint free rags after cleaning.
- 3.8** In conjunction with the ship's Electrical Officer, tank level transmitter shall be proven operational.
- 3.9** All dirt and debris found in tanks shall be removed ashore and disposed of by the Contractor in an approved manner. Surrounding areas affected by the cleaning to be left in an 'as found' condition.
- 3.10** The contractor is to disassemble the self closing tank vent heads from each tank, clean and lay out the components for inspection by TCMS Surveyor and the Chief Engineer.
- 3.11** NOTE: Tanks and vent heads are to be inspected by TCMS inspector and Owner's representative upon completion of cleaning. Contractor shall arrange scheduling of TCMS inspector.

- 3.12** The Contractor is to perform an air test on all tanks using an open ended manometer to the satisfaction of the TCMS inspector. The contractor will be responsible to seal/blank all penetrations to the tested tank and make any necessary isolations. The contractor is to remove all such seals/blanks and isolations following successful testing.
- 3.13** Contractor shall install manhole covers on tanks in good order using new ¼” neoprene gaskets compatible with marine diesel , after final tank inspection by Chief Engineer. Gasket material is to be approved by Chief Engineer. All fasteners shall be coated with an approved anti-seize compound.

Part 4: PROOF OF PERFORMANCE:

- 4.1** All work is to be to the satisfaction of the Chief Engineer and attending TCMS Surveyor.

Spec item #: HD-15	SPECIFICATION	TCMSB Field # N/A
HD-15 : MISCELLANEOUS TANK SURVEYS		

Part 1: SCOPE:

1.1 The intent of this specification shall be to clean, inspect and obtain TC/MS survey credit for the listed tanks.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

Tank	Capacity M ³	Location	Field Number
Oily Bilge Retention Tank	5.7	Fr 61-67	3L020
Waste Oil Tank	3.44	Fr 67.71	3L021
FO Overflow Tank	7.37	Fr 122-127	3L031
Dirty LO Tank	4.94	Fr 122-127	3L033
FO Drain Tk (Stbd)		Fr 122-127	3L032

Tank	Manhole Locations
Oily Bilge Retention Tank	Aux Mach Space Port Side
Waste Oil Tank	Aux Mach Space Port Side
FO Overflow Tank	Eng Room Fwd
Dirty LO Tank	Eng Room Fwd
FO Drain Tk (Stbd)	Eng Room Fwd Stbd

2.2 Owner Furnished Equipment

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

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The tanks are considered confined spaces under the Safety Management System.
- 3.2 The contractor is to ensure the tank side valves are locked closed and tagged before work commences.
- 3.3 Contractor to remove and dispose of entire contents of the tanks. For bidding purposes quote on entire volume of tanks.

- 3.4 Prior to entry, all identified Tanks are to be certified gas free and “Safe for Workers” or “Safe for Hot Work” by a marine chemist and certificates posted in conspicuous locations as required by SSB TP3177E.
- 3.5 Contractor to supply any temporary lighting required. Lighting to be removed upon completion.
- 3.6 Tanks are to be opened up and cleaned internally by hosing down surface with fresh water (350 psi at nozzle maximum). Space to be pumped dry and wiped down with clean lint-free rags.
- 3.7 Tanks are to be inspected by TCMS inspector and Owner’s representative upon completion of cleaning. . Contractor to arrange scheduling of TCMS inspector.
- 3.8 All valves, controls, transducers etc. and related equipment are to be protected prior to and during washing and cleaning.
- 3.9 In conjunction with ship’s Electrical Officer and TCMS inspector, level alarms in each tank to be proven operational.
- 3.10 All sounding pipes are to be proven clear.
- 3.11 Tanks to be inspected by Owner’s representative prior closing up. Tanks to be closed up in good order, using new ¼” neoprene gaskets. All fasteners are to be coated with an approved anti-seize compound.
- 3.12 The vent head assembly for each tank is to be disassembled for inspection by TCMS and the Chief Engineer. Following inspection the vent head assembly(s) for each tank is to be reassembled using anti-seizing compound on all fastener threads.
- 3.13 The Contractor is to perform an air test on all tanks using an open ended manometer to the satisfaction of the TCMS inspector. The contractor will be responsible to seal/blank all penetrations to the tested tank(s) and make any necessary isolations. The contractor is to remove all such seals/blanks and isolations following successful testing.
- 3.14 Vent heads to be replaced in good order.

Part 4: PROOF OF PERFORMANCE:

- 4.1 All work is to be to the satisfaction of the Chief Engineer and attending TCMS Surveyor.

Spec item #: HD-16	SPECIFICATION	TCMSB Field # N/A
HD-16 : BALLAST TANK INSPECTION AND COATING		

Part 1: SCOPE:

- 1.1 The intent of this specification is to clean, inspect, coat and obtain TC/MS credit for the listed tanks.
- 1.2 This work shall be carried out in Conjunction with the following:

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

Tank	Capacity M ³	Location	Field Number
Aft TrimTank	109.9	0-18	3L003
Aft Stab Tk	197.76	127-140	3L040
Fwd Stab Tank	256.05	140-150	3L041
M/E Jacket Water	7.53	118.5-125	3L034

Tank	Manhole Locations
Aft TrimTank	Helicopter Fuel Pump room
Aft Stab Tk	Port and Stbd Main Deck Alleyway
Fwd Stab Tank	In Aft Stab Tank
M/E Jacket Water	Main Gen Room, Fwd

2.2 Standards

2.3 Regulations

The tanks are considered confined spaces under the Safety Management System.

2.4 Owner Furnished Equipment

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

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The listed tanks are to be gas-freed and opened for cleaning and inspection purposes and TCMS credits.

- 3.2** The tanks are skin tanks (except the M/E JW tank), access holes through the ship's hull may be required to facilitate the specified work. All costs associated with this must be included in the bid. This will include dressing each access hole, re-welding the removed hull plating, and X-Rays of the completed welding (bid on 4 shots per plate and unit cost for additional). This would also include internal tank coating touch-up by way of welding.
- 3.3** The tanks will be pumped as low as possible using the ship's pumps. Contractor will use his own pumps and hoses to pump out remaining water, mud, dirt and debris in the course of the work.
- 3.4** Prior to entry, tanks to be certified gas free and "Safe for Workers" or "Safe for Hot Work" by a marine chemist and certificates posted in conspicuous locations as required by SSB TP3177E. Confined space entry procedures are to be followed.
- 3.5** Contractor to supply any ventilation equipment required for the gas free Certificate and the certificate's continued validity for the duration of the work.
- 3.6** All functional tank openings (vents, ducts, valves, controls, transducers etc.) and related equipment are to be blanked or otherwise protected prior to and during cleaning, blasting and painting activity.
- 3.7** Tanks are to be pressure washed cleaned using SSPC-SP12/NACE No 5 cleaning methods for the entire interior of the tanks (water to be removed after by Contractor). Supplement with SSPC-SP1 Solvent cleaning and SSPC-SP2 and 3 hand and power tool clean areas of corrosion and loose or flaking paint. Sand glossy areas to provide profile. All debris to be removed from tank and disposed of ashore.
- 3.8** Prior to painting operations, each tank is to be inspected by Transport Canada Marine Safety and Chief Engineer.
- 3.9** All areas of bare metal are to be given (1) coat of WASSER MC-Miozinc 100 or equivalent as per paint manufacturer's instructions for mixing, ventilation, application and precautions at 3 to 5 mils D.F.T.
- 3.10** An intermediate coat of WASSER MC-Tar 100 Red or equivalent is to be applied over the primed areas of the ballast tank surface at 5 to 7 mils D.F.T.
- 3.11** A final coat of WASSER MC-Ballast Coat Beige is to be applied over the repaired areas to 4 mils D.F.T.

- 3.12 Contractor to quote on preparation and recoating of 100M² with a unit cost for per M² for additional mechanical cleaning and recoating.
- 3.13 Contractor to supply all necessary lighting (explosion proof), ventilation (including heaters and/or dehumidifiers) to prevent condensation from forming in tanks after vacuum blasting has taken place.
- 3.14 Tanks are to be inspected by Owner's representative prior closing up.
- 3.15 The contractor is to disassemble the self closing tank vent heads from each tank, clean and lay out the components for inspection by TCMS Surveyor and the Chief Engineer.
- 3.16 NOTE: Tanks and vent heads are to be inspected by TCMS inspector and Owner's representative upon completion of cleaning. Contractor shall arrange scheduling of TCMS inspector.
- 3.17 Following inspection the tank vent heads are to be reassembled and reinstalled in good order using anti-seizing compound on all fastener threads.
- 3.18 The Contractor shall bid on the pneumatic testing of each individual tank, as well as quoting a unit price for each for hydrostatic testing. The quote shall include the installation and removal of blanks for suctions, overflow pipes and vent head removals, additional tank openings, and tank drainage (including the disposal of water and the wiping down of the tank internals).
- 3.19 The attending TCMS Surveyor solely shall determine the test method. All tests shall be witnessed by the attending TCMS Surveyor and the Technical & Inspection Authorities.
- 3.20 Tanks to be boxed up in good order, using new ¼" neoprene gaskets. All fasteners are to be coated with an approved anti-seize compound.
- 3.21 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

The Contractor is to be responsible for all inspections and is to consult with TCMS, prior to commencement of work, to determine an inspection schedule; at each inspection point,

the Contractor is to advise the Owner's representative, in advance, to allow his/her attendance.

Part 5: DELIVERABLES:

- 5.1** Upon completion of all repairs and testing, the Contractor and the Owner's representative (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 TCMS Surveyor has completed all inspections.

Spec item #: HD-17	SPECIFICATION	TCMSB Field # N/A
HD-17 : SEA BAY/SEA CHEST ANODES		

1.1 The intent of this specification is to replace the anodes in the sea bays and sea chest.

1.1 This item is to be completed in conjunction with the following

Sea Bays and Chest cleaning and Coating.

Part 2: REFERENCES:

2.1 Equipment Data

Bay/Chest	Location	Field #	Size
Main Sea Chest, port	Fr. 83 to 89	3L026	2.5
Main Sea Chest, Stbd	Fr. 83 to 89	3L025	2.5
Distiller Sea Chest, Stbd	Fr. 80 to 81	3L022	0.9
Sea Chest Aft Port	Fr. 59 to 61	3L019	1.5
Main Suction Sea Bay	Fr. 86 to 89	3L024	19.0
Discharge Sea Bay	Fr. 83 to 86	3L023	19.0

Part 3: TECHNICAL DESCRIPTION:

3.1 Contractor shall supply all equipment, enclosures, ventilation, staging, chain falls, craneage, slings, and shackles necessary to perform the work. All lifting equipment shall be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, of a safe working load for the expected duties.

3.2 The sea bay/sea chests are considered confined spaces under the Safety Management System.

3.3 This item deals with 10 kg sacrificial anodes that will be contractor supplied and trap corrosion and marine growth anodes that will be owner supplied. The Contractor is to quote on replacement of thirty four -10 kg sacrificial zinc anodes. Quote unit cost per anode including installation.

3.4 The Contractor to also quote on replacement of ten (10)trap corrosion and ten (10)marine growth anodes (Owner supply). Anodes are fitted in the aft sea bay, port and starboard sea boxes and suction sea chest.

3.5 Trap Corrosion and Marine Growth anodes are fitted as follows:

Aft sea bay: 4 anodes (2 marine growth, 2 trap corrosion);
 Port sea box: 8 anodes (4 marine growth, 4 trap corrosion);
 Stbd sea box: 8 anodes (4 marine growth, 4 trap corrosion);

- 3.6** New anodes are to be installed under the direction of a Service Representative from Jastram Technologies Ltd. The service representative will be the responsibility of the Contractor.
- 3.7** With the ship's Electrical Officer the contractor is to ensure the Lockout/Tagout is in place. The contractor is to supply his/her own locks and tags but complete the vessel's Lockout/Tagout procedure.
- 3.8** Prior to the removal of any anode, the cables terminated within the anode safety cap shall be mechanically disconnected, NOT CUT. Connections are presently bolted together and taped.
- 3.9** Prior to installation of new anodes, the mounting surface is to be cleaned completely of any corrosion and dirt and dried to ensure a watertight seal.
- 3.10** The anodes are to be installed as per mounting instructions attached. Contractor to fabricate and install required number of spacer rings to fit over new diameter of securing bolt. The mounting bolt on each anode is to be torqued to a minimum value of 110 ft-lbs. A new insulating spacer is required to be fabricated and installed between the ships hull and the anode by the contractor for each anode being replaced. Insulators are approximately four inches in diameter and one and one half inch thick. Exact measurements to be verified upon installation.
- 3.11** Electrical connection of the anode lead and control power cable is with a nut and bolt. Connections are to be tight and clean. A suitable compound electrical tape shall be used to bind the connection with a final binding of vinyl electrical tape to ensure waterproof integrity. When installing bent anodes or anodes exceeding 30Kg, use two nuts to secure anode hanging bolt.
- 3.12** Anode cofferdams are to be filled with a petroleum jelly upon completion. New 'O'-rings (Contractor supply), 2 per anode are to be installed in the replaced anode safety caps and a suitable anti-seize compound used on threads of safety caps prior to installing and tightening.
- 3.13** 10 kg sacrificial zinc anodes in Port & Stbd. sea boxes and suction and discharge sea bays are fitted as follows:

Suction Seabay	10 anodes
Discharge Seabay	10 anodes
Port Sea Chest	6 anodes
Starboard Sea Chest	6 anodes
Distiller Sea chest	1 anode

Seachest aft port	1 anode
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- 3.14 All anode supports and areas affected by welding to be coated as per the coating specification.
- 3.15 Any manhole covers removed to facilitate the removal and installation of new anodes to be replaced in good order using 1/4" neoprene gaskets and anti-seizing compound on the threads
- 3.16 Any dirt and debris from cleaning of sea bays, sea chests to be removed from ship's bilges and disposed of ashore.

Part 4: PROOF OF PERFORMANCE:

- 4.1 The completed installation is to be functionally tested during sea trials to the satisfaction of the Chief Engineer. Upon undocking all anode glands are to be proven free from leaks. All leaks to be repaired by contractor.

Part 5: DELIVERABLES:

5.1 .

Spec item #: HD-18	SPECIFICATION	TCMSB Field # N/A
HD-18 : SEA BAY/SEA CHEST		

Part 1: SCOPE:

1.1 The intent of this specification is to open the following spaces for cleaning, inspection and application of coatings.

1.1 This item is to be completed in conjunction with the following

Sea Bays and Chest Anode replacement

Part 2: REFERENCES:

2.1 Equipment Data

Bay/Chest	Location	Field #	Size
Main Sea Chest, port	Fr. 83 to 89	3L026	2.5
Main Sea Chest, Stbd	Fr. 83 to 89	3L025	2.5
Distiller Sea Chest, Stbd	Fr. 80 to 81	3L022	0.9
Sea Chest Aft Port	Fr. 59 to 61	3L019	1.5
Main Suction Sea Bay	Fr. 86 to 89	3L024	19.0
Discharge Sea Bay	Fr. 83 to 86	3L023	19.0

2.2 Drawing Number	Description
23-0703-02	Sea Chest Aft Arrangement
23-0703-04	Sea Chest / Sea Bays Main Arrangement
23-0703-05	Sea Chest Distiller Arrangement

Part 3: TECHNICAL DESCRIPTION:

3.1 Contractor shall supply all equipment, enclosures, ventilation, staging, chain falls, craneage, slings, and shackles necessary to perform the work. All lifting equipment shall be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, of a safe working load for the expected duties.

3.2 The sea bay/sea chests are considered confined spaces under the Safety Management System.

3.3 Access to sea chests is by removal of manhole covers on ship's exterior

- 3.4** Access to the Main Sea Chest Port, is through manhole located in Steward's Cabin 133 on Main Deck. Access to Stbd. Sea Chest is through manhole located in P.O.'s Lounge, Main Deck.
- 3.5** Access to Main Suction/Discharge Sea Bays is by removal of manhole covers located in the Auxiliary Engine Room..
- 3.6** Total of 32 securing plates to be renewed from manhole cover securing studs. Plates are ¼" x 1" x 3" stainless steel. All rough edges to be ground smooth.
- 3.7** All grid and internal sea bays, Distiller Sea Chest and main port and stbd seachests are to be pressure water cleaned using SSPC-SP12/NACE No 5 cleaning methods. Supplement with SSPC-SP1 Solvent cleaning and SSPC-SP2 and 3 hand and power tool clean areas of corrosion and loose or flaking paint (feather edges of sound existing paint back to a firm edge). Sand glossy surfaces to provide profile. Area at waterline interfaces to be carefully checked for pitting.
- 3.8** All areas of bare metal are to be given (1) coat of WASSER MC-Miozinc 100 or equivalent as per paint manufacturer's instructions for mixing, ventilation, application and precautions at 3 to 5 mils D.F.T.
- 3.9** An intermediate coat of WASSER MC-Tar 100 Red or equivalent is to be applied over the primed areas of the sea bay/ sea chest surface at 5 to 7 mils D.F.T.
- 3.10** A final coat of WASSER MC-Ballast Coat beige is to be applied to 100% of the sea bay/sea chest surface at 4 mils D.F.T.
- 3.11** Contractor to bid on repair and coating of 40 M² with unit cost for additional M².
- 3.12** Areas to be used for bidding are as follows: Discharge Sea Bay 340 M², Suction Sea Bay 340M², Port and Stbd Sea Chests 460 M² each, Distiller Sea Bay 23M², Sea Chest Aft Port 23M².
- 3.13** Contractor responsible for complete and thorough ventilation of sea chest for complete curing of paint.
- 3.14** Grid holes in shell and on manhole covers are to be cleaned by hydro-blasting or reaming using a close fitting drill. The diameter of each grid hole perforation is 25mm.
- 3.15** All countersunk screws to be dressed with die nut and all screw holes are to be tapped out. Contractor to bid on supplying and installing 75 stainless steel countersunk screws (19 mm.) to replace all screws from sea bay/sea chest manhole covers. Unit price is also to be quoted.
- 3.16** New stainless steel securing plates (32 off - See Para 2) are to be welded in place after manhole covers and securing studs are in place. All welds are to be ground flush.

- 3.17 All grids and manhole covers are to be securely refitted. Contractor is to supply and fit new gaskets in way of all manholes. Anti-seizing compound is to be applied to all threads.
- 3.18 Any dirt and debris from cleaning of sea bays, sea chests to be removed from ship's bilges and disposed of ashore.

Part 4: PROOF OF PERFORMANCE:

- 4.1 The completed installation is to be functionally tested during sea trials to the satisfaction of the Chief Engineer. All leaks to be repaired by contractor.
- 4.2 Coast Guard will be retaining the services of an independent consultant to verify that the surface preparation and coating; storage, preparation, and application are as per the specification. Payment for the consultant will be directly by Coast Guard outside of this contract.

Part 5: DELIVERABLES:

- 5.1 .

Spec item #: HD-19	SPECIFICATION	TCMSB Field # N/A
HD-19 : #4 FUEL OIL TANK TOP REPLACEMENT		

Part 1: SCOPE:

- 1.1 The intent of this specification is that the wasted tank top on the #4 double bottom fuel tank is cut out and replaced in way of the area specified separately by Poseidon Marine Consultants scope of work.
- 1.2 This specification item is to be carried out concurrently with the survey of the tank for TCMS credit in a separate specification item.

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

CCGS Henry Larsen
 Type 1200 Medium Icebreaker
 Steel Renewals IWO Tank Top
 OUTLINE SCOPE OF WORK
 Doc. No. 17-200-001
 Rev. 0
 20 December 2017
 Poseidon Marine Consultants

Name	Location (Frame)	Capacity (m³)	TCMS Field No
No 2 FO Wing Tank Stbd	30 – 61	200.39	3L011
No 3 FO DB Tank Stbd	30 – 61	82.64	3L013
No 4 FO DB Tank Stbd	61-83	67.02	3L015
No 5 FO Wing Tank Stbd	61 – 83	115.57	3L017

Manhole Locations

No 2 FO Wing Tank Stbd	(2) Prop MTR room upper level, fore and aft
No 3 FO DB Tank Port	Prop Mtr Room under shaft coupling
No 4 FO DB Tank Stbd	Aux Mach Space aft of sewage tank.
No 5 FO Wing Tank Stbd	Heating Room Stbd

2.2 Owner Furnished Equipment

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

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The below work will take into consideration the specification by Poseidon Marine Consultants in part 5 below.
- 3.2 Tanks will be pumped as low as possible by ship's staff. Contractor to remove tank residuals and transfer the tank residuals to another fuel tank(s) as directed by the Chief Engineer.
- 3.3 For bidding purposes quote on 5 m³ of tank residuals, actual amount to be adjusted by 1379 action. For clarity, the residual tank contents for #2 FO Wing Tank Stbd, #3 FO DB Tank Stbd, and # 4 DB Stbd are included separately in the Fuel Tank Survey Specification.
- 3.4 Prior to the commencement of cleaning, all tanks are to be certified gas free for worker entry by a marine chemist and certificates posted in conspicuous locations as required by the CLC. All Contractor workers entering any tanks are to be qualified as per CLC.
- 3.5 For clarity, the actual hotwork will be taking place on #4 FO DB Stbd. At the same time, the contractor is to be aware that the #2 FO Wing Tank Stbd, #3 FO DB Stbd, and the #5 fuel wing tanks are directly adjacent to the tank top to be renewed and therefore will need to be certified for hotwork by a Marine Chemist for the duration of the hotwork.
- 3.6 Due to the fact that the area where the tank top renewal will take place is inside the ship with delicate machinery and electronics in the area, the contractor will fabricate an enclosure to completely ensure none of the by-products of grinding, cutting, and welding does not contaminate the area. The contractor will supply and install sufficient extraction fans and ducting to the outside of the ship (and away from the ship intake air systems) to keep the dust and dirt from escaping to the engine room.
- 3.7 Noting the enclosure in 3.6 above and the difficulty with keeping the dust and dirt from escaping, the contractor will be responsible to cover the following equipment with heavy clear plastic in the auxiliary machinery space all electric motors, power packs, and the auxiliary generator. The heavy clear plastic will be secured in such a manner that dust and dirt cannot get inside. The contractor will

- be aware that if dirt and dust makes it way from the enclosure that is the responsibility of the contractor to carry out all remedial measures.
- 3.8** The contractor will note that due to sensitive equipment in the area that the ground leads from all welding machines are to be secured as close to the welding as practicable.
- 3.9** Contractor shall supply any ventilation equipment required for the gas free Certificate and the certificate's continued validity for the duration of the work.
- 3.10** The contractor shall supply any temporary lighting required. Lighting to be removed upon completion
- 3.11** The tanks are to be thoroughly cleaned; all scale, dirt and debris is to be removed ashore. Any rusty areas are to be power tool cleaned. All vent, sounding and overflow pipes are to be proven clear.
- 3.12** Tanks shall be wiped dry with lint free rags after cleaning.
- 3.13** In conjunction with the ship's Electrical Officer, tank level transmitter shall be proven operational.
- 3.14** All dirt and debris found in tanks shall be removed ashore and disposed of by the Contractor in an approved manner. Surrounding areas affected by the cleaning to be left in an 'as found' condition.
- 3.15** The contractor is to disassemble the self closing tank vent heads from each tank, clean and lay out the components for inspection by TCMS Surveyor and the Chief Engineer.
- 3.16** NOTE: Tanks and vent heads are to be inspected by TCMS inspector and Owner's representative upon completion of cleaning. Contractor shall arrange scheduling of TCMS inspector.
- 3.17** The Contractor is to perform an air test on all tanks using an open ended manometer to the satisfaction of the TCMS inspector. The contractor will be responsible to seal/blank all penetrations to the tested tank and make any necessary isolations. The contractor is to remove all such seals/blanks and isolations following successful testing.

- 3.18** Contractor shall install manhole covers on tanks in good order using new ¼” Nitrile gaskets suitable to be used with diesel fuel, after final tank inspection by Chief Engineer. All fasteners shall be coated with an approved anti-seize compound. The contractor will supply a copy of the certificate for the new gaskets indicating that the material is suitable to be used with diesel fuel. A copy of this certificate is to be presented to the vessel Chief Engineer before the new gaskets are installed.

Part 4: PROOF OF PERFORMANCE:

- 4.2** All work is to be to the satisfaction of the Chief Engineer and attending TCMS Surveyor.

Part 5: Poseidon Marine Consultants Ltd.

**CCGS Henry Larsen
Type 1200 Medium Icebreaker**

Steel Renewals IWO Tank Top

OUTLINE SCOPE OF WORK

Doc. No. 17-200-001

Rev. 0

20 December 2017

Prepared For:

CCG Supervisor / Engineering - St. John's
P.O. Box 5667
St. John's, NL A1C 5X1

Prepared By:

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	CCGS HENRY LARSEN STEEL RENEWALS IWO TANK TOP OUTLINE SCOPE OF WORK	20 December 2017
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Rev	Date	Description	Prepared	Checked	Approved
0	20 Dec 17	Issued for Approval	S. Mulrooney	D. Dyke	-

REVISION SUMMARY

Rev	Affected Sections	Remarks	By

	CCGS HENRY LARSEN <u>STEEL RENEWALS IWO TANK TOP</u> OUTLINE SCOPE OF WORK	20 December 2017
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	CCGS HENRY LARSEN <u>STEEL RENEWALS IWO TANK TOP</u> OUTLINE SCOPE OF WORK	20 December 2017
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1.0 PURPOSE

This document is intended to provide a baseline scope of work pertaining to steel renewals in way of the #4 FO Starboard tank top on the subject vessel, further to a visual survey and ultrasonic inspection.

NOTE: The extent of renewals as reflected in this specification is subject to approval by TCMS.

2.0 REFERENCE DRAWINGS AND DOCUMENTS

CCG Dwg. No. 12-0007-01	Tank Top Plating
Acuren UT-MT111217-001 R0	Nondestructive Examination
Eastern Technical Services 17-920	Ultrasonic Thickness Report

3.0 DEFINITIONS AND ABBREVIATIONS

Contractor	TBD	Refit/Repairer
CCG	DFO - Canadian Coast Guard	Vessel Owner
PMC	Poseidon Marine Consultants Ltd.	Technical Representative
TCMS	Transport Canada Marine Safety	Flag Admin / Inspection Authority

4.0 GENERAL REQUIREMENTS

4.1 Acceptance of the Work

All work shall be completed to the satisfaction of CCG and TCMS.

The Contractor shall provide appropriate steel certificates and welding procedures to TCMS, in accordance with the criteria listed below. The Contractor shall establish critical milestones at which the work may be inspected.

4.2 Materials and Welding

Unless otherwise specified, all new plating shall be provided with mill certification to CSA G40.21 Grade 44W, or an equivalent as approved by the attending TCMS surveyor.

All welding shall be completed using electrodes as required for specific weld procedures.

4.3 Execution of the Work

In general, the Contractor shall progress repairs in a manner that:

- regards prevailing and forecasted weather conditions, such that CCG property and equipment is suitably sheltered where applicable.

	CCGS HENRY LARSEN <u>STEEL RENEWALS IWO TANK TOP</u> OUTLINE SCOPE OF WORK	20 December 2017
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- does not compromise the structural integrity of the vessel.
- enables periodic and systematic inspections of ongoing and completed work by CCG and TCMS.

In preparation for steel renewals, the Contractor shall:

- provide all ancillary services necessary to complete the subject repair. These may include, but are not limited to strip out, craneage, staging, cleaning, debris removal, water, shore power, etc.
- remove fittings, fixtures, linings, deck coverings, pumps, piping, equipment etc. as required to complete cropping and renewal of steelwork.
- protect all remaining fittings, fixtures, linings, deck coverings, cabling, piping, etc. which remain installed during the cropping and renewal of steelwork.
- provide all appropriate permits for entrance into and completion of welding in confined spaces.
- ensure new steel is shot blasted and coated with weldable primer prior to placement onboard.

During the completion of hot work, the Contractor shall:

- supply fire watch while hot work is ongoing, with appropriate class portable fire extinguisher and charged fire hose ready for use.
- utilize existing seams/butts as practical when completing plate renewals. Where no butts/seams are present in the vicinity of new steel, corners to have a minimum of 100mm radius. Steel renewals are to follow good ship repair practices generally in accordance with IACS 47.
- maintain a minimum parallel separation between seams of 100mm from nearest internal stiffening.
- extend new welding a minimum 100mm past perpendicular seams to release stresses.
- subject work to inspection as coordinated with CCG and TCMS personnel.

Following the completion of hot work in specific areas of the vessel, the Contractor shall:

- engage qualified person(s) to complete ND testing, 100% visual and 100% UT of butts welds or as otherwise agreed with TCMS. Subject work to final inspections by CCG and TCMS.

	CCGS HENRY LARSEN STEEL RENEWALS IWO TANK TOP OUTLINE SCOPE OF WORK	20 December 2017
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- Reinstall all fittings, fixtures, linings, deck coverings, pumps, piping, equipment etc. removed during cropping and renewal of steelwork.
- clean affected spaces and remove debris from vessel.
- clean and apply primer to welded seams and other disturbed areas. Apply internal and external coatings as directed by CCG personnel.

5.0 SCOPE OF WORK

Renewal of tank top plating shall be completed in the regions listed below.

Areas and offsets indicated are approximate and shall be confirmed onsite by Contractor prior to renewal, in conjunction with CCG or their designate.

See **Appendix A** for sketch relevant to area subject to steel renewal.

See **Appendix B** for referenced Ultrasonic Thickness Reports.

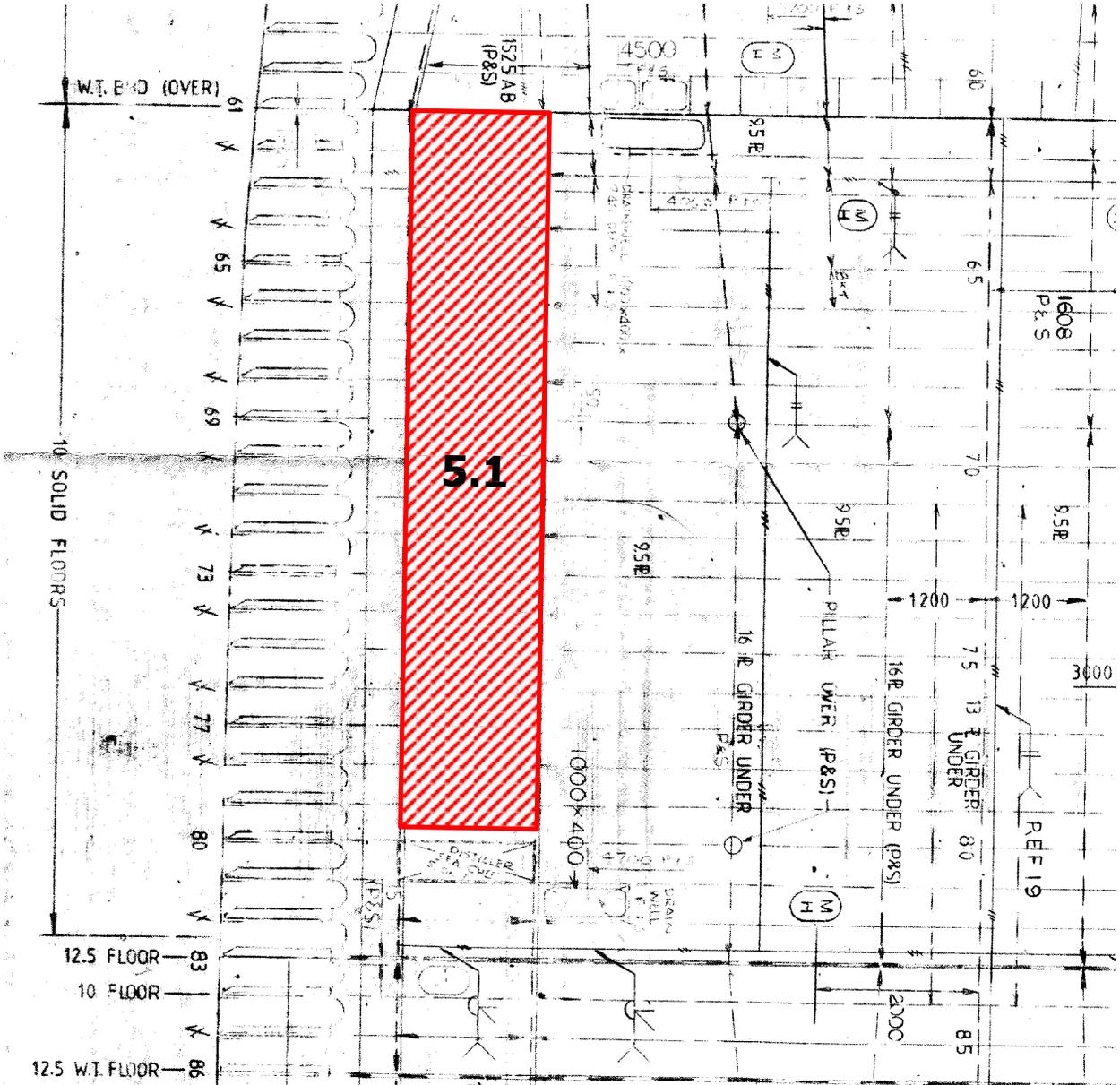
5.1 #4 FO Tank Top Stbd (Frs. 61-80)

Longitudinal Extent	Transverse Extent	Steel Grade	Approx. Area	New Plate Thickness
BHD at Fr.61 to existing seam at Fr. 80	5350 off CL STBD to 7000 off CL STBD	44W	14.5 m ²	3/8"

 <p>Poseidon MARINE CONSULTANTS LTD.</p>	<p>CCGS HENRY LARSEN <u>STEEL RENEWALS IWO TANK TOP</u> OUTLINE SCOPE OF WORK</p>	<p>20 December 2017</p>
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APPENDIX A
Sketch

<p>CCGS HENRY LARSEN <u>STEEL RENEWALS IWO TANK TOP</u> OUTLINE SCOPE OF WORK</p>	<p>20 December 2017</p>
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Plan View of Tank Top

Spec item #: HD - 20	SPECIFICATION	TCMSB Field # N/A
HD - 20 : Cooling System Piping Renewals		

CCGS Henry Larsen

Type 1200 Medium Icebreaker

Salt Water Cooling System Piping Renewals

TECHNICAL SPECIFICATION

Doc. No. 17-099-001
Rev. 1

16 January 2017

Prepared For:

CCG Supervisor / Engineering - St. John's
P.O. Box 5667
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Prepared By:

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1.1

1.2

REVISION SUMMARY

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1	4.4	Updated as per CCG	SM

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APPENDIX A CENTRAL COOLING SYSTEM DIAGRAM

1.0 PURPOSE

This document is intended to provide a baseline scope of work pertaining to salt water cooling piping renewals on the subject vessel's fresh water central cooling system.

2.0 REFERENCE DRAWINGS AND DOCUMENTS

Canadian Coast Guard Central Cooling System Diagram – 22-0713-01 Rev. 13

3.0 DEFINITIONS AND ABBREVIATIONS

Contractor	TBD	Refit/Repairer
CCG	DFO - Canadian Coast Guard	Vessel Owner
PMC	Poseidon Marine Consultants Ltd.	Owner's Representative
TCMS	Transport Canada Marine Safety	Flag Admin / Inspection Authority

4.0 CONTRACTOR SCOPE OF WORK

4.1 Contractor Responsibility

This section describes the general scope of work under the responsibility of the Contractor.

While every effort has been made to capture the extent of impact on existing vessel arrangements, the Contractor shall carry out their own familiarization prior to commencing the work.

In the course of planning or execution of the work, the Contractor is welcome to make suggestions for means of accelerating the completion of the work, provided that such means are acceptable to CCG, PMC, and TCMS. The Contractor shall advise CCG on any anticipated deviations from the specified scope of modification prior to the commencement of work in the affected area of the vessel, as far as practicable.

Existing items removed from the vessel shall be stored in a dry and secure location and reinstalled or replaced as directed by CCG.

All new materials, equipment and systems not specifically identified in this document shall be approved by CCG and/or TCMS prior to procurement.

4.2 Execution of the Work

The Contractor shall complete the work in a manner that regards prevailing and forecasted weather conditions, such that CCG property and equipment is suitably sheltered where applicable, does not compromise the structural integrity of the vessel or piping systems, and enables periodic and systematic inspections of ongoing and completed work by CCG and TCMS.

All work shall be completed to the satisfaction of CCG and TCMS. The Contractor shall establish critical milestones at which the work may be inspected.

The Contractor shall provide all ancillary services necessary to complete the work. These may include, but are not limited to strip out, temporary removal of interference items, craneage, staging, cleaning, debris removal, water, shore power, etc.

The Contractor shall remove fittings, fixtures, linings, deck coverings, machinery, etc. as required to complete the work and replace all removed items as per original once the work is completed and as directed by CCG.

Unless otherwise specified, all new piping shall be ERW steel ASTM A 53 Grade A SCH 80 hot dipped galvanized.

All welding shall be completed using electrodes as required for specific weld procedures and shall be subjected to 100% visual examination and 100% MPI / UT, unless approved otherwise by the attending surveyor.

All parts of the vessel remaining in existing condition, which could be impacted or damaged by ongoing work, shall be duly protected. Damaged areas and equipment shall be rectified accordingly.

New piping and other disturbed areas shall be cleaned and primed. Final coatings shall be applied as directed by CCG personnel.

All affected areas and spaces shall be cleaned and all debris removed from the vessel once the work has been completed.

4.3 Supply of Equipment

The Contractor shall supply all equipment and materials required to complete the work. Existing valves shall be re-used pending inspection by CCG.

4.4 Scope of Renewals

The salt water cooling system is comprised of, but not limited to, 8" pipe, 10" pipe, 14" pipe, various reducers, various fittings, Victaulic Roust-A-Bout and Gruvlok fittings, and valves. Sea water piping is highlighted in the referenced drawing and will be marked onboard by the Chief Engineer. The Contractor shall be responsible for confirming the type and quantity of each

component in the system. Renewal of salt water cooling system piping in way of the fresh water central cooling system, jacket water cooling system and stern tube cooling shall be completed as follows:

- a) The Contractor shall supply temporary cooling water connected to the fresh water cooling system while the sea water is isolated. Flow and pressure shall be as directed by the Chief Engineer.
- b) The Contractor shall remove all existing salt water piping, valves, couplings and fittings from the intake sea bays through to discharge sea bay for the fresh water cooling, jacket water cooling and stern tube cooling systems, both port and starboard.
- c) The existing salt water cross over shall be removed.
- d) All existing valves, including port and starboard sea water temperature control valves and sea water flow control valve, shall be overhauled as per ship side valve procedures.
- e) The Contractor shall fabricate and install new pipe spools and crossover as existing. All connections shall be as existing. New grooved Victaulic fittings and couplings shall be used as per original.
- f) The Contractor shall fabricate and install new pipe spools between the port and starboard 3-way valves.
- g) The Contractor shall fabricate and install new pipe spools connecting the port and starboard sea chest to the sea strainers.
- h) The Contractor shall fabricate and install new pipe spools connecting the port and starboard sea strainers to the sea bay.
- i) The Contractor shall fabricate and install new tail pieces from the suction side of the sea water pumps into the sea bay.
- j) The Contractor shall fabricate and install new pipe spools for the stern tube cooling system.
- k) The Contractor shall renew all sea chest vent pipes.
- l) All pipes shall be sufficiently supported as per original to prevent vibration.
- m) All existing valves shall be re-used pending overhaul and inspection by CCG.
- n) Upon completion, all piping shall be flushed and free from debris. The Contractor shall pressure test the piping to the satisfaction of the Chief Engineer.

- o) All piping shall be coated and labeled as directed by CCG.

4.5 Contractor Deliverables

Prior to the completion of the work, the Contractor shall submit to CCG any NDT reports completed on their behalf.

5.0 GENERAL NOTES

- Questions of a technical nature arising from this scope of work or the referenced documents shall be directed to PMC.
- Questions of a commercial nature arising from this scope of work or the referenced documents shall be directed to CCG.
- Due attention shall be paid to all provided dimensions, offsets, and details on design drawings. Where details are not provided, or otherwise unclear, the Contractor shall verify appropriate action with PMC.
- Should issues arise during periodic inspections by TCMS, necessitating action which deviates from the content of this scope of work or the referenced drawings, the Contractor shall contact CCG prior to carrying out any additional work.

APPENDIX A
Central Cooling System Diagram

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

Part 1: SCOPE:

- 1.1 The intent of this item is to completely disassemble the Schat-Harding Miranda davit for Quinquennial inspection and credit by TCMS and reassemble the davit upon completion of inspection.

Part 2: REFERENCES:

Type	MRT 3900	
Winch	BHY 5300	
STL	5280 KG	
SWL	2400 KG	

Part 3: TECHNICAL DESCRIPTION:

- 3.1 Contractor is responsible for all ancillary services necessary to complete the specification item. This includes, but is not limited to, strip out, crantage, staging , cleaning, debris removal and disposal, etc.
- 3.2 With the ship’s Electrical Officer the contractor is to ensure the Lockout/Tagout is in place. The contractor is to supply his/her own locks and tags but complete the vessel’s Lockout/Tagout procedure.
- 3.3 Contractor to supply to services of a Palfinger Schat FSR to oversee the overhaul of the Miranda Davit.
- 3.4 The contractor is to remove the FRC cradle from the davit and remove and discard the wire rope falls.
- 3.5 The contractor is to ensure all blocks, sheaves, pins, davit arms and other components that will be removed for servicing are adequately identified as to location prior to removal; in order to facilitate re-installation in correct locations.
- 3.6 The contractor is to remove guide sheaves and FRC cradle to Contractors facility for cleaning, inspection and testing.
- 3.7 The contractor is to remove guide sheaves, including removal of pins & bushings. Contractor is to thoroughly clean components of grease and debris and arrange for inspection by TC Marine Safety Inspector and Owners’ representative.

- 3.8** The contractor's bid is to include the cost of a load test for each assembled sheave. Also quote unit cost per sheave.
- 3.9** All wearing items are to be measured and have their running clearances and measurements recorded. A typewritten copy of the measurements and running clearances is to be made available by the contractor to the Chief Officer during the inspection by the Chief Officer and Transport Canada Marine Safety Inspector.
- 3.10** The readings are to clearly indicate the items and location the readings refer to so as to allow for future referral.
- 3.11** On completion of repairs and/or inspection and subsequent approval by TCMS, davit structure is to be cleaned to a minimum SSPC-SP-6 (ISO 8501-1:1988) or International Paint Hydroblasting Standard HB2M. If oxidation occurs between blasting and application of Intershield 300, the surface must be re-blasted to the specified visual standard prior to application of Intershield 300.
- 3.12** The contractor is to clean the area of the ship's deck and connections to the davit structure in way of the connection welds to a distance of 15 cm. The area is to be cleaned to a minimum SSPC-SP-6 (ISO 8501-1:1988) or International Paint Hydroblasting Standard HB2M to allow visual inspection of the connection welds.
- 3.13** The connection welds are to have NDT completed by a certified company specializing in this testing.
- 3.14** Following inspection the contractor is to apply 1 coat (contractor supplied) Intershield ENA 300 Bronze to a dry film thickness of 5.0 mils, followed by one coat (contractor supplied) Interguard 263 Light Grey to a dry film thickness of 4 mils. Finish with 2 coats Interfine 599 White, DFT 2 mils each, (owner supplied). Finish coat on deck to be 2 coats (owner supplied) Interlac 665, French grey to a DFT of 2 mils each. All coatings to be applied with strict adherence to manufacturers' recommended application instructions.
- 3.15** Contractor to provide proof test results to Owners' representative prior to re-installation and TCMS inspection of the sheaves.
- 3.16** The contractor is to re-assemble all sheaves following inspection and testing by TCMS and re-install at davits.
- 3.17** Contractor to remove the davit cradle to the contractor's facility.
- 3.18** The davit cradle is to be completely stripped of all attachments and/or components and the davit cradle is to be cleaned to a minimum SSPC-SP-6 (ISO 8501-1:1988) or International Paint Hydroblasting Standard HB2M. If oxidation occurs between blasting and application of Intershield 300, the surface must be re-blasted to the specified visual standard prior to application of Intershield 300.

- 3.19** The readings are to clearly indicate the items and location the readings refer to so as to allow for future referral.
- 3.20** Contractor to arrange for inspection, by TCMS inspector and Chief Engineer following cleaning.
- 3.21** On completion of repairs and/or inspection and subsequent approval by TCMS, be cleaned to a minimum SSPC-SP-6 (ISO 8501-1:1988) or International Paint Hydroblasting Standard HB2M. If oxidation occurs between blasting and application of Intershield 300, the surface must be re-blasted to the specified visual standard prior to application of Intershield 300.
- 3.22** The contractor is to apply 1 coat (contractor supplied) Intershield ENA 300 Bronze to a dry film thickness of 5.0 mils, followed by one coat (contractor supplied) Interguard 263 Light Grey to a dry film thickness of 4 mils. Finish with 2 coats Interfine 599 White, DFT 2 mils each, (owner supplied). All coatings to be applied with strict adherence to manufacturers' recommended application instructions.
- 3.23** The davit winch gearbox is to be drained of oil, opened up, cleaned and refilled with new contractor supplied Esso Spartan EP68 oil. (approximately 9 litres.) Used oil to be disposed of ashore.
- 3.24** The gearbox internals are to be inspected by the Chief Engineer before being closed back up. Upon completion the gearbox to be boxed up using a new contractor supplied gasket on the gearbox cover.
- 3.25** The davit winch centrifugal and deadman brakes and sprag clutch assembly to be opened out for inspection by Chief Engineer.
- 3.26** Replace brake linings with owner supplied spares if linings are worn to within 1 mm of screw/rivet heads.
- 3.27** Upon completion of inspection the brake/clutch assemblies are to be assembled in good order and brakes and sprag clutch be proven operational by raising and lowering the contractor supplied load test weights. The deadman brake must return by its own weight to the full "on " position when the handle is released. Brakes and clutch to be serviced as per instructions in the Manufacturer's manual attached.
- 3.28** On completion of inspections and all associated work, contractor to return all components of the Miranda Davit system to vessel for re-installation. Contractor to re-install davit in accordance with manufacturers spec.
- 3.29** Entire Davit structure including brake/clutch housing, winch and winch motor is to be painted with 2 coats, 2 mils DFT each, of Interfine 599 White.

- 3.30** Three new owner supplied cable falls are to be greased using a contractor supplied pressure greasing device and owner supplied grease before the cables are installed by contractor.
- 3.31** Following re-installation, contractor to verify correct operation of davit systems using contractor supplied weights of 1.25 times the SWL prior to returning the FRC. All weights are to be certified as to their total weight before being used. To be completed to the satisfaction of the attending TC/MS inspector and the Chief Officer.

Part 4: PROOF OF PERFORMANCE:

- 4.1** All work to be completed to the satisfaction of the Chief Engineer, FSR and attending TC/MS inspector
- 4.2** All Operation and function of the davit to be verified through operation of the equipment. This will be done by Ship's Officers, with the Contractor in attendance. Following operations and verifications, the Contractor will make any adjustments required in order to establish correct operation of the Miranda Davit System.
- 4.3** Any removed interference items are to be reinstalled and proven operational upon completion of all work.

Part 5: DELIVERABLES:

- 5.1** Copies of all readings in paper and electronic formats.

Spec item #: H-02	SPECIFICATION	TCMSB Field # N/A
H-02 : PORT AND STBD LIFEBOAT DAVIT INSTALL		

Part 1: SCOPE:

1.2 The intent of this specification shall be to remove the port and stbd lifeboat davits and boats and replace them with CCG supply Palfinger davits and boats. The contractor will be responsible for all removals of old equipment and fitting of new equipment as identified herein.

1.3 Part 2: REFERENCES:

Description	Electronic Number
Electric Wiring Diagram	NS1246
Service Area Diagram	NS1328
Installation Manual	NPD DOC-IM-001
General Arrangement	I-1055-0003

2.3 Guidance Drawings/Nameplate Data

2.4 Standards

- 2.1.1.** The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.1.2.** Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.1.3.** Coast Guard ISM Confined Space Entry 7.D.9
- 2.1.4.** Coast Guard ISM Hotwork procedures
- 2.1.5.** Coast Guard ISM Fall Protection procedures
- 2.1.6.** Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.1.7.** CWB CSA 47.1 latest revision Division I, II or III
- 2.1.8.** SSPC-SPT

2.5 Regulations

- 2.3.1.** Canada Shipping Act

2.6 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:

Section 1 - General

1.1 Introduction

The contractor shall remove the port and stbd lifeboat davits and boats and replace them with CCG supply Palfinger davits and boats. The contractor will be responsible for all removals of old equipment and fitting of new equipment as identified herein.

The new lifeboat access will be from the stowed position which requires the construction of a new embarkation stairs to permit access.

The contractor will note that the engine room soft patch which is used for moving large pieces of equipment in and out of the engine room is physically located between the superstructure and the stbd lifeboat. The contractor is to ensure that access is not blocked to this soft patch.

1.2 Supplied Drawings and Information

The MSI drawings are attached for use for covering this upgrade. The MSI drawings are as follows:

- 2942-01-00 CCGS Larsen-Lifeboat Davit Installation Plan
- 2959-01-00 CCGS Larsen-Officers Deck Walkway Extension & Lifeboat Access Platform

1.3 Owners Requirements

The owner will supply the following components to the contractor:

- 2 New Palfinger NPD 11300 Davits
- 2 New Palfinger LBT 750C Lifeboats

All other materials, equipment and labour will be contractor supplied. It is the owner's intention that the successful contractor will be responsible to complete all aspects of this installation. The owner will provide the contractor with vessel access 24 hours per day for the purpose of completing the installation.

1.4 Contractor's Responsibility

It is the contractor's responsibility to follow all applicable federal, provincial and local regulations. The contractor is to adhere to all DFO-Coast Guard / PWGS work requirements and must complete the work to the satisfaction of both the Technical Authority and the attending TCMS Surveyor.

The contractor is also responsible to provide all materials, labour, lighting, ventilation, staging and lifting capacity to complete the required tasks. The contractor is also responsible for all temporary enclosures to facilitate the work, and finally, all clean up and disposal of debris generated due to the work.

Section 2 - Workmanship

2.1 Materials

All materials are the contractor's responsibility. All new plate and sections are to be the minimum Lloyds Grade A or equivalent. All plate and sections are to be clean and primed with a weldable primer prior to fabrication. Material certificates for the steel to be provided. Any substitution of plate or sections is to be made by written request and must be accepted by owner prior to fabrication.

2.2 Welding

All welding to conform to section 19 in the SOW preamble.

2.3 Coatings and Paint Work

The contractor will be responsible to prepare and coat both the new and the heat affected steel in the davit installation areas. The heat affected paint is to be hand tooled to a feathers edge and the current coating reapplied. The contractor is to supply all coatings. All coatings are to be in accordance with the ships painting system. The contractor is to complete the coating and all associated machine tooling to feather back the affected areas. All coatings, glues, and solvents must be supplied with acceptable WHIMS data sheets and correctly marked. The contractor is responsible to remove all containers of paint and solvents from the work place daily.

The new lifeboat davit will arrive painted from the Owner but will require touch ups following assembly and installation on the vessel.

The new embarkation stairs shall have coatings applied by the contractor that comply with the vessels coating system. The embarkation stairs will be painted white to match the superstructure of the vessel.

The contractor will prepare all new and disturbed steel to a SA 2.5 surface profile immediately prior to application of the first coat of Marine Primer. The contractor will apply two coats of Marine Top Coat in way of the primer noted above. The contractor will apply all coatings as per the manufacturers recommendations. All coatings will be supplied and applied in accordance with the vessels coating system.

2.4 Insulation and Linings

The contractor will be responsible to remove all deckhead panels and bulkhead linings as required to complete the work. Care must be taken during removals to avoid any damage. The contractor is responsible to replace and deckhead panels or linings damaged as a result of the work being carried out.

All disturbed insulation is to be replaced with new material and secured in an approved manner. The contractor is to repair and place any damaged expanded metal covering the insulation where found.

2.5 Testing & Inspections

- 2.5.1 The contractor shall perform magnetic particle inspection (MPI) of the davit connection to the vessel before the lifeboat commissioning and after to ensure the connection and welds are free of defects. The work is to be completed to the satisfaction of the attending TCMS inspector and owner's representative. The

completed steel work is to be visually inspected after welding is completed. Welding is subject to the following M.P.I testing:

- 100% for new insert plates and under deck stiffening in way of new davits and embarkation structure.
- The contractor will include a unit price per X-Ray inspection should it be required.

All NDT work to be completed by approved testing personnel. This testing is to be carried out in the presence of the attending TCMS surveyor and owner's representative. All costs associated with the inspection to be included in the contractor's price for known steel work.

- 2.5.2 The owner requires full access to the vessel for inspections by the Owner's personnel and or other Owner appointed representatives.
- 2.5.3 The contractor shall acquire the services of Schat-Harding to assist with the installation, perform an inspection of the completed installation and final commissioning. The contractor will include \$25000 for FSR costs which will be adjusted by 1379 . The contractor will submit approved timesheets and proof of travel costs for the FSR.
- 2.5.4 The contractor is to schedule and facilitate TCMS inspections for the installation work and TCMS for commissioning of the lifeboat. The contractor is to inform the owner of the inspections prior to the surveyor(s) attendance.
- 2.5.5 The contractor is to test the lifeboat as required by TCMS. The contractor shall be responsible for providing all testing equipment and materials and conducting the tests. Any defects noted during the testing in work completed by the contractor are to be repaired by the contractor and testing repeated.

The contractor is responsible for all air quality testing to ensure hot work and entry is permitted. The contractor shall issue and post hot work permits and shall maintain a fire watch.

2.6 Documentation

Three copies of the following documentation are to be supplied upon completion of work scope:

- Material Certificates for Plate & Sections
- CWB Certificates for Welders
- CWB Certificates for Weld Supervisor
- CWB Weld Procedures
- CWB Weld Data Sheets
- NDT Documentation
- Test Certificates
- Calibration certificates for load cells

- TCMS certificates for new Davit and Lifeboat Systems

2.7 Protection of Area from Environmental Damage

It is the contractor's responsibility to protect the vessel from damage due to cold temperatures and water while the davit installation is ongoing. The contractor is to ensure that all still water in the work area is isolated or heat protected. The contractor is to effectively tarp and insulated the area so that other damages are not created. If other damages occur due to ineffective environmental protection, the contractor will repair at the contractor's cost.

2.8 Protection of Area from Addition Damage and Disruption

The contractor is responsible to protect the equipment

Section 3 - Removals

3.1 Lifeboat & Davit Removals

The contractor shall remove the port and stbd existing lifeboats, lifeboat davits and all associated equipment. The removed lifeboat davit, boat and ancillary gear is to be disposed of at the contractors expense as per applicable provincial environmental regulations.

3.2 Lifeboat Davit Electrical Components

The existing davit motor starters are located in the double fan room on the stbd side boat deck at approximately Frame 120.

The contractor will remove the associated starter panels and renew the surrounding insulation and expanded metal to match the existing as close as possible.

The contractor will remove all of the following cabling in it's entirety:

Port Lifeboat

- P-102-3 2C#14 anti condensation heater (feed to be terminated in space in IP57 junction box and tagged as spare)
- P-508-14 3C#12 davit motor
- P508-14-PB 6C#14 Davit Pushbutton station
- P508-14-LS1 2C#14 Raise Limit switch
- P508-14-LS2 2C#14 Raise Limit switch
- Manual Crank limit switch
- P201-11 Port Lifeboat Heating and Battery Charger

Stbd Lifeboat

- P-102-4 2C#14 anti condensation heater (feed to be terminated in space in IP57 junction box and tagged as spare)
- P-508-15 3C#12 davit motor
- P508-15-PB 6C#14 Davit Pushbutton station
- P508-15-LS1 Raise Limit switch
- P508-15-LS2 Raise Limit switch

- Manual Crank limit switch
- P201-12 Stbd Lifeboat Heating and Battery Charger

The contractor shall be responsible for the removal of the existing deck penetrations and repair of the deck plating where the penetrations were removed. All disturbed cable trays are to be secured upon completion of all work.

All disturbed cable transits other than deck penetrations will be supplied with blank transit blocks as per the appropriate size.

3.4 Embarkation Platform

The contractor shall remove the existing embarkation platform and access ladders.

Section 4 – Installation

4.1 Lifeboat Davit Installation

The new lifeboat and davit will be installed in the location as identified in the MSI drawings

4.2 Davit Assembly

The contractor shall be responsible for receiving and unloading the davit supplied by the owner at the contractor's facility. The davit components shall be stored in a secure location until the time of assembly and installation on the vessel.

The contractor shall be responsible for all davit assembly, outfitting and rigging as per Palfinger instructions or drawings . The contractor shall obtain Palfinger approval of the assembled davits and rigging. The contractor will ensure a Palfinger FSR is present for the assembly and fitting of the new Davits. See Installation Manual NPD-DOC-IM-001 .

Each of the new port and stbd davits require 220 Liters of hydraulic oil to be filled into the reservoir and there is 28.5 Liters of hydraulic oil in each of the three accumulators. The contractor will supply this new oil and fill the system by using a filtering cart with all new 10 Micro hydraulic filters. For clarity, each davit will require 220 Liters + (3 X 28.5 Liters) to fill to operating level. The contractor will supply 700 litres of Hydraulic Fluid with additional fluid above required for the install retained by the vessel . The Hydraulic oil will be Petro Canada MV Arctic 15.

4.3 Davit Connections

The davit will be supplied by the Owner and all additional steel and materials required shall be supplied by the contractor. The new davit is to be connected to the deck as indicated on the supplied MSI drawings

4.4 Lifeboat Installation

The contractor shall be responsible for receiving and unloading the lifeboat supplied by the Owner at the contractor's facility. The lifeboat shall be stored in a secure location until the time

of installation on the vessel. The lifeboat shall be installed in accordance with the Palfinger Installation, Operation and Maintenance Manual. The contractor is responsible for all materials, equipment and labour required including cranes and rigging for lifeboat installation.

4.5 New Lifeboat Davit Electrical Requirements

The new davits are supplied as one complete unit. There is only one electrical feed connection per davit.

1. The contractor will supply 2 new 50Amp breaker compatible with existing MCC. The new breakers are to be GE, Tri Break, Cat # TB13050BWE09 or equivalent.
2. The new power feeds will be fed from the Emergency Switchboard located in the Emergency Generator room located on the Officers deck.
3. The contractor will supply 2 new 8/4 AWG marine rated cables with integrated marine braid with outer PVC jacket. One of these conductors will be used as a ground. The contractor is responsible to determine cable lengths.
4. The new feed will be run from the emergency generator room switchboard to each new davit. The contractor will ensure that the new cable has enough slack to allow the davit to rotate between the stowed and lowered position. The contractor will supply a gland to secure the cable to the davit.
5. The contractor will supply all necessary hangers and glands as needed.
6. The davit has a 51mm non-threaded hole for the contractor supplied glands suited to the new supply cable.
7. The contractor will install a bonding cable from the new davit base adjacent to the cable inlet to the ship's deck. The bonding cable will be of sufficient length to allow the davit to rotate between the stowed and lowering position.
8. The contractor will also install all new kick-pipes, glands, transit blocks as required where new cabling passes between decks and bulkheads.
9. The contractor will also assemble and connect all other wiring to the davit arms. This is pre-wired at the factory and is detailed in the included NS1246_B electrical diagram.

All materials to be Transport Canada approved for use onboard ships. All work to comply with TP 127 Ships Electrical Standards.

4.6 Lifeboat Outfit

The contractor is responsible for filling up the lifeboat diesel fuel tanks. The contractor will coordinate with the vessel Chief Engineer to add diesel fuel to the fuel tank. The contractor will note that as part of the hotwork permit system, no fuel transfers can take place when hotwork is ongoing. The diesel fuel 180 Litres, will be supplied by the vessel.

4.7 Lifeboat Embarkation Access and Walkway

The new embarkation stairs, walkway and railing shall be constructed and installed by the contractor as per the details given on the supplied MSI drawing number 2959-01-00 CCGS Larsen-Officers Deck Walkway Extension & Lifeboat Access Platform

Section 5 – Relocations

5.1 Life Raft racks

The contractor shall relocate one existing life raft rack aft of each Davit to a location suitable to a new location agreed upon by the Chief Engineer.

5.2 Existing Recycling container

The contractor shall remove the existing aluminum recycling container and shorten by 16” on the aft side for access to the lifeboat davit and boat. The existing container is bolted to a raised pad located in the center of the container.

The contractor will also remove the existing single door and modify so that it is a double door arrangement. The contractor will fabricate an arrangement so that the doors can be kept open by way of a metal hook. The contractor will also fabricate a means of keeping both doors closed. After all modifications the container will be re-mounted in the original position.

Section 6 – Interference Items

Section 6 – Commissioning

6.1 Lifeboat Davit Commissioning

The contractor will be responsible for testing the davit with lifeboat and on the vessel in accordance with Transport Canada Technical Publication 7323 (TP 7323) and Palfinger requirements.

The contractor shall be responsible for supplying all materials and labour required to conduct the testing to the satisfaction of the Owner, the attending Transport Canada surveyor and Schat Harding representatives. This will include supplying sandbags to represent the WLL of the lifeboat with the mass distributed to represent the positions of the personnel and equipment in the lifeboat for the test to demonstrate that the lifeboat mass is sufficient to overcome the frictional resistance of the winch, fall, blocks and associated gear.

For the test where the brakes are abruptly applied while launching, the contractor shall use water bag(s) and load cell(s) instead of the lifeboat on the davit. The water bag and rigging shall have a mass of 1.1 times the WLL of the lifeboat. The contractor shall work with the local Transport Canada office, Palfinger and the owner to develop an acceptable loading arrangement.

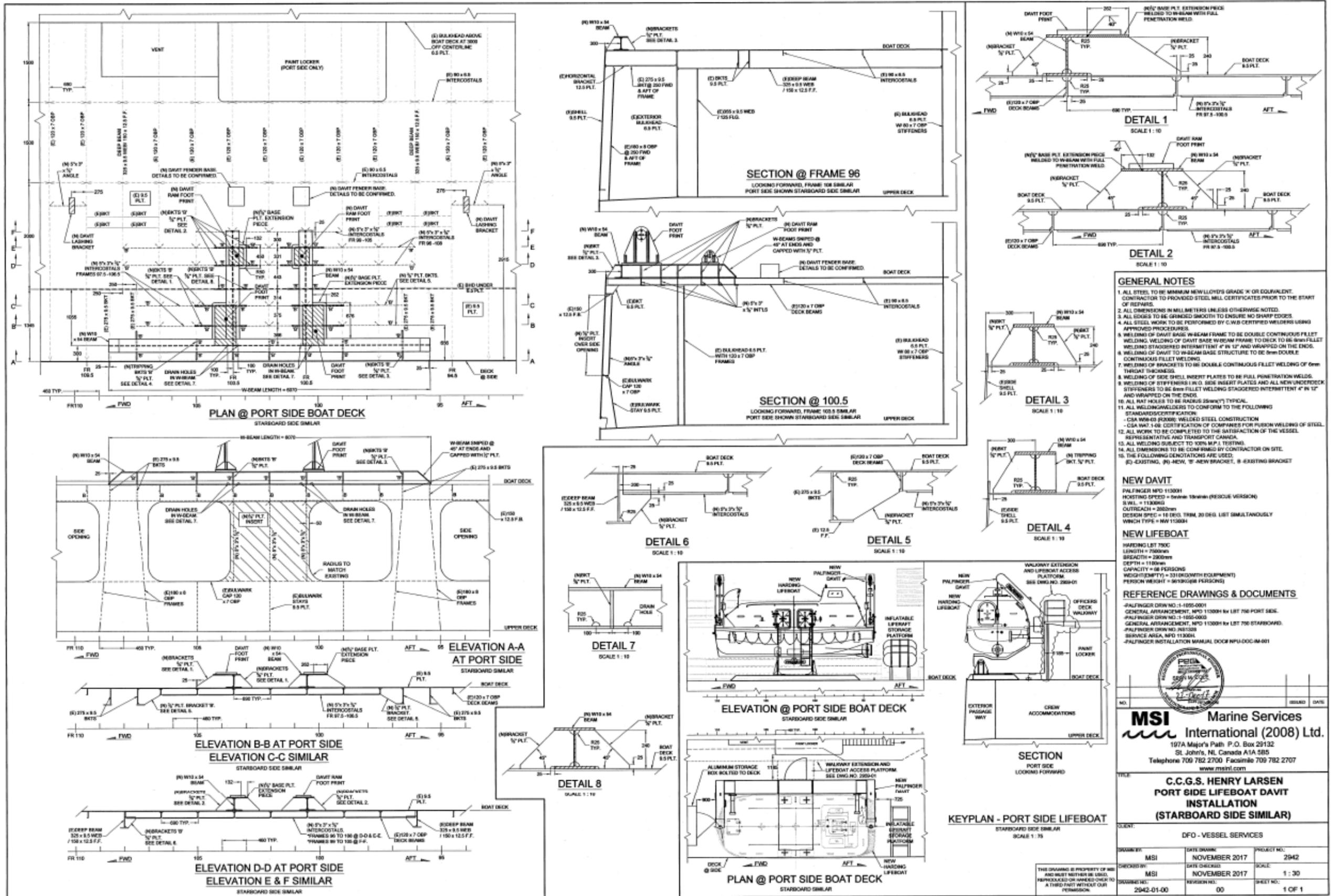
The contractor shall perform magnetic particle inspection (MPI) of the davit connections to the vessel before and after the lifeboat commissioning to ensure the connections and welds are free of defects.

The contractor shall be responsible for preparing and submitting a commissioning procedure to the Owner, Transport Canada and Palfinger for approval prior to the commissioning of the davit.

No testing is to be under taken by the contractor without approval from the Owner, Transport Canada and Palfinger. Upon completion of the davit testing, the contractor shall supply a report to the Owner outlining the procedures followed during testing and any problems that occurred.

6.1 Arising Work

If, during the completion of this work, it is evident that additional work items are required to complete the general scope of work, the contractor is to immediately notify the owner's representative or the Technical Authority. The arising work will be defined and agreed to by the owners before such work is undertaken.



- GENERAL NOTES**
1. ALL STEEL TO BE MINIMUM NEW LLOYD'S GRADE 'X' OR EQUIVALENT. CONTRACTOR TO PROVIDE STEEL MILL CERTIFICATES PRIOR TO THE START OF REPAIRS.
 2. ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE NOTED.
 3. ALL EDGES TO BE GRIND SMOOTH TO ENSURE NO SHARP EDGES.
 4. ALL STEEL WORK TO BE PERFORMED BY C.W.B. CERTIFIED WELDERS USING APPROVED PROCEDURES.
 5. WELDING OF DAVIT BASE W-BEAM FRAME TO BE DOUBLE CONTINUOUS FILLET WELDING. WELDING OF DAVIT BASE W-BEAM FRAME TO DECK TO BE 6mm FILLET WELDING STAGGERED INTERMITTENT 4" IN 12" AND WRAPPED ON THE ENDS.
 6. WELDING OF DAVIT TO W-BEAM BASE STRUCTURE TO BE 6mm DOUBLE CONTINUOUS FILLET WELDING.
 7. WELDING OF BRACKETS TO BE DOUBLE CONTINUOUS FILLET WELDING OF 6mm THICK SUBSTRINGS.
 8. WELDING OF SIDE SHELL INSERT PLATES TO BE FULL PENETRATION WELDS.
 9. WELDING OF STIFFENERS I.R.O. SIDE INSERT PLATES AND ALL NEW UNDERDECK STIFFENERS TO BE 6mm FILLET WELDING STAGGERED INTERMITTENT 4" IN 12" AND WRAPPED ON THE ENDS.
 10. ALL RADIUS TO BE RADIUS 25mm(TYP).
 11. ALL WELDING/WELDERS TO CONFORM TO THE FOLLOWING STANDARDS/CERTIFICATIONS:
 - CSA W48.03 (RWS); WELDED STEEL CONSTRUCTION
 - CSA W47.1-08; CERTIFICATION OF COMPANIES FOR FUSION WELDING OF STEEL
 12. ALL WORK TO BE COMPLETED TO THE SATISFACTION OF THE VESSEL REPRESENTATIVE AND TRANSPORT CANADA.
 13. ALL WELDING SUBJECT TO 100% M.P.I. TESTING.
 14. ALL DIMENSIONS TO BE COMPARED BY CONTRACTOR ON SITE.
 15. THE FOLLOWING DENOTATIONS ARE USED:
 - (E)-EXISTING, (N)-NEW, (B)-NEW BRACKET, (X)-EXISTING BRACKET

NEW DAVIT
PALFINGER NFD 11000H
HOISTING SPEED = 30mm/10min (PREVIOUS VERSION)
S.W.L. = 11300kg
OUTREACH = 2800mm
DISCHARGE SPEED = 18 DEG. TRIM, 20 DEG. LIST SIMULTANEOUSLY
WINCH TYPE = NW 11000H

NEW LIFEBOAT
HARDING LIT 750C
LENGTH = 2500mm
BREADTH = 2300mm
DEPTH = 1100mm
CAPACITY = 68 PERSONS
WEIGHT (EMPTY) = 3310kg (WITH EQUIPMENT)
PERSON WEIGHT = 3630kg (68 PERSONS)

REFERENCE DRAWINGS & DOCUMENTS

- PALFINGER DRAWING NO. 1-1055-0001
- GENERAL ARRANGEMENT, NFD 11000H BY LIST 706 PORT SIDE.
- PALFINGER DRAWING NO. 1-1055-0003
- GENERAL ARRANGEMENT, NFD 11000H BY LIST 706 STARBOARD.
- PALFINGER DRAWING NO. 1051028
- SERVICE AREA, NFD 11000H
- PALFINGER INSTALLATION MANUAL DOOR NFD-DOC-04-001

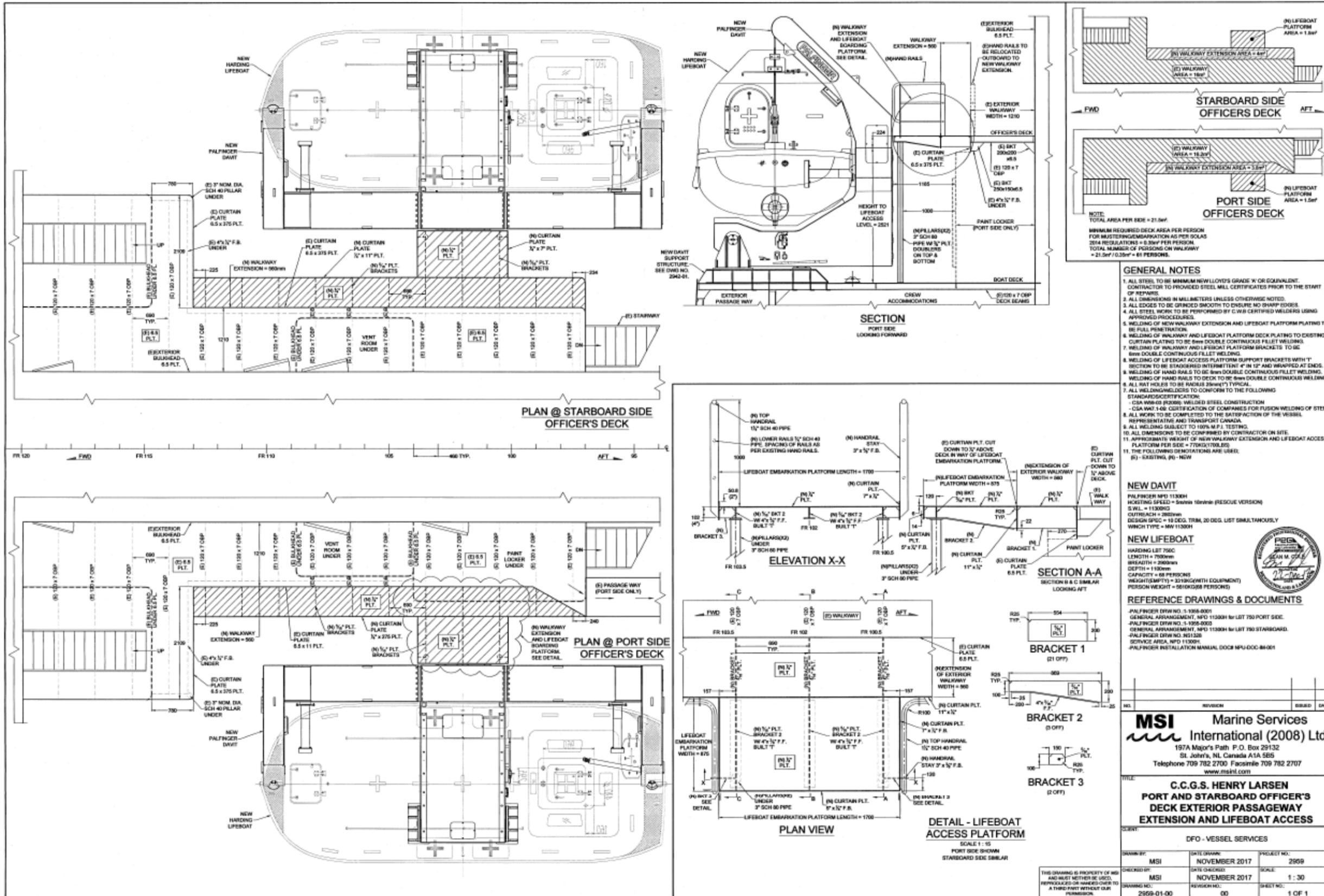
MSI Marine Services International (2008) Ltd.
197A Major's Path P.O. Box 29132
St. John's, NL Canada A1A 5B5
Telephone 709 782 2700 Facsimile 709 782 2707
www.msintl.com

C.C.G.S. HENRY LARSEN
PORT SIDE LIFEBOAT DAVIT
INSTALLATION
(STARBOARD SIDE SIMILAR)

CLIENT: DFO - VESSEL SERVICES

DRAWN BY: MSI	DATE DRAWING: NOVEMBER 2017	PROJECT NO.: 2942
CHECKED BY: MSI	DATE CHECKED: NOVEMBER 2017	SCALE: 1:30
DRAWING NO.: 2942-01-00	REVISION NO.: 00	SHEET NO.: 1 OF 1

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Spec item #: H - 03	SPECIFICATION	TCMSB Field # N/A
H-03 : MULTIBEAM INSTALL		

Specification
CCGS Henry Larsen
**Installation of Multi-Beam
Sounder**

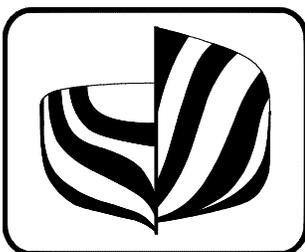
Reference 217-049

Revision 4

January 30, 2018

Prepared for:

Canadian Coast Guard
Ottawa, Canada



Prepared by

Robert Allan Ltd.
Naval Architects and Marine Engineers
230 - 1639 West 2nd Avenue
Vancouver, BC V6J 1H3 Canada
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<p>NOTE: THIS SPECIFICATION IS BASED ON A STANDARD NUMERIC FORMAT. NOT ALL NUMBERS ARE NECESSARILY ALLOCATED IN THIS SPECIFICATION, ONLY THOSE LISTED IN THE TABLE OF CONTENTS.</p>
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Technical Specification

CCGS Henry Larsen

Installation of Multi-Beam Sounder

For: Canadian Coast Guard
Ottawa, Canada

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• PART 100 - GENERAL

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100.1 Description

This specification covers work to be completed onboard the CCGS *Henry Larsen* during its dry-docking work period to install a multi-beam echo sounder.

The equipment to be installed includes:

- Kongsberg EM 302 multi beam sounder transducers (1 degree transmit and 2 degree receive)
- Kongsberg EM 302 transceiver and processing unit
- Kongsberg EM 302 Hydrographic Workstation and remote display
- Applanix POS MV 320 with inertial sensor and GPS antennas
- AML Micro SV water Sound Velocity Meter

The work also includes changes to a portion of the ship's air conditioning equipment in room 181 with the installation of dedicated "mini-split" HVAC for transceiver room

This specification is intended as an instruction to the Contractor, and as such, it is written in the positive imperative voice.

Overall Work Summary:

Install the multibeam transmit (Tx) transducer array within the portside #2 double bottom void and the receiver (Rx) transducer array within the transverse double bottom cofferdam underneath the forward end of the generator room compartment. Enclose the transducer arrays with structural casings integrated into the existing ship structure to form watertight boundaries. Protect transducers by installing Kongsberg acoustic ice windows.

Install transceiver processing unit and its uninterruptable power supply (UPS) within room #181, which is located outboard portside main deck level.

Install three large structural stainless steel conduits for the transducer casings to the main deck level. These are used to run cabling from the arrays to the transceiver.

Install auxiliary power, sensors and cabling to connect components including the GPS and Inertial sensors, the processors and hydrographic work station.

Install new Sound Velocity Sensor in a separate pipe connection tapped off Receiver transducer conduit.

Relocate an existing echo sounder that would interfere with transmitter array.

Install a mini-split air conditioning outdoor unit in port side valve space. Install indoor wall units in room 181 to cool transceiver unit. Install insulated copper piping for refrigerant to connect units.

Provide all material required, including any material required to complete the work which is not explicitly identified in specification or drawings

Perform all work to the satisfaction of the approval authorities, and consistent with good shipbuilding practice where standards are not applicable.

- **102. DEFINITIONS**

- **102.1 Organizations**

- Owner - Canadian Coast Guard
- Contractor - The organization or business selected to perform the work
- Design Agent - Robert Allan Ltd.
#230 1639 West 2nd Ave
Vancouver, BC V6H 1K3

Contact:

Evan Gatehouse, P.Eng
604-736-9466
egatehouse@ral.ca

- Owner’s representative - A person or organization selected by Owner to represent them in the Shipyard during construction of this vessel

Contact:
Lindsay Fyfe
Project Manager
Marine Engineering-Integrated
Technical Services
Canadian Coast Guard
200 Kent Street, 7th Floor,
Station 7W065
Ottawa, ON, K1A 0E6
tel: (613)998-1652,
cell: (613)698-5306
fax: (613)993-3519
email: Lindsay.fyfe@dfo-mpo.gc.ca

- Administration. - Canada
- Class - Lloyds Register of Shipping

- **102.2 Terminology**

- Equal - considered equal to the specified materials or equipment in terms of: availability of spare parts/service, efficiency, performance, reliability, service life, size, weight. Approval from the CCG is required if the Contractor wishes to deviate from any of the specified materials or methods. Contractor must present factual evidence to support the claim that a component qualifies as "equal" to any indicated in the Specification. The Owner will make the final determination of equipment considered as "equal" to specified materials or equipment
- Good Shipbuilding - designs, applications, and

Practice

procedures proven successful through long term in similar vessels engaged in comparable service

• **102.3 Abbreviations**

- ANSI - American National Standards Institute
- ASME - American Society of Mechanical Engineers
- ASTM - American Standard for Testing and Materials
- CCG - Canadian Coast Guard
- ECDIS - Electronic Chart Display Information System
- GPS - Global Positioning System
- HVAC - Heating, Ventilation, and Air Conditioning
- IACS - International Association of Classification Societies
- IMO - International Maritime Organization
- ISO - International Standards Organization
- OFE - Owner Furnished Equipment
- NACE - National Association of Coating Engineers
- SNAME - Society of Naval Architects and Marine Engineers
- TBD - To Be Determined

• **102.4 Language and Units**

- Drawings, reports, specification, manuals - English
- Labels and nameplates - English
- Units - SI metric units

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- **103. SERVICE CONDITIONS**

- Ambient air temperature
 - All materials supplied and work carried out by the Contractor shall be adequate to meet service conditions of outside air temperature of -40 °C to +35 °C
 - All materials supplied and work carried out by the Contractor shall be adequate to meet service conditions of wind velocity of 50 knots

- **104. REGULATION AND CLASSIFICATION**

- All work shall be in accordance with the Standards as applicable, including (but not limited to):
 - SOLAS, International Convention for the Safety Of Life At Sea
 - 2008 IS Code – International Code on Intact Stability, 2008 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel
 - CSA W59-03, Welded Steel Construction (Metal Arc Welding)
 - CSA 28, Canada Shipping Act - Hull Construction Regulations
 - CSA 33, Canada Shipping Act – Marine Machinery Regulations
 - CSA 29, Canada Shipping Act - Hull Inspection Regulations
 - CSA 57, Canada Shipping Act – Safe Working Practices Regulations
 - Lloyds Register Rules and Regulations for the Classification of Ships
 - MOSHR, Canada Labour Code – Marine Occupational Safety and Health Regulations
 - Provincial Occupational Safety and Health Regulations, for the province where the work is performed

- IACS No. 47 Shipbuilding and Repair Quality Standard (1996) Part B – Repair Quality Standard for Existing Ships
- TP 127E, Transport Canada Marine Safety – Ship Electrical Standards
- IEEE STD 45 – 1998 Recommended Practice for Shipboard Electrical Installations
- Note: In case of conflict between any of these standards, then the most stringent requirements will prevail.

- **106.5 Deviation from Design Documents**

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-
- Prior to commencement of the work obtain Owner's Representative approval of a standard Contractor form for processing Requests for Changes (including claims for extras and credits) which will be used for all changes throughout the building contract
- Notify the Owner's Representative, Class, and National Authorities as applicable of any proposed departures from the Specification, Drawings or other Documents, whether in principle or detail, and obtain approvals before committing such changes
- Provide cost and schedule impact quotations in writing for all Requests for Changes by the Owner or by the Contractor.
- Obtain approvals of Requests for Changes in the form of a Change Order before commencing any work related to the change(s).
- Implement all Change Orders following the terms and conditions of the Contract.

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- **115. DOCUMENTS**

- As Built Drawings
 - Update the installation drawings of this project provided with this Specification to “As-Built” status
 - Update existing ship’s drawings that are affected by this work to “As-Built” status
 - Provide PDF copies of drawings to Owner’s Representative for review
 - Provide Final copies of drawings in unprotected PDF and Autocad format to Owner’s Representative

- Robert Allan Ltd. will provide the Contractor with uncontrolled Autocad format drawings associated with the project for modification to “As-Built” status
- Use CCG CAD Standards. No restrictions as to drawing use shall be identified nor implied. The Contractor is bound by and is to follow the requirements of the CCG “Specification for Electronic Technical Data Deliverables”. All electronic files shall be unprotected with full editing available to the reader.
- Vendor documents
 - Provide the Owner’s Representative with the original copies of complete instruction manuals, drawings, and other documents for all items of machinery, electrical and electronic equipment, and mechanical equipment installed
 - Make photocopies of manufacturer’s documents for shop/installation purposes to preserve and protect the original documents
 - Refer to Kongsberg, Applanix GPS, and AML Oceangraphic installation documents for further details of installing specific pieces of equipment

Project Drawings

Robert Allan Ltd.

Number	Drawing Name
14110	Docking Plan
21260	Rx and Tx Transducer Housing *
21261	Transducer Structure Modifications
21262	Transducer Conduit Arrangement
30000	Modifications Overview Arrangement
61510	Cable Arrangements
61600	Electronic Equipment Arrangement
94000	GPS Antenna Mast Modifications

Kongsberg Maritime Equipment

* KM drawings modified by RAL to account for different steel thickness requirements of CCG.

Number	Drawing Name	Responsibility to Manufacture
430256	Casing Ice Window 2 deg Rx	Yard
353859	Endplate A Ice Window Rx	Yard
353860	Endplate B Ice Window Rx	Yard
354393	Sidecover A Ice Window Rx	Yard
354395	Sidecover B Ice Window Rx	Yard
430238	Casing Assembly Protected Rx 2 deg	Assembly
353856	Bolster Short Ice Window Rx	KM
353857	Bolster Ice Window Rx	KM
353858	Bolster Plate Ice Window Rx	KM
430244	Mounting Frame Assembly, Rx 2 deg	KM
353047	Ice Window Section Ice Window Rx	KM
211475	Outline Dimensions Rx Module	KM
218461	End Section Tx Casing Ice Window	Yard
392135	Casing Ice Window 1 deg Tx Mounting Frame	Yard
392136	Arrangement Drawing Casing w. 1° Tx Mounting Frame and Ice Window	Assembly
391928	Mounting Frame Assy Modified 1 deg System Tx Module Ice Window	KM
218453	Ice Window Section Tx Modules	KM
211473	Outline Dimensions Tx Module 1	KM
211474	Outline Dimensions Tx Module 2	KM
302051	Outline Dimension Transceiver Unit	KM
360016	Mounting Frame Assembly Protected System Rx 1 Degree EM302	KM
392135	Casing Ice Window 1 Deg Tx	KM

120. PRODUCTION

- **120.1 Scheduling**

- Immediately after being notified of Contract acceptance, collaborate with Owner's Representative in preparation of an overall production schedule
- Provide sufficient personnel, material, and equipment resources to

complete the specified work, within the period of the contract

- Extra effort required due to the Contractor's failure to maintain the production schedule will not be paid by CCG
- Provide weekly progress reports to Owner's Representative and highlight any critical issues

• **120.5 Cleanliness**

- In addition to cleaning of steel surfaces, maintain a clean and tidy condition during construction and outfitting and thoroughly clean bilges, voids, compartments, tanks, pockets, and any spaces which were affected by Contractor's work.
- Obtain approval signature of Owner's Representative before final closing up of any tank
- Take proper precautions to protect any machinery, equipment, fittings, stores or items of outfit which might become damaged by exposure, movement of materials, paint, sand, grit or shot blasting, airborne particles from sand, grit or shot blasting, welding, grinding, burning, gouging and painting
- Repair any damage or replace any equipment damaged caused by the Contractor or by improper storage
- Ensure all spaces, compartments and areas of ship affected by Contractor's work are left as least as clean as they were found
- Do not allow any Contractor personnel to smoke on the ship
- Do not eat meals aboard the ship unless approved by Owner's Representative
- Do not use ship's washrooms unless approved by Owner's Representative
- Do not enter any ship's cabins, offices, bridge, control room, mess, or lounge areas except to perform the work required by this specification

• **120.6 Safety**

- Block the ship on drydocking blocks at a height sufficient to allow bottom access
- Ensure safe working conditions exist in workshops and at the ship
- Provide adequate guardrails. Provide ladders, gangplanks and bridges of adequate strength, and secure against shifting.
- Provide adequate lighting and temporary ventilation where required
- Keep the site orderly and free from obstruction and hazards
- Comply with all requirements of DFO 5737 *CCGS FLEET SAFETY MANUAL* applicable to dry-docking and repair work
- Bidders shall include with their bids the name and qualifications of their Safety Manager or Supervisor who will ensure that these requirements for workplace safety are met
- All conditions, stipulations etc. listed in apply to any Sub-Contractors

employed by the Contractor to carry out any work for this Contract

- The Contractor shall supply the Project Officer with Marine Chemist's Certificates in accordance with TCMS TP 3177E before any cleaning, painting or hot work is commenced in confined spaces. Certificates shall clearly state the type of work permitted and shall be renewed as required by the regulations
- Provide copies of confined space and fall protection certificates to Project Officer for all workers engaged in this work
- Contractor will provide all equipment and personnel for confined space entry including air testing, rigging, ventilation, and rescue teams
- Include all costs for transportation, rigging, staging, slinging, crantage, garbage removals, washing water, oily waste removal, hazardous waste removal, and installations of parts and equipment such as may be required to carry out the work
- Supply all tools required to perform the work
- Advise the Project Officer prior to starting any hot work
- Provide sufficient suitable fire extinguishers and a fire watch during any hot work and until the work has cooled
- Do not use Ship's fire extinguishers except in an emergency
- Preparations for entry and hot work will include ventilation and testing of the following as a minimum but may include other spaces or tanks:
 - Portside No 2 DB Void tank (frame 127 to 140)
 - Aft Stability tank (frame 127 to 140)
 - Pipe Tunnel (frame 122 to 168)
 - The double bottom cofferdam (frame 120 to 122)
- Drain, clean, and test the double bottom purifier lube oil tank (portside, frame 122 to 127), double bottom Fuel Oil overflow tank (stbdside, frame 122 to 127), and No 6 fuel oil tanks (portside and stbdside, frame 146 to 165) to ensure a safe working environment.

- **125. INSPECTION AND SURVEY**
-

- Keep Owner's Representative fully informed of progress of all work so timely inspection may be carried out
- Failure of Owner's Representative to discover a defect during construction will not relieve Contractor of their responsibility to complete work in a satisfactory manner, and to comply with applicable regulations and standards and the Contract requirements
- Failure to give notification does not absolve the Contractor of the responsibility of providing the Owner's Representative with the opportunity to inspect any item
- The construction of the vessel will be inspected under various authorities including Transport Canada Marine Safety (TCMS), Lloyds

Register, however, the ultimate responsibility for acceptance rests with the Owner's Representative

- Provide an inspection and test plan of all completed work
- Submit a written report of all tests including any original field notes and photographs
- In addition to mandated weld testing, thoroughly clean all shell welds and provide staging for access for Owner's Representative to carry out complete visual inspection of weld before and after welding
- In addition to any Class requirements for NDT testing, x-ray each transducer casing welds in at least 2 locations each, with locations determined by Owner's Representative
- Dye penetrant test all transducer casing weld seams to bottom shell
- Dye penetrant test all transducer casing internal welds including supporting ribs and plates
- Open up and examine defective welds to determine extent of defect and subsequently re-weld to approval. Provide further radiography to establish total extent if defects extend beyond initial test site

- **126. WARRANTY**

- Refer to Contract

- **150. TESTS AND TRIALS**

- Provide Owner's Representative with a minimum 24 hours notice of testing
- Arrange for witnessing of all testing required by Class and Regulatory Agencies
- Perform a comprehensive set of tests and trials throughout the construction and/or upon completion of vessel to satisfy the following:
 - Satisfy Regulatory Authorities vessel and all systems and equipment are fit for purpose, and in compliance with all applicable regulations
 - Prove that execution of all work is in accordance with the Specification
 - Carry out trials on all items of newly installed equipment to ensure that they are functioning correctly and that the items of equipment and related infrastructure (cabling, conduit, etc.) are correctly installed and are functioning as per their intended purpose.
 - Perform trials on any mechanical or electrical items of outfit

that may have been disturbed or disconnected during the modifications have to demonstrate they have been properly reconnected and are fully operational, as well as being fully compliant with all applicable codes

- Provide two hard copies and one electronic copy of test records
- Under direct supervision of Kongsberg FSR, power up echo sounder equipment prior to vessel leaving drydock to ensure operation. Do not operate without verifying with Kongsberg.

- After construction
 - Air Pressure test tank integrity of new casings and affected tanks / voids
 - Use vacuum testing frames to test all new hull welds from outside
 - pressure test of cable conduits
 - Test duration to be 24 hours or as agreed with Owner's Representative

- **PART 200 - STRUCTURE**

- **201. CONSTRUCTION**

- **201.5 Workmanship**

- Provide compensation as approved in writing by Owner's Representative and Class where it is necessary to cut holes or openings in structural members for pipes, cables, access, or other purposes or where indicated by Drawings
- Preserve hull structural integrity. Refer any questions involving such integrity to the Design Agent
- Neatly and carefully execute all plate edges and holes burned in structure.
- Make all cuts regular in outline without notches.
- Openings burnt in shell, deck, or other main strength members to be circular or have well- rounded corners.
- Grind edges of all structure creating smooth and bullnosed edges to retain coatings
- Remove all erection clips or bridges and grind any projections smooth. Removal of material from plate to be avoided, but if occurring, fill with weld deposit. Grind such locations flush and smooth where exposed to view inside or out
- Provide limber holes, typically 50 mm radius, to achieve total drainage to lowest point of compartment or tank if existing limber holes are blocked by new work

- **201.7 Welding**
-

- Prepare and fair all plate edges before welding
- Where stress concentrations may arise at corners, edges, and terminals, continue welding runs around the joint for a distance of at least 38 mm
- At intersections of new hull plating to existing weld seams, cut back seams 150mm from corners or cross joints. Re-weld with beveled full penetration welds
- Leave finished work clean and smooth with all projections and rough welds chipped flush and ground smooth

- Chamfer edges of insert plates on a four-to-one bevel down to thickness of surrounding plate, and make corners with a generous radius
 - Ensure surfaces of all parts to be welded are clean, dry, and free from rust, scale, and grease
 - Use double continuous fillet welds on internal structures
 - Provide sound, and uniform welds substantially free from slag inclusion and porosity. Take care to ensure thorough penetration and fusion; avoid undercutting. Before a sealing run is applied to a butt weld, expose the clean metal of the original root run
 - Cut out and re-weld all welds not meeting these conditions
 - Follow a welding sequence to eliminate as far as practicable any "locked in" stresses or objectionable distortion in structure
 - Ensure certification by the Canadian Welding Bureau in accordance with Standard W47.1-03 "Certification of Companies for Fusion Welding of Steel Structures," Division 1, 2.1 or 2.2.
 - Work to the current version of CCG Welding Specification
 - Prior to commencing modifications, supply welding engineer stamped welding procedures, specifications and supporting weld procedure data sheets for the grades of material, thickness range, processes and positions of welding required to undertake the work
 - Provide Procedure Qualification Records for welding procedures of full penetration groove welds in Grades E / EH-36. In addition to transverse tensile tests, hardness and charpy-v-notch toughness @ - 40° C shall be recorded for the weld metal
 - List CWB qualified welders being assigned to the work and supporting qualification cards.
 - Ensure external weld beads are ground smooth and do not provide local obstructions to flow that will cause bubble formation and interfere with transducer operation
 - Use welding materials according to CSA W59-13 Welded Steel Construction
-
- **205. CONSTRUCTION MATERIALS**
 - Class E or EH Grade steel as shown on drawings for transducer casings only will be supplied by

Owner

- See Kongsberg Maritime drawings for scope of Owner supplied transducer casing equipment
- Other hull steel will be the same grade as the existing grade of steel of the hull
- Minor brackets, supports, not part of hull structure etc. ASTM A36 mild steel
- stainless steel - ASTM 316L
- aluminum - 5086-H116 plates, 6061-T6 shapes

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- **PART 300 - OUTFIT AND FURNISHINGS**

- **380. PAINTINGS AND COATINGS**

- **380.1 General**

- Carry out surface preparation, application techniques and conditions, drying between coats, coverage, mixing instructions, etc., in strict accordance with paint manufacturer's instructions
- Follow standard CCG Painting Specification
- Record air and surface temperatures and dew point during each painting process to demonstrate compliance with manufacturer's requirements
- Touch-up or repaint soiled, damaged, or missed areas to approval of Owner's Representative
- Take care in the application of final coats to ensure furnishings and fittings are protected from excess spray paint and, in particular, give special consideration to electronic or other equipment liable to more serious damage due to excess spray
- **DO NOT PAINT ICE WINDOWS**
- Protect existing transducers and bottom plugs from blasting/painting or other damage
- Contractors schedule must allow sufficient weather related delays for painting due to the time of the refit project
- The Void spaces/Pipe Tunnel are double bottom areas. Access holes through the ship's hull may be required to facilitate the specified work. All costs associated with this must be included in the work. This will include providing a written repair plan including weld procedures acceptable to TCMS and also include internal tank coating touch-up in way of welding
- Close Void spaces after final inspection, using new ¼" neoprene gaskets on all manholes. Coat fasteners with an approved anti-seize compound. Do not use power tools to tighten manhole fasteners

- **380.2 Surface Preparation**

- For exposed bare steel: clean, descale by sandblasting to SSPC-SP6 (ISO 8501-1:1988) and degrease metal surfaces
- Remove all blast debris
- Inform Owner's Representative when surface preparation is to be put in hand, and obtain approval of paint manufacturer's representative of same prior to painting

- **380.3 Painting, Quality Control**

- Retain a paint manufacturer's representative or NACE qualified paint coating inspector acceptable to Owner, for field service inspection, guidance and to produce and maintain a preparation and coating quality control program during the work in collaboration with, and to approval of Owner's Representative, including:

- recommendations regarding product selection and application
 - check on surface preparation
 - check on application equipment and procedures
 - check of each coat before application of subsequent coat
 - check on dry film thickness as each coat is applied
 - submission of interim and final painting reports to Owner's Representative
- Painting reports will comprise a record of inspections and observations of time and date of application, film thickness, ambient conditions, quantities used, and any general remarks, within two working days of application
- Verify and document the specified dry thickness of each coat by approved means
- Make good any deficiencies below recommended film thickness by additional coats, or recoating as required

- **380.4 Application Procedures**
 - Apply all coatings in strict accordance with manufacturer's instructions
 - Apply each coat evenly and uniformly without spray or brush marks, "curtains", "holidays", or other defects
 - Take care when painting perforated or expanded sheathing, perforated liners, screens of ventilator intakes, etc., to ensure holes are not clogged with paint
 - Do not paint the following:
 - bearings
 - bronze pins
 - electrical insulation and fittings
 - electrical or electronic control panels
 - floorplates
 - gaskets
 - gearing
 - grease fittings
 - machined surfaces
 - Monel metal fittings
 - nameplates
 - packing
 - pump shafts
 - screw threads
 - stainless steel
 - strainers
 - universal joints
 - valve stems
 - in general, all working parts
 - zinc anodes

- **380.5 Paint Schedule**

a) #2 Void Space / Double Bottom

Areas with existing coatings adjacent to new steel:

- Royal coatings Easy Prep or equivalent as per the manufacturer's data sheet. Then high pressure water washed (min 3,000 psi fresh water). This will etch the surfaces and prepare the intact existing epoxy coatings for re-coating.
- 1 coat of WASSER MC-Tar 100 Red 5 to 7 mils D.F.T
- Hold for inspection of void spaces by owner's representative and CG retained consultant.
- 1 coat WASSER MC-Ballast Coat beige

Bare metal:

- sandblast to SSPC-SP10
- clean all blasting debris from space
- 1 coat of WASSER MC-Miozinc 100 or equivalent at 3 to 5 mils D.F.T
- Hold for inspection of void spaces by owner's representative and consultant
- 1 coat of WASSER MC-Tar 100 Red 5 to 7 mils D.F.T
- Hold for inspection of space by owner's representative and consultant.
- 1 coat WASSER MC-Ballast Coat beige

New steel used in construction:

- sandblast to SSPC-SP10
- Apply Pre-weld primer to all new steel used in fabrication
- Ensure priming coats used as pre-weld primer are non-toxic to welders and do not detract from quality of weld
- Wire brush areas of excess weld primer in way of welds to eliminate porosity due to excess primer thickness
- 1 coat of WASSER MC-Tar 100 Red 5 to 7 mils D.F.T
- Hold for inspection of void spaces by owner's representative and consultant.
- 1 coat WASSER MC-Ballast Coat beige

b) Hull, Exterior

- sandblast to SSPC-SP10
- 1 coat International Paint - Intershield 163 Inerta 160 colour black, at 18-50 mils D.F.T. (20 mils nominal thickness)
- Note: For application, the steel temperature must not be lower than 10°C (50°F) and the humidity must not exceed 80%. Application is by hot twin feed gun

c) Aft Stabilization Tank (transducer conduits)

- All vents and transducers and related equipment are to be blanked or otherwise protected prior to and during cleaning, blasting and painting activity.
- Wash internal surfaces of the tanks with high pressure water solution (min 3,000 psi fresh water) with a mixture of 50:1 Holdtight 102® Solution (Vapcor Inc.) or equivalent to de-salinate and prevent flash rusting
- Remove and dispose of all cleaning water, sludge and debris generated by cleaning process
- Hold for inspection of tanks by owner's representative and CG retained consultant
- Local spot blast areas to SSPC-SP6 (ISO 8501-1:1988) where conduit brackets or penetrations have been welded
- Clean all sandblasting debris from tank
- 1 coat of WASSER MC-Miozinc 100 or equivalent at 3 to 5 mils D.F.T
- 1 coat WASSER MC-Tar 100 Red or equivalent at 5 to 7 mils D.F.T
- Hold for inspection of tanks by owner's representative and CG retained consultant
- 1 coat WASSER MC-Ballast Coat beige or equivalent at 4 mils D.F.T

• **PART 800 – DOMESTIC SYSTEMS**

• **815. AIR CONDITIONING**

AC Units

- Install 2.5 kW cooling capacity, mini-split type air conditioning compressor/condensor unit in port side valve space
- Unit must be certified by manufacturer to cool at temperatures from -10 °C to +40 °C
- Install a drain pan and connect drain pipe to a new Liberty Pumps model 404 automatic drain pump in same space
- Connect pump outlet to deck scupper drain directly under Water Tight Door #12. Fit pipe with spring loaded check valve

Evaporator Units

- Install a wall mounted cooling unit (fan cooled evaporator) in transceiver room 181 located as per drawing 61600
- Install condensate drain pan tubing and connect to drain from canteen sink (111-SD-040 shown on drawing 25-0013-03)

Electrical

- Install power cables to drain pump (5.2 FLA) and outdoor unit compressor air conditioning unit (breaker capacity and cable size to suit model selected) from engine room
- Provide power cable to indoor units from panelboard P205

Piping

- Connect evaporator to condenser with copper refrigerant piping with suitable cable glands at deck and bulkhead penetrations
- Insulate piping with closed cell foam

Commissioning

- sleeves. Avoid use of split type sleeves where possible
- Vacuum purge copper piping and fill with refrigerant by licensed HVAC technician

- **PART 900 – CONTROL, COMMUNICATION, AND NAVIGATION**

- **920. NAVIGATION AIDS**

- **920.1 Echo Sounder Installation**

- **Transducer Arrays**

- Refer Kongsberg Installation manual & Block Diagram for details of equipment installation requirements
- See drawings for details of structural modifications for Transmission and Receiving transducers
- Modify internal hull structure in accordance with drawings to install transducer casings
- Ensure weld sequence of casing installation do not cause distortion during construction
- Ensure faces of both arrays are in the same horizontal plane with tolerances as required by Kongsberg
- Use shims as described in installation manual to level transducers mounting frame
- Drill and tap mounting brackets using transducer mounting frames as templates
- Drill and tap perimeter of casing ring using ice window panels as templates
- All bolts for mounting of transducers and ice windows will be supplied by Kongsberg
- Torque and secure bolts in accordance with Kongsberg instructions

- **Anodes**

- Fit bolted zinc anodes inside each transducer casing
- Size and quantity as recommended by Kongsberg manual

- Hull Fairing plates
 - Fit steel fairing plates where the transducers protrudes from the hull
 - Obtain guidance and final approval from Project Officer and Kongsberg representative as to slope and final treatment of welds. Generally plate edges and welds are to be ground smooth to avoid bubble formation
 - Bevel fairing plates to meet hull plating and casing sides.

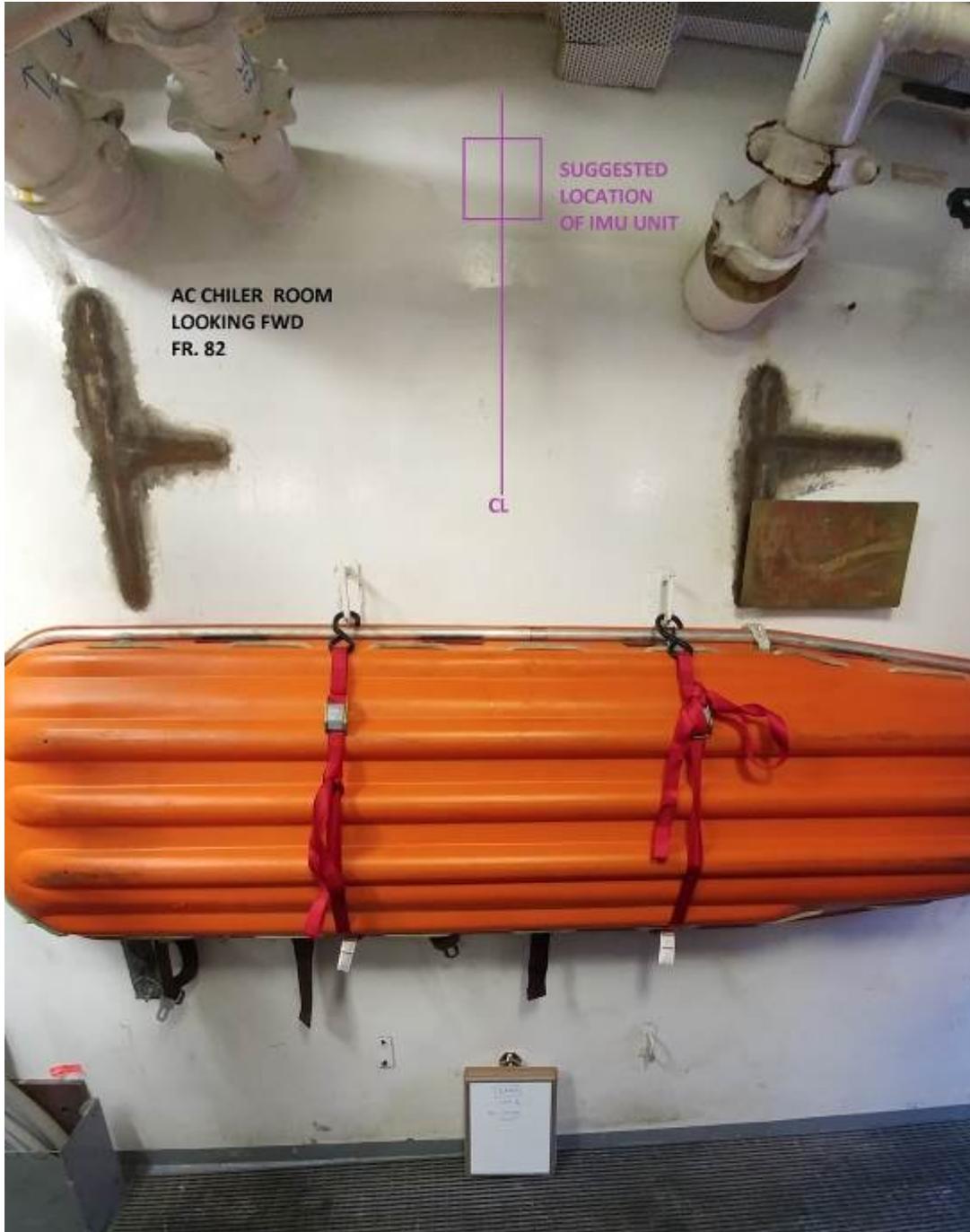
- Existing Depth Sounder
 - Relocate existing port side depth sounder transducer and cable as shown on drawings
 - CCG staff will exchange port and stbd depth sounder cables in bridge so port transducer will operate at different frequency than new EM302 transducers



- EM302 Transceiver
 - Subdivide Room 181 with new partition bulkhead and new door with locking doorknob as shown on drawing
 - Fabricate a rack or brackets suitable to mount unit in Room 181
 - Mount Uninterruptible Power Supply (UPS) for transceiver in same room
 - Install power cable from panel P205 to transceiver,
 - P205 is located on main deck, outside of ship's laundry,
 - Install a new circuit breaker in panel P205, if no suitable spare breaker is present
 - Provide a 3 kVA 208 -> 230 V single phase transformer to power the transceiver

- Cable Conduits
 - Install three 316L stainless steel pipe conduits between transducer arrays to main deck as shown on drawings
 - Cut hole in ship side or bottom into stabilizer tank / double bottom if required to insert conduit pipes
 - Use class approved conduit pipes
 - Fit conduits with support brackets within aft stabilizer tank in accordance with drawings
 - Fit conduits with Rextec watertight cable glands
 - Use full penetration welds on all joints
 - Fit conduits with vent pipes leading to ship exterior through a ball valve and gooseneck fitting
 - Use appropriate welding procedures and materials to join stainless steel pipe to steel collars and brackets
 - Pressure test to 35 psi to satisfaction of Owner's Representative

- EM302 Processing Unit
 - Do not use collared connections
 - Vent all conduits with a common vent pipe leading to a gooseneck fitting on outside deck, closed with a ball valve
- POS MV Processing Unit
 - Mount sounder Processing Unit in a 19" rack located in designated hydrographic space as per drawings
- POS MV Inertial Motion Unit
 - Install unit in a 19" rack located in the designated hydrographic space in accordance with manufacturer's instructions for vibration and shock mounting
 - Weld a steel mounting plate to forward bulkhead frame 82 of AC Chiller Compartment
 - Bolt the Inertial Motion unit to the mounting plate, oriented so that unit axis is aligned with vessel longitudinal and transverse axis
 - Drill oversize mounting plate bolt holes so unit can be rotated slightly to ensure accurate orientation



- Hydrographic Work Station
 - Install the EM302 Hydrographic Work Station within the designated hydrographic space
 - Install Post Processing unit in space

- Remote display monitor
 - as shown on drawings
 - Fit the monitor on the Bridge console as shown on drawings



- GPS antennas
 - The existing MSAT Space Comm Antenna on the portside yard arm is to be removed. See Iridium Pilot MSAT Removal Specification.
 - Fit two GPS antennas to the forward mast with pre-fabricated temporary jig
 - Ensure center of jig is aligned with center of mast and remove after antenna mounts are welded to mast
 - Affix new brackets and supports for antennas as per drawing
 - Install cables down stbd. side of mast to Inertial Motion processor
- AML micro-x SV-Exchange Sound Velocity Meters
 - Install sound velocity meter sensor in a sea water pipe connected to Receiver transducer conduit as shown on drawing
 - Provide pump to circulate water

- Electrical Cables
 - Provide grill on outlet of pipe to prevent ice ingestion
 - See drawings for locations of cables
 - Refer to Kongsberg installation manual for details of cabling interconnections
 - Refer to Kongsberg installation manual for details of power requirements for each piece of equipment
 - Use existing cable trays or supports where possible
 - Secure cables to wireways at intervals required by TP127E/Lloyds Register
 - Use armoured cables or cables in threaded metal conduit in areas where cables are exposed to mechanical damage
 - When cables are not supplied by manufacturer, use approved type
 - Penetrate decks and bulkheads using existing cable transits where possible
 - For new penetration use approved new water and/or firetight glands based on the requirements of the penetration
 - Use Roxtec or equal glands for transducer cables at upper conduit exits
 - Avoid installing signal cables near power cables
 - Tag all cables with metal circuit identifying markers
 - Terminate cables with approved fittings
 - Megger test all power cables

- **920.2 Vessel Coordinate Survey**

- CCG/Kongsberg will conduct this survey
- The Contractor provides access, labour of two persons for two days and any required staging to support this survey.
- Staging will allow GPS antenna, IM unit, and transducers to be accurately sighted by surveyor's equipment.
- While docked, a terrestrial based survey will be conducted to design the vessel coordinate system. The coordinate system shall be designed so the X-Axis is parallel to the keel and along the centerline (preferably). The Y-axis is perpendicular to that and the Z-axis is positive down.
- The Vessel Reference point (RP) is the alignment crosshairs on the IMU. An attempt to measure the IMU mounting angles relative to the Vessel coordinate system must be undertaken (as such the IMU Unit should be mounted as close as possible in the same orientation as the vessel system). The IMU unit may be sighted through a doorway. The IMU is mounted so that it can be rotated to accurately align with the vessel coordinate system
- The Sonar shall be surveyed to determine the XYZ linear offsets from the RP and mounting angles of the transducers relative to the Vessel Coordinate system. The waterline height (estimate of the normal static draft) from sonar face as well as from IMU must be determined. This line must be related to the ships plimsoll marks in order to adjust this value as a result of changes in loading etc.
- If a squat test has ever been conducted with this vessel and recorded, it should also form part of the final survey report deliverable. The final report shall have a schematic, description of methodology and table of values for all points of interest.
- Kongsberg will implement these values during system setup and will be confirmed though operational tests once vessel is wet

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Spec item #: H-04	SPECIFICATION	TCMSB Field # N/A
H-04 : Deck Crane Quinquennial Survey		

Part 1: SCOPE:

- 1.1 The intent of this item is to service the fwd, port and stbd deck cranes and obtain TC/MS Quinquennial Certification.

Part 2: REFERENCES:

- 2.1 Manufacturer Jacobs Brothers Machine Works

Forward Crane- Well Deck (SN 1140-1, 8.5 Tonnes SWL/13.5 m)
Aft Crane Stbd Side Boat Deck (SN 1140-3 10 Tonnes SWL/10m)
Aft Crane Port Side Boat Deck (SN 1140-2 10 Tonnes SWL/10m)
Hydraulic Operating Pressure 2000 PSI
Relief Valve Setting 2250 psi

- 2.2 Winch
Braden CH 165A-25 Planetary Hoist
- 2.3 Jacobs Crane Manual

Part 3: TECHNICAL DESCRIPTION:

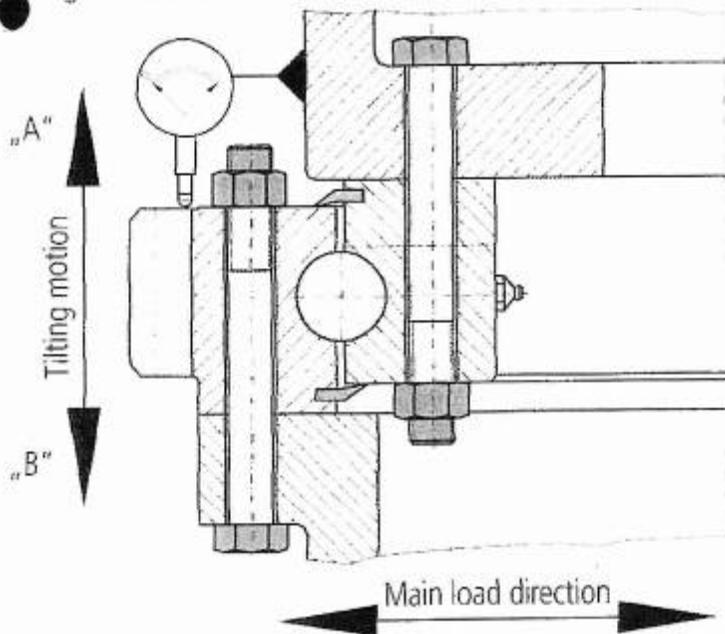
- 3.1 Contractor is responsible for all ancillary services necessary to complete the specification item. This includes, but is not limited to, strip out, crantage, staging , cleaning, debris removal and disposal, etc.
- 3.2 This item to done in conjunction with the Crane Cab renewal.
- 3.3 In conjunction with the ship's Electrical Officer the contractor is to ensure the Lockout/Tagout is in place. The contractor is to supply his/her own locks and tags but complete the vessel's Lockout/Tagout procedure. Breakers locations: Fwd Crane MCC No 6 P509-31 (Bubbler Compartment) Port Crane MCC No 7A P510-4. Stbd Crane MCC No 7A P510-7 (Diving Salvage Locker)
- 3.4 All hydraulic hoses, steel lines and fittings on the crane assembly are to be replaced with new. This includes hydraulic hoses, steel lines and fittings not specifically mentioned in

this specification. All completed hose and steel line assemblies are to be flushed and pressure tested to 1.25 times the working pressure. This will include all hydraulic hoses to the crane operating controls. All hydraulic fittings and hose ends are to be wrapped in 'Denso' tape or equivalent upon completion of all testing.

- 3.5** The Contractor is to perform a visual inspection and function test on the crane before any work commences. The intent is to identify any items requiring servicing not included in the specification document. Particular attention should be paid to any additional defects. These items will be dealt with by 1379 action.
- 3.6** The Contractor is to provide the Chief Engineer with a typewritten service report detailing the as found condition and any items requiring servicing not included in the specification document. The service report is to detail any items requiring servicing not included in this specification including parts and labour required and a detailed timeline for completing the items requiring servicing not included in the specification document.
- 3.7** The Contractor is to inspect the slew bearings and swing motors and brake assemblies. The Contractor is to verify the tightness of all slew bearing retaining bolts. Slewing Bearings SAMHYUN Engineering Co Ltd www.samhyun-eng.com Serial No SHE-KC170400-1125-01 (20) (03)
- 3.8** All hydraulic valves to be inspected
- 3.9** The Contractor is to perform a Rock Test on the crane prior to any work. See below for details of the Rock Test. The results are to be properly tabulated and a typewritten copy presented to the Chief Engineer within 24 hours of being taken.

Procedure

Tilting clearance measurement



1. Determine and mark the measuring point, if possible in the main load direction, on all bearing rings.
2. Attach the dial gauge – see sketch.
3. Apply the defined tilting torque, minimum 50% of the maximum operational load in “A” direction.
4. Set the dial gauge to zero.
5. Apply the defined tilting torque, minimum 50% of the maximum operational load in “B” direction.
6. The measured value displayed corresponds to the tilting clearance and serves as a basis for comparison for later inspections.

- All subsequent measurements are performed at the same measuring point, with the same loads, at the same position of the bearing rings relative to one another and in the same sequence.
- All the measured values are to be recorded.
- For purely axial or radial loads, tilting clearance is inspected by applying an additional tilting load.

- 3.10** The Contractor is to remove the winch wire from all three deck cranes and dispose of the old wire ashore.
- 3.11** All necessary hydraulic lines are to be disconnected. All open hydraulic hoses and/or fittings are to be capped or plugged to prevent ingress of foreign matter.
- 3.12** The winch of each crane is to be removed from the crane to the Contractor’s premises. Contractor to disassemble each winch assembly including hydraulic components and

- brake assembly as per manufacturer's instructions to examine all serviceable components. All parts and materials to be contractor supply.
- 3.13** Clean the winch drums surface to minimum SSPC-SP-6 (ISO 8501-1:1988) or International Paint Hydroblasting Standard HB2M. If oxidation occurs between blasting and application of Intershield 300, the surface must be reblasted to the specified visual standard prior to application of Intershield 300.
- 3.14** Coat the winch drum with two coats of Intershield 300 anti-corrosive epoxy and a further two coats of Intergard 345 (Black).
- 3.15** Clean and lay out all components for inspection. Examine all components as per manufacturer's instructions and in conjunction with the Chief Engineer determine new components required.
- 3.16** The winch is to be reassembled using new parts as required. A shop test is to be completed on the on the assembled winch assemblies.
- 3.17** The contractor is to replace the winch wire on the three deck cranes with new owner supplied winch wire. The wire is to be greased using a contractor supplied pressure greasing machine and owner supplied grease before being installed.
- 3.18** The winches are to be secured to the cranes with new contractor supplied fasteners. Per winch, Four 1-8 UNC SAE Grade 8 plated capscrews fitted with hardened flat washers. Torqued to 650-710 ft-lbs. Reconnect all hydraulics.
- 3.19** Hydraulic lift cylinders are to be marked to ensure they are returned to their original positions. The hydraulic lift cylinders are to be lifted from the cranes and taken to the contractor's workshop.
- 3.20** All disconnected hydraulic fittings are to be blanked off on the cranes to prevent ingress of foreign material.
- 3.21** Completely disassemble the lift cylinders for inspection. Cylinders are to be honed to remove wear marks.
- 3.22** The cylinder pins and securing brackets are to be measured. All wearing items are to be measured and have their running clearances and measurements recorded. The measurement /running clearance readings are to clearly indicate the items and location of the readings to allow for future referral.
- 3.23** All items are to be cleaned and laid out for inspection by Chief Engineer and TC/MS inspector. Following inspection the lift cylinders are to be reassembled using new owner supplied seals and bearings.

- 3.24** Once assembled the lift cylinders are to be bench tested to prove correct operation of the new seals.
- 3.25** Two coats of (contractor supplied) Interprime 198 Code Number CPA-098, are to be applied to the cylinders, to a dry film thickness of 5.0 mils each coat. Finish with 2 coats Buff Intersheen 579, Code Number LAA033, DFT 2 mils each, (owner supplied) to the exterior of the lift cylinders. All coatings to be applied with strict adherence to manufacturers' recommended application instructions
- 3.26** Lift cylinders are to be reinstalled on the vessel in good order. All pins to be greased and locking bolts are tightened. All hydraulics to be reconnected.
- 3.27** All necessary hydraulic lines are to be removed from the main and second stage boom assemblies. All hoses to be capped or plugged to prevent ingress of foreign matter. Remove boom assemblies and transport to contractors premises.
- 3.28** Remove Wear Strip Retainers (51, 53) and Wear Strips (52, 54) from 2nd stage boom Assembly.
- 3.29** Completely disassemble 2nd stage boom assembly and Extension Cylinder assembly.
- 3.30** All surfaces of the Main Boom Assembly, 2nd stage boom assembly and the exterior of the Extension Cylinder assembly are to be cleaned to remove all traces of oil and blast cleaned to a minimum SSPC-SP-6 (ISO 8501-1:1988) or International Paint Hydroblasting Standard HB2M. If oxidation occurs between blasting and application of Interprime 198, the surface must be re-blasted to the specified visual standard prior to application of Interprime 198.
- 3.31** The interior of the Extension cylinder is to be polished to remove any wear marks and bore checked for diameter and out of round. The readings are to be recorded and typewritten report delivered to C/E within 2 business days of being taken.
- 3.32** The Ext Cyl Pins (Front and Rear) (20, 23) and their corresponding securing points on the 2nd stage boom assembly and Main Boom assembly are to be cleaned for inspection and measured for wear and out of round. The readings are to be recorded and typewritten report delivered to C/E within 2 business days of being taken.
- 3.33** The Boom Hinge Pin (3) and its corresponding securing points on the Main Boom assembly and Upper Tower Assembly are to be cleaned for inspection and measured for wear and out of round. The readings are to be recorded and typewritten report delivered to C/E within 2 business days of being taken.
- 3.34** All parts will be inspected by the Chief Engineer.
- 3.35** The Main Boom Assembly and 2nd stage boom assembly are to be ultrasonic thickness tested by certified NDT technician at 20 points as determined by the Chief Engineer with

the measurements recorded and typewritten report delivered to C/E within 2 business days of being taken.

- 3.36** Following visual inspection and ultrasonic testing the contractor is to apply 2 coats of (contractor supplied) Interprime 198 Code Number CPA-098, to a dry film thickness of 5.0 mils each coat. Finish with 2 coats Buff Intersheen 579, Code Number LAA033, DFT 2 mils each, (owner supplied) to all surfaces of the Main Boom Assembly, 2nd stage boom assembly and exterior of the extension cylinder. All coatings to be applied with strict adherence to manufacturers' recommended application instructions.
- 3.37** The contractor is to paint the extension cylinder distance markings and main boom SWL markings using contractor supplied red paint as per the existing markings.
- 3.38** Reassemble the extension cylinder assembly using new owner supplied parts.
- 3.39** Bench test the assembled extension cylinder to the working pressure to check for smooth operation and leaks in the presence of the Chief Engineer.
- 3.40** Install new owner supplied wear strips on the 2nd stage boom assy.
- 3.41** Completely reassemble the 2nd stage boom assembly and Extension Cylinder assembly into the Main Boom Assembly using all new contractor supplied hydraulic hoses and hydraulic steel lines and fittings and return to the vessel.
- 3.42** Remove the Wear Pad Assemblies (Detail 2) and disassemble and clean for inspection. All parts will be inspected by the Chief Engineer.
- 3.43** Reassemble and reinstall the Wear Pad Assemblies using new owner supplied Wear Pads.
- 3.44** Remove the Skid Pad Assembly (Detail 3) from the Main Boom Assembly and disassemble and clean it for inspection. All parts will be inspected by the Chief Engineer.
- 3.45** Reassemble and reinstall the Skid Pad Assembly into the Main Boom Assembly using new owner supplied Skid Pads.
- 3.46** Reinstall the Main Boom Assembly onto the Upper Tower Assembly.
- 3.47** Reinstall the hydraulic lift cylinders and reconnect all hydraulics.
- 3.48** Remove the Rotary Coupling Assy (item 71) from the crane and transport it to the contractor's premises.
- 3.49** Disassemble, clean, and lay out the Rotary Coupling Assy for inspection by the Chief Engineer.
- 3.50** Running clearance between item 1 (Rotary Shaft) and item 2 (Rotary Tube) of Rotary Coupling Assembly is to be measured and recorded. The manufacturer's limit is 0.013".

- 3.51** Following inspection by the Chief Engineer the Rotary Coupling Assy is to be re-assembled using new owner supplied parts.
- 3.52** Bench test the assembled Rotary Coupling Assy to 1.25 times the working pressure to check for smooth operation and leaks in the presence of the Chief Engineer.
- 3.53** The test procedure is to plug a pressure port on the rotary barrel and introduce a regulated pressure of 3000 psi to the corresponding port on the rotary shaft and slowly turn the rotary coupling assembly through 360 ° checking for leaks and/or pressure drop.
- 3.54** Proof of calibration of pressure gauge is to be provided to the Chief Engineer before testing.
- 3.55** The test is to be performed on each of the four ports in turn.
- 3.56** Following the Rotary Coupling Assy servicing return the Rotary Coupling Assy to the crane and re-install it in good order.
- 3.57** Re-connect all hydraulic hoses.
- 3.58** Replace all disturbed covers etc on the crane.
- 3.59** Blocks are to be removed from crane falls and transported to Contractor's facility for opening up and inspection of all components.
- 3.60** Blocks are to be opened up completely, all parts to be thoroughly cleaned prior to inspection. All grease passages are to be proven clear.
- 3.61** All wearing items are to be measured and have their running clearances and measurements recorded. A typewritten copy of the measurements and running clearances is to be made available by the contractor to the Chief Officer during the inspection by the Chief Officer and Transport Canada Marine Safety Inspector.
- 3.62** The measurement/running clearance readings are to clearly indicate the items and location the readings refer to so as to allow for future referral.
- 3.63** All parts, including cheek plates, sheaves, bushings, sheave pins, swivel head fittings and partition plates to be inspected for excess wear, fractures and distortion, by the Chief Officer and Transport Canada Marine Safety Inspector.
- 3.64** Contractor to apply one coat of Intershield ENA 300 Bronze to a DFT of 5 mils followed by one coat of Interguard 345 Black.
- 3.65** Defective and/or worn parts to be replaced with owner supplied parts prior to re-assembling.
- 3.66** Block components to be lubricated in accordance with manufacturer's recommendations, and re-assembled.

- 3.67** On completion of repairs and/or inspection and subsequent approval by TCMS, contractor to apply 2 coats owner supplied Interprime 198 Red (owner supplied) to a dry film thickness of 2.0 mils. All coatings to be applied with strict adherence to manufacturers' recommended application instructions.
- 3.68** Following re-assembly, each block to be load tested by a TC Marine Safety recognized test firm, to achieve a Safe Working Load of 10.5 tons. Test certificates for each block to be supplied to Chief Officer on completion of tests.
- 3.69** Blocks to be reinstalled on respective cranes and tested for correct operation
- 3.70** The cable sheaves (3 per crane) are to be removed from the cranes and taken to the Contractor's facility for inspection by Chief Officer and Transport Canada Marine Safety Inspector..
- 3.71** Sheaves, sheave pins and bushings to be cleaned of grease and corrosion prior to inspection. All grease passages are to be proven clear.
- 3.72** All wearing items are to be measured and have their running clearances and measurements recorded. A typewritten copy of the measurements and running clearances is to be made available by the contractor to the Chief Officer during the inspection by the Chief Officer and Transport Canada Marine Safety Inspector.
- 3.73** The measurement/running clearance readings are to clearly indicate the items and location the readings refer to so as to allow for future referral.
- 3.74** All parts, sheaves, bushings, sheave pins, to be inspected for excess wear, fractures and distortion, by Owner's Representative and TC Marine Safety Inspector.
- 3.75** All sheaves are to be load tested and certificates supplied to the Chief Officer.
- 3.76** Defective and/or worn parts to be replaced with owner supplied prior to re-assembling.
- 3.77** Contractor to apply 1 coat contractor to apply 1 coat (contractor supplied) Intershield ENA 300 Bronze to a dry film thickness of 5.0 mils to sheaves and (1) one coat of Interguard 345 Black.
- 3.78** Components to be lubricated in accordance with manufacturer's recommendations and re-assembled.
- 3.79** Sheaves to be reinstalled on respective cranes and tested for correct operation.
- 3.80** The contractor is to provide all equipment and personnel to load test the three deck cranes to the satisfaction of the Chief Officer and attending TCMS Surveyor and provide certificates.
- 3.81** Following all work the three deck cranes are to be load tested to the satisfaction of the Chief Officer and attending TCMS Surveyor.

- 3.82 All weights are to be certified as to their total weight.
- 3.83 The contractor's personnel will operate the deck cranes during the load tests.
- 3.84 Following all testing all new and disturbed hydraulic fittings are to be covered with Denso tape or equivalent.

Part 4: PROOF OF PERFORMANCE:

- 4.1 All work to be completed to the satisfaction of the Chief Engineer, Chief Officer and attending TC/MS Surveyor.
- 4.2 All the cranes will be test run by the ship's crew to test for leaks and correct operation to the satisfaction of the Chief Engineer. The Contractor is to verify the operating pressure, relief valve setting and correct safety device operation.
- 4.3 Any removed interference items are to be reinstalled and proven operational upon completion of all work.

Part 5: DELIVERABLES:

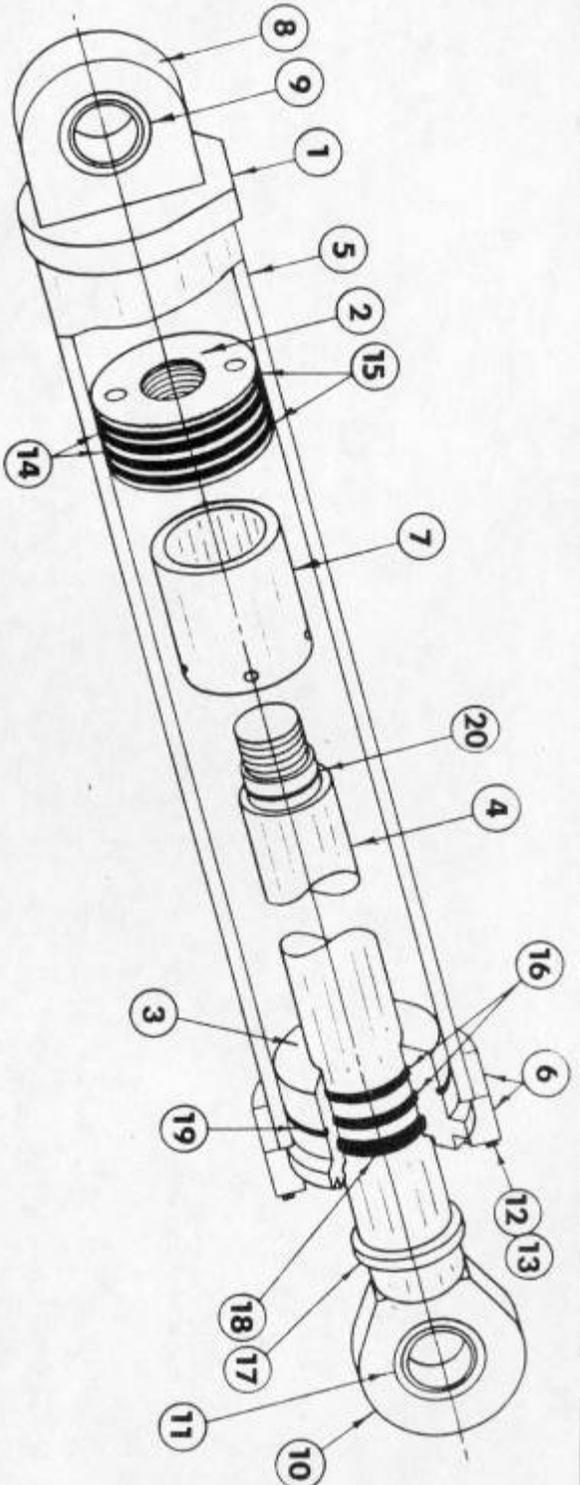
- 5.1 The contractor is to provide the Chief Engineer with a service report including; as found condition, parts replaced, work performed, length and number and fittings of hydraulic hoses, measurements, and test certificates. The report is to be typewritten and 1 hardcopy and 1 electronic copy in pdf format provided.

HYDRAULIC LIFT CYLINDER

To disassemble hydraulic lift cylinder for seal replacement.

1. Elevate boom and brace to hold.
2. Pull top cylinder pin out and lower cylinder horizontally to rest on the tower. Pull top pin and lower second cylinder if necessary.
3. Remove rod end hydraulic hose line and allow oil to drain into a clean container. Pull piston rod out as far as possible. ,
4. Remove cylinder head retainer bolts and pull piston rod clear of cylinder tube.
5. Inspect and wipe clean of oil all visible parts and determine those parts deemed necessary to replace.
6. To strip piston head remove piston nut lock screw and turn piston head c/clockwise while holding rod end. Remove piston and seals.
7. To remove rod bushing pull down piston rod and remove over threaded piston head end. Inspect "O" ring, wear rings, and seals. Replace if necessary (See your manual for seal kit).
8. To reassemble cylinder clean and oil all parts, caution should be taken while replacing rod head bushing on piston rod so as not to damage internal seals.
9. Re-assemble by reversing procedures 6, 5 & 4.

NO	PART NO	DESC	QTY	NO	PART NO	DESC	QTY
1	D10417-1	Cyl. Base	1	12	Sae	3/4" Flat Washer	12
2	C10424-1	Piston & Nut	1	13	Grade 8	3/4" N/C Bolt	12
3	C10418-2	Cyl. Head	1	14	W2-8000-500	Wear Ring	2
4	C10425-2	Piston Rod	1	15	37507250	Piston Seal	2
5	D10417-5	Cyl. Tube	1	16	W2-5250-625	Wear Ring	2
6	C10418-1	Retaining Ring	1	17	110-082	Wiper Seal	1
7	C10425-1	Destroke Tube	1	18	001-267	Rod Seal	1
8	C10425-3	Tail Section	1	19	265	"O" Ring	1
9	32SF52	Tail Bearing	1	20	242	"O" Ring	1
10	C10424-2	Rod Anchor	1				
11	32SF52	Rod Bearing	1				



NOTE

When ordering replacement parts, quote crane serial no., parts no., description and qty.
 Quantities shown are for one cylinder only.
 For complete 8" cyl assy quote part no. D10417

8" LIFT CYL. ASSY. D10417

JACOBS BROTHERS MACHINE WORKS LTD. DELTA B.C.

HYDRAULIC EXTENSION CYLINDER

Para: A To remove hydraulic extension cylinder it is necessary to remove sheave head assy. so a through check should be made to determine if this step is necessary.

1st Remove main boom inspection plate and inspect hydraulic hose line fittings to see if they are leaking. Tighten if necessary.

If hose lines require replacing tie a long length of rope securly to both lines unscrew fitting from cylinder, pull hoses out from rear end of main boom, disconnect hoses from manifolds and replace hoses, reverse procedures to replace hoses.

NOTE: Cylinder must be retracted during disassembling and re-assembly.

- Para: B
1. Mark hyd. hose lines. (identify for reassembly.)
 2. Disconnect hoses from rotary coupling and cap hose lines (See hydraulics diagrams) tie a long length of rope to hose line to guide hoses thru. main boom of crane.
 3. Remove rear ext. cyl. pin and seperate cylinder assy. from boom assy. Remove sheave head assy. for access to cyl.
 4. Remove front cylinder pin. and seperate cylinder assy. from booms. Inspect and replace hydraulic cyl. lines if necessary.

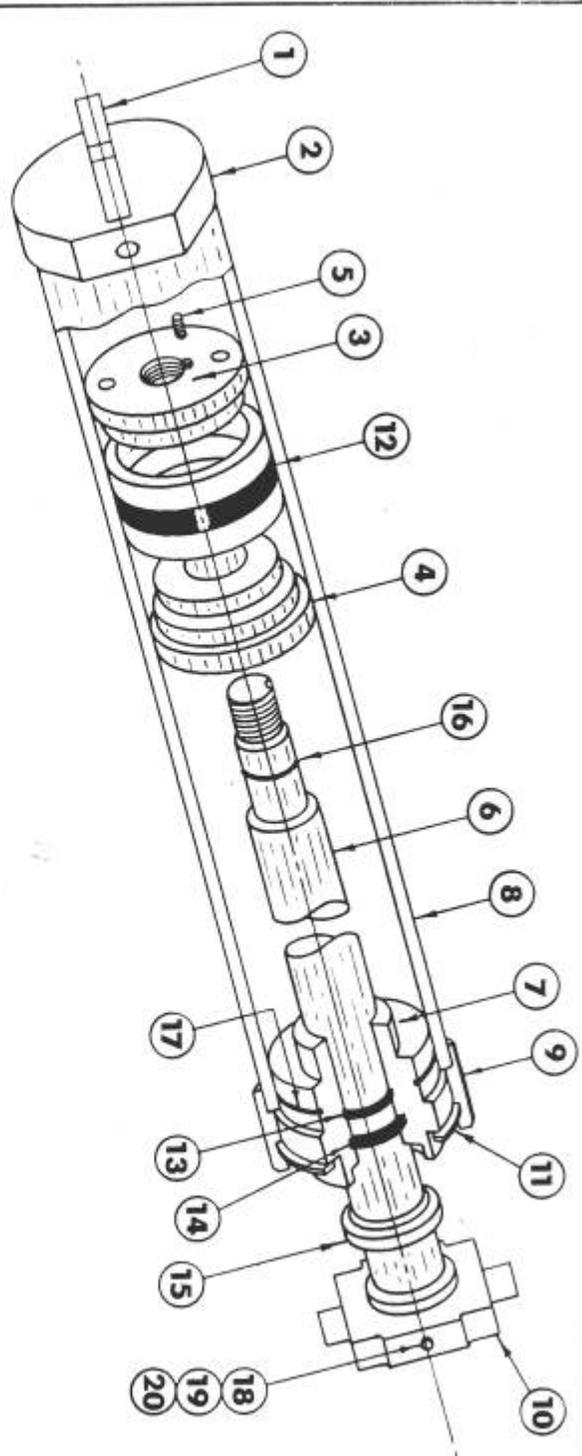
- Para: C
- To disassemble hydraulic extension cylinder, place hose ends in a container to catch oil spillage.
1. Remove retaining ring, and remove piston rod, clean and inspect all cylinder parts (See extension cylinder section this manual).
 2. To strip piston seal remove piston nut lock screws and turn nut c/clockwise remove nut, piston seal and piston head.
 3. Remove rod head bushing over threaded end of piston rod, clean and inspect.

4. Inspect all cylinder components clean and oil. Replace any necessary parts.
5. Replace all seals with seal kits as listed in this manual for 6" EXT. CYL. ASSY. Oil all seals before attempting to replace.

"Caution should be taken while replacing rod head bushing on piston rod as not to damage internal.

Para: D Re-assemble cylinder by reversing procedures 3, 2 and 1.

Para: E Re-assemble cylinder in boom by reversing procedures in para B.



NO	PART NO	DESC	QTY	NO	PART NO	DESC	QTY
1	C10426-2	Tail Anchor	1	11	#5000-625	Retaining Ring	1
2	C10167	Tail Section	1	12	R13670-SDM	Piston Seal	1
3	C10414-2	Piston Nut	1	13	W2-3750-500	Mear Ring	1
4	C10414-3	Piston Head	1	14	2500-3000-375	Rod Seal	1
5	Cornal	Lock Screw	1	15	110-047	Niper Seal	1
6	C10415-2	Piston Rod	1	16	Z26	"O" Ring	1
7	C10386-1	Rod Bushing	1	17	256	"O" Ring	1
8	C10415-1	Cyl Tube	1	18	Cornal	3/4" N/C Bolt	1
9	C10414-3	Bushing Retainer	1	19	Cornal	3/4" Flat Washer	2
10	C10426-1	Rod Anchor	1	20	Cornal	3/4" N/C Nut	1

NOTE
 When ordering replacement parts,
 Quote crane serial no., parts no.,
 description and qty.
 Quantities shown are for one
 cylinder only.
 For complete 6" cyl assy quote
 part no. D10417

6" EXT. CYL. ASSY. C14014
JACOBS BROTHERS MACHINE
WORKS LTD. DELTA B.C.

ROTARY COUPLING

To repair the rotary coupling it may not be necessary to completely remove this unit from the CRANES UPPER TOWER. Clean the coupling thoroughly with wire brush or scraper.

1. Disconnect all hydraulic hose lines from the rotary tube item 2, cap these line to prevent oil spillage and mark lines.

2. Remove electrical coupling making sure to mark all electrical wiring for retaching.

3. Remove retaining rings items 13 and 14. Remove bolts from cap items 7 and remove cap, item 3.

4. Remove the 4 bolts fastening coupling to tower and loosen coupling in tower hole.

5. To separate the rotary tube item 2 from the rotary shaft item 1, apply pressure to top of rotary shaft and rotate tube while applying an upward pressure.

NOTE: A puller may be applied using 1 1/2 NA plug as a pressure point and pulling on any 2 rotary tube ports or rotary tube base plate.

Tighten 1 1/2 NPT. plug lift rotary shaft item 2 approx. 1 inch above tower plate and applying a hard rap on the centre of the rotary shaft item 1.

6. Lift rotary tube clear of rotary shaft and inspect bearing, "O" ring (Moly) seals and wear rings. Inspect and clean rotary shaft.

7. Inspect rotary tube for scratches, grooves etc. and clean thoroughly.

8. Oil rotary shaft, oil wear rings and replace with the ring splits staggered. Oil "O" ring seals and locate in "O" ring grooves. Replace bearing in rotary tube and oil inside tube. Gently lower tube straight over shaft rotating back and forth while lowering easing "O" rings and wear rings inside the bottom of the tube till assembly is completed.

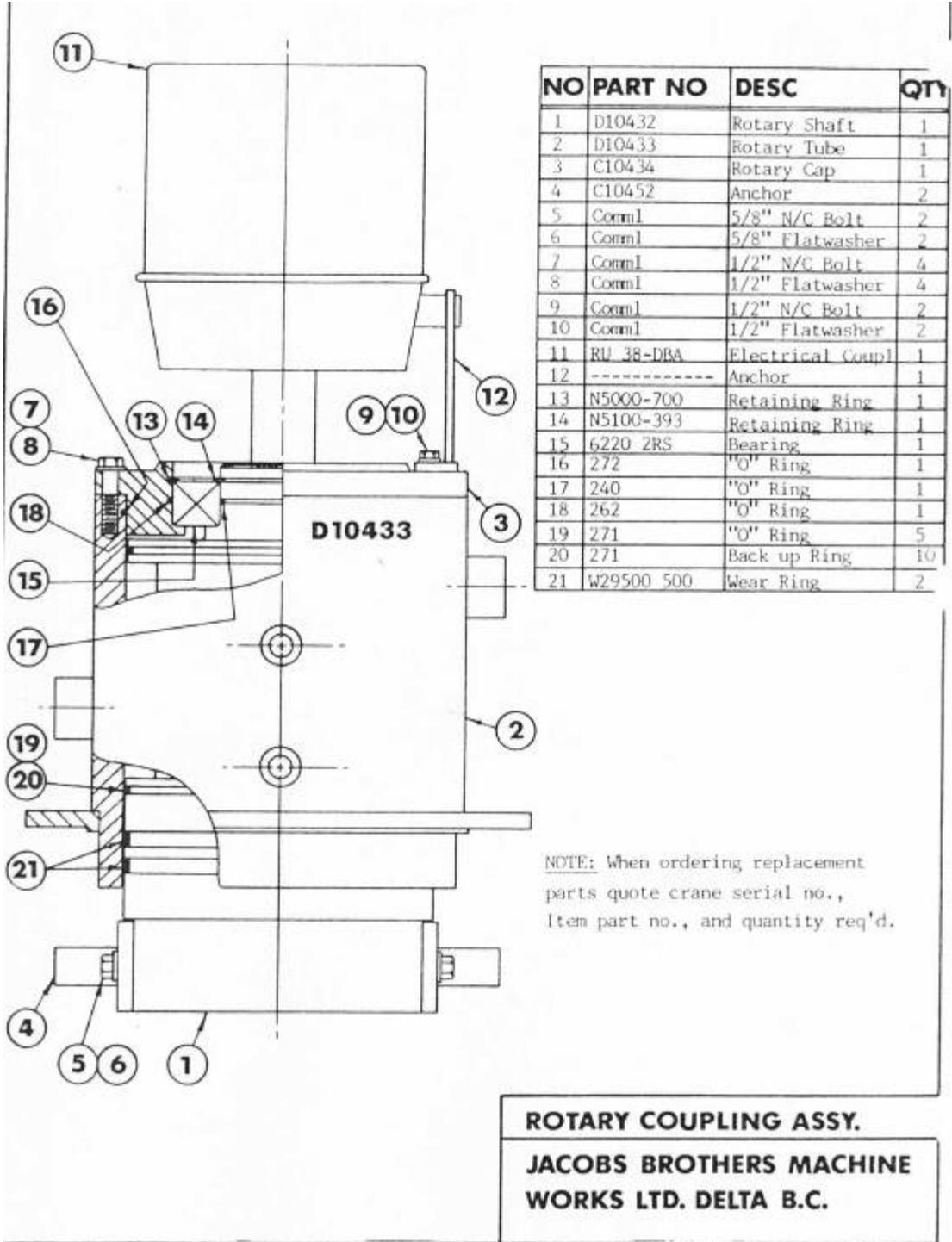
"JAYLIFT MOBILE EQUIPMENT"

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9. Replace retaining rings, cap, and 1/2" bolts.

10. Remove 1 1/2" NPT. plug, connect all hoses, and electrical coupling.

11. Replace bolts to assemble coupling to tower.



NO	PART NO	DESC	QTY
1	D10432	Rotary Shaft	1
2	D10433	Rotary Tube	1
3	C10434	Rotary Cap	1
4	C10452	Anchor	2
5	Comm1	5/8" N/C Bolt	2
6	Comm1	5/8" Flatwasher	2
7	Comm1	1/2" N/C Bolt	4
8	Comm1	1/2" Flatwasher	4
9	Comm1	1/2" N/C Bolt	2
10	Comm1	1/2" Flatwasher	2
11	RU 38-DBA	Electrical Coupl	1
12	-----	Anchor	1
13	N5000-700	Retaining Ring	1
14	N5100-393	Retaining Ring	1
15	6220 ZRS	Bearing	1
16	272	"O" Ring	1
17	240	"O" Ring	1
18	262	"O" Ring	1
19	271	"O" Ring	5
20	271	Back up Ring	10
21	W29500 500	Wear Ring	2

NOTE: When ordering replacement parts quote crane serial no., Item part no., and quantity req'd.

ROTARY COUPLING ASSY.
JACOBS BROTHERS MACHINE
WORKS LTD. DELTA B.C.

Spec item #: H-05	SPECIFICATION	TCMSB Field # N/A
H-05 : Helicopter Fueling System Maintenance		

Part 1: SCOPE:

- 1.1 The intent of this item is to carry out annual inspection, maintenance and certification of the ship’s Helicopter Refueling system.
- 1.2 Contractor shall supply the services of a qualified service representative to complete the work in this specification.

Part 2: REFERENCES:

Tank	Capacity (m3)	Location	Field #
Helo Fuel Tank Cofferdam	132	Fr 4-12	3L007
Helo Fuel Tank	27	Fr 5-11	3L006

- 2.1 Guidance Drawings/Nameplate Data
Flow Diagram – Helicopter Fuelling Package (New-Mar Oil Services)
- 2.2 Standards
Helicopter Fuel Standard – Canada CGSB 3.23-02
- 2.3 Regulations
Transport Canada Marine Safety
- 2.4 Owner Furnished Equipment
The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

Part 3: TECHNICAL DESCRIPTION:

- 3.1 Helicopter fuel tank cofferdam is to be opened to allow required work. The manhole cover is to be removed and the space certified gas free for entry. The gas free certificate is to be maintained for the duration of necessary work.
- 3.2 The contractor is to clean the cofferdam of any debris and water.
- 3.3 Upon completion of work the cofferdam area is to subject to a final inspection by Owner’s representative and then immediately closed up using new packing on the installed manhole cover.

3.4 Contractor shall remove the following safety valves from tank/system and transport them to a certified testing facility:

- a. 1 x 1.5" vacuum relief valve (15017)
- b. 1 x 1.5" 'UNIACT' pressure relief valve (15009SP)
- c. 1 x 8" fire engulfment valve (6R8/411422/C)

Blanks are to be fitted to exposed flanges to prevent ingress of foreign materials into tank. Silica Gel is to be fitted to tank to absorb any moisture from ingress of air into the tank. Removed safety valves shall be thoroughly inspected, cleaned as necessary and certified for proper operation. A condition assessment will be carried out at that time. Upon completion of inspection all valves shall be boxed up, tested, reset and recertified as indicated. Contractor shall return valves to the vessel and refit them in their original locations in good order.

3.5 The Contractor shall supply and install new gaskets on each of the 1.5" vacuum relief valve and 1.5" pressure relief valve and 8" flame engulfment valve. The gasket material used is to be intended by the manufacturer for use with Jet A helicopter fuel. The Contractor must supply proof that the gasket material is so intended.

3.6 Contractor shall make arrangements to have the 1 1/2" diameter helicopter fueling hose removed from the ship and shipped to a recognized test facility test for annual certification, This certification will require the hose be pressure tested to 150 psi.. A contractor supplied stamped metal tag showing test dates and pressures shall be affixed to the hose. Contractor shall return the hose to the ship and re-install it on the hose reel on the Stbd side flight deck upon completion of testing. A test certificate shall be issued to Chief Engineer. Nozzle and all associated fittings to be inspected.

3.7 Dispensing meter calibration is to be verified. The meter is a positive displacement flow-meter, Bopp & Reuther 0150M5F5, calibrated for use with JET A1.

3.8 The Contractor is to verify the electrical continuity of all the piping associated with the system.

3.9 Monitor elements to be replaced. (Owner supply).

3.10 Filter/water Separator expendable cartridges to be replaced. (Owner supply).

3.11 Silica Gel in tank vent to be renewed (Owner supply).

3.12 A minimum 2.5 litre sample is to be taken from the helicopter fuel pumped from the vessel into the holding facilities for laboratory analysis. This testing and re-certification is to be completed prior to the fuel being returned to the vessel. Laboratory testing of the fuel is to include but not necessarily limited to:

1. Appearance / Colour
2. Water / Contaminants
3. Flash Point
4. Freezing Point

5. Distillation
6. Density
7. Copper
8. Corrosion
9. Existence of Gum
10. Water Reaction

3.13 Contractor to dispose of used cartridges, elements and the used Silica Gel ashore as per Provincial regulations.

3.14 Contractor to supply all materials unless specified otherwise.

3.15 Location

- a) The vessel's aviation tank is located at the lower deck level Fr: 4 to Fr: 11.
- b) The control for the aviation fuel quick closing valves is located inboard of the dispensing unit.

3.16 Interferences

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

Part 4: PROOF OF PERFORMANCE:

- 4.1** The Contractor is to be responsible for all inspections and is to consult with TCMS, prior to commencement of work, to determine an inspection schedule; at each inspection point, the Contractor is to advise the Owner's representative, in advance, to allow his/her attendance.
- 4.2** All work shall be completed to the satisfaction of the Chief Engineer
- 4.3** Upon completion of work, system is to be run up and proven fully operational to satisfaction of the Chief Engineer or delegate.

Part 5: DELIVERABLES:

- 5.1** The Contractor is to provide a Service Report including the as found condition, work performed, and any parts used.
- 5.2** Gas free certificates for subject spaces.
- 5.3** Testing reports and certificates for fuel, fuel hose, valves, gas monitors, and gauges.

Spec item #: H-06	SPECIFICATION	TCMSB Field # N/A
H-06 : LIFERAFTS		

Part 1: SCOPE:

- 1.1 The intent of this item is for the contractor to have the vessels liferafts serviced.
- 1.2 The contractor shall remove the liferafts from the vessel, ship to the approved service center, ship the liferafts back to the vessel, and reinstall back in the original locations.

Part 2: REFERENCES:

- 2.2 There are ten liferafts onboard to be sent for servicing.

Liferafts						
✓	Location	Serial #	CAP.	Service Due	Hydro Expiry	Comments
✓	Starboard Rack	XDC5EN01A808	25	06-2018	06-2019	
✓	Starboard Rack	XDC5EV41B909	25	06-2018	06-2019	
✓	Starboard Rack	XDC0EK06C707-D	25	06-2018	06-2019	
✓	Aft of FRC (Port)	,5085910203906	10	06-2018	06-2018	
✓	Port Crane (SAR Raft)	1FW96G516	10	06-2018	NA	
✓	Port Rack	XDC9EJ12C707	25	06-2018	06-2019	
✓	Port Rack	XDC5EN02A808	25	06-2018	06-2019	
✓	Port Rack	XDC0EK12C707-D	25	06-2018	06-2019	
✓	Starboard Crane	5085910203903	10	06-2018	06-2018	
✓	Barge	XDCZ0503D000	6	06-2018	07-2018	

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The Contractor is to remove and transport the ship's ten liferafts to and from an authorized service centre, as designated by the vessel, for servicing.
- 3.2 The contractor shall ensure that the liferafts are placed back in the same location that they were removed from.
- 3.3 The Contractor is responsible to remove and reinstall the liferafts on the vessel. Item is to be completed in conjunction with the Chief Officer.

Part 4: PROOF OF PERFORMANCE:

- 4.1 The contractor shall provide original certificates and the work report for each of the life rafts.
- 4.2 All work to be completed to the satisfaction of the Chief Engineer.

Part 5: DELIVERABLES:

5.1 The Contractor will supply 1 PDF and 1 printed Copy of service report for each liferaft .

Spec item #: H-07	SPECIFICATION	TCMSB Field # N/A
H-07 : ACCOMMODATION HVAC CLEANING		

Part 1: SCOPE:

- 1.1** The intent of this item is to clean all Supply and Re-circulating ducting associated with HVAC systems on the Wheelhouse, Officers Deck, Boat Deck, Upper Deck and Main Deck areas.

Part 2: REFERENCES:

Dwg #	Location
15-0311-01	Ventilation & A/C Main Deck
15-0311-02	Ventilation & A/C Upper Deck
15-0311-03	Ventilation & A/C Boat Deck
15-0311-04	Ventilation & A/C Officers Deck
15-0311-05	Ventilation and A/C Nav Bridge Deck and Wheelhouse

Part 3: TECHNICAL DESCRIPTION:

- 3.1** The contractor shall provide the labour and materials to internally clean the ducting associated with the following Air Handling.
- Air Handling Unit #1, located Officer's Deck, port side at Frame 105.
 - Air Handling Units #2, located Boat Deck, starboard side at Frame 110.
 - Air Handling Unit #3, located Upper Deck port side at Frame 20.
 - Air Handling Units #4, located Boat Deck, starboard side at Frame 110.
 - Air Handling Unit #5, located Main Deck port side at approx Frame 140
- 3.2** The contractor shall schedule the work in a manner that will ensure minimal disruptions to the ships personnel. The work schedule shall be agreed upon by both the Chief Engineer and the contractor.
- 3.3** With the ship's Electrical Officer the contractor is to ensure the Lockout/Tagout is in place. The contractor is to supply his/her own locks and tags but complete the vessel's Lockout/Tagout procedure.
- 3.4** The following locations are supplied air from Air Handling Unit #2:
Officers' Deck 378, 381, 381 Night Cabin, 383, 389, 389 Night Cabin, 385, and 367.
- 3.5** Boat Deck Room 339, 341, 343, 352, 350, 350 Night Cabin, and 345.
- 3.6** The following locations are supplied with air from Air Handling Unit #4:
Upper Deck Room 262, 260, 242, 244, 277, & 279.
Main Deck Room 130, 131, 132, & 133, Room 151, 162, 161, 160, 159, 158, & 157, 168, 167, 166, 165, 169, & 163

- 3.7** Contractor shall clean out the ducting by the application of suction at the supply and discharge ends. Care shall be taken to minimize the ingress of dirt, dust or debris into the spaces.
- 3.8** Access to the ducting will involve the removal of the deckhead diffusers in each space and opening the casing at the supply fan.
- 3.9** Prior to reinstallation, all disturbed deckhead diffusers shall be washed with a degreaser.
- 3.10** Upon completion of work, all disturbed deckhead diffusers, deckhead panels, grids and casings, shall be restored to the original as found condition.

Part 4: PROOF OF PERFORMANCE:

- 4.1** The Contractor shall take digital HD colour photos prior to closing up, labelled with locations, demonstrating cleanliness at various points throughout the duct work.
- 4.2** Upon completion of work, the Air Handling Units shall be run up and ductwork proven free and clear.
- 4.2** All work to be completed to the satisfaction of the Chief Engineer.

Part 5: DELIVERABLES:

- 5.1** The Contractor is to provide a Service Report including the as found condition, work performed, and any parts used.

Spec item #: H-08	SPECIFICATION	TCMSB Field # N/A
H-08 : ACCOMMODATION WASHROOM EXHAUST DUCT CLEANING		

Part 1: SCOPE:

- 1.1. The intent of this item is to internally clean the ductwork and fittings associated with the Main, Upper, Boat and Officers Deck Exhaust Air systems.

Part 2: REFERENCES:

Dwg #	Location
15-0311-01	Ventilation & A/C Main Deck
15-0311-02	Ventilation & A/C Upper Deck
15-0311-08	Fan Room Boat Deck Arrangement & Details
15-0311-03	Ventilation & A/C Boat Deck
15-0311-04	Ventilation & A/C Officers Deck
15-0401-02	Insulation Plan, Upper, Flight/Boat, Nav Br., Raised Deck & Wheelhouse.
15-0401-03	Insulation Plan Tank Top Lower & Main Decks

Part 3: TECHNICAL DESCRIPTION:

- 3.1 Contractor to provide the required labor and materials to internally clean the ductwork and fittings associated with the Upper, Boat and Officers Deck Exhaust Air systems.
- 3.2 With the ship’s Electrical Officer the contractor is to ensure the Lockout/Tagout is in place. The contractor is to supply his/her own locks and tags but complete the vessel’s Lockout/Tagout procedure.
- 3.3 The Contractor shall clean the ducting in a manner that will minimize the ingress of dirt and debris into the spaces.
- 3.4 The Contractor shall schedule the work in a manner that will ensure minimal disruptions to the ship’s personnel. The work schedule to be agreed upon by both the Contractor and Chief Engineer.
- 3.5 The Contractor to access the exhaust ductwork via deckhead mounted diffusers in the following spaces:
 - a) Main Deck
 Washrooms 138, 142, 143, 170, 171, 172, 172, 173, 174, 175, 194, 195.
 200 Laundry
 183 Gym, 184 Saunas Washroom
 152A E/R Crew Change Room
 153 Launderette

b) Upper Deck
Washroom 265, 267, 269, 252, 271, 275, 294, 292, 257, 288, 251, 286, 284 and 282.

c) Boat Deck
Washroom 339, 334, 341, 343, 352, 350, 347, 345, and SAR Locker.

d) Officers Deck
Washroom 378, 381, 383, 389, 385, 374, 365, and 367

e) Wheelhouse
Washroom adjacent to Wheelhouse Stair tower entrance.

3.6 Upon completion of the work, any deckhead accessories disturbed by the Contractor during the cleaning operation, to be restored to their as found condition.

Part 4: PROOF OF PERFORMANCE:

4.1 Upon completion of work, the Washroom Exhaust Fan shall be run up and ductwork proven free and clear.

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

Part 5: DELIVERABLES:

5.1 The Contractor is to provide a Service Report including the as found condition, work performed, and any parts used.

Spec item #: H-0	SPECIFICATION	TCMSB Field # N/A
H-09 : GALLEY RANGE HOOD AND EXHAUST FAN TRUNKING		

Part 1: SCOPE:

- 1.1 The intent of this item is to open up, clean and close up in good order the Galley range hood and exhaust fan trunking.

Part 2: REFERENCES:

Galley range hood (Gaylord model BDL-DS)

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The Galley range hood shall be opened up for thorough cleaning and degreasing. The existing exhaust fan trunking run from the Galley Range hood to the Exhaust fan outlet at Upper Deck, port side Frame 30, shall be internally degreased and cleaned.
- 3.2 The contractor shall co-ordinate the work with the Chief Engineer to minimize disruptions to ship's routine. Contractor to include in bid, his and any sub-contractor's cost for premium time for evenings, weekends and/or holidays worked.
- 3.3 With the ship's Electrical Officer the contractor is to ensure the Lockout/Tagout is in place. The contractor is to supply his/her own locks and tags but complete the vessel's Lockout/Tagout procedure.
- 3.4 All chemicals used in cleaning the range hood and galley exhaust fan trunking shall be non-toxic and safe for use in food preparation and handling areas. Contractor to provide 2 copies of product Material Safety data Sheet information corresponding to the cleaning agents which will be used in the cleaning process.
- 3.5 Prior to the commencement of work, qualified personnel shall release all range hood mechanical and electrical components, including suppression system piping, controls and lighting. All fittings liable to interfere with cleaning of the range hood are to be temporarily relocated and protected.
- 3.6 The range hood filter screens to be removed and steam cleaned. All range hood drains and grease traps shall be proven clear. Fire dampers to be cleaned and demonstrated in good working order.
- 3.7 The contractor shall remove all debris and soiled materials from the vessel and dispose ashore daily

- 3.8** Upon completion of work, the contractor shall return all disturbed range hood components as per original. Range hood wash-down system shall be tested and proven operational.
- 3.9** The contractor shall access the exhaust trunking by removing the following:
- a) In deck cross alleyway and Galley ceiling panels in way of the trunking run.
 - b) Main deck flanged exhaust trunking fire damper. Unit flanged and bolted in situ.
 - c) Inline exhaust fan, located Upper Deck Fan Room. Unit flanged and bolted in situ.
 - d) Two- 12"x12" sheet metal trunking access panels Upper Deck fan room. Screwed in situ.
 - e) Port side Upper Deck exhaust trunking outlet louver. Bolted in situ.
- 3.10** The Galley Exhaust Fan to be removed to allow for cleaning of trunking on either Side. Fan and motor units to be completely degreased.
- 3.11** The exhaust trunking outlet louver shall be removed. Fine mesh screen to be removed and cleaned. Remainder of louver, including cover, to be sandblasted to white metal and painted with two coats of primer and one coat of white paint. Hinge pins to be freed up and greased. Louver door rubber seal to be removed during sandblasting and painting, then reinstalled with proper adhesive. New gasket to be supplied when louver bolted in place.
- 3.12** All disturbed exhaust trunking access points shall be reinstalled using fire rated materials.
- 3.13** Prior to reinstallation of the main deck ceiling panels, the fire damper shall be tested to the satisfaction of the Chief Engineer for correct operation.

Part 4: PROOF OF PERFORMANCE:

- 4.1** Upon completion of work, the Air Handling Units shall be run up and ductwork proven free and clear.
- 4.2** All work to be completed to the satisfaction of the Chief Engineer.

Part 5: DELIVERABLES:

- 5.1** The Contractor is to provide a Service Report including the as found condition, work performed, and any parts used.

Spec item #: H-10	SPECIFICATION	TCMSB Field # N/A
H-10 : LAUNDRY DRYER EXHAUST DUCTWORK CLEANING		

Part 1: SCOPE:

- 1.1 The intent of this item is to clean the clothes dryer(s) exhaust ductwork on the Officers Deck, Boat Deck, Upper Deck and Main Deck to remove any accumulation of lint and or debris.

Part 2: REFERENCES:

Ship's drawings:

Laundry, Launderette, And Change room – Main Deck
Launderette Arrgts. Upper Dk. Boat & Officers Dk.

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The contractor shall schedule the work in a manner that will ensure minimal disruptions to the ships personnel. Both the Chief Engineer and the contractor shall agree upon the work schedule.
- 3.2 The Contractor in consultation with the vessel's Electrical Officer will lockout the power supply(s) to the dryers. The Contractor is to supply their own locks and tags and complete the vessel's Lockout/tagout procedure.
- 3.3 The contractor shall provide the labor and materials to internally clean the dryer exhaust ducting associated with the as fitted laundry dryers in the following spaces:
 - a) Main Deck Laundry Room, Main Deck Room 200, at Fr.167
 - b) Main Deck Launderette, Main Deck, Room 153, at Fr.116
 - c) Oilers Change room, Main Deck, Room 152 at Fr. 16
 - d) Upper Deck Launderette, Upper Deck Room 252, at Fr.122
 - e) Boat Deck launderette, Boat Deck, Room 334, at Fr.122
 - f) Officers Deck Launderette, Officers Deck Room 365, at Fr.112

- 3.4 The dryer exhaust ducting is to be cleaned from the dryer to the vent head on the vessel's exterior.
- 3.5 The Contractor shall clean out the dryer exhaust ducting by the application of suction at the supply and discharge ends. Care shall be taken to minimize the ingress of dirt, dust or debris into the spaces. Any ingress of dirt, dust or debris is to be cleaned up.
- 3.6 Any openings made in the ductwork are to be sealed using approved seals such that there are no leaks at the openings.
- 3.7 Upon completion of work, all disturbed ducting and associated fittings shall be restored to their as found condition.
- 3.8 The Chief Engineer will inspect disturbed ductwork before ceiling panels are reinstalled.

Part 4: PROOF OF PERFORMANCE:

- 4.1 Upon completion of work, the dryers shall be run up and ductwork proven free and clear.
- 4.2 All work to be completed to the satisfaction of the Chief Engineer.

Part 5: DELIVERABLES:

- 5.1 The Contractor is to provide a written report in electronic pdf format to the Chief Engineer detailing the as found condition, work performed, and digital images showing the before and after condition of the ducting.

Spec item #: H-11	SPECIFICATION	TCMSB Field # N/A
H-11 : Sewage System		

Part 1: SCOPE:

- 1.1 The intent of this specification shall be to clean, inspect, coat as necessary and return the sewage system treatment tank to service.
- 1.2 This work shall be carried out in Conjunction with the following: E - 18

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

RED FOX Industries Inc.

Model : PVCL-6R

Location: Auxiliary Machinery Space - Fr. 65 - 75.

Holding capacity : 19,000 litres.

Description: Segregated tank measures 2.1m x 4.2m x 2.4 m which is divided into three compartments; aeration, clarifier and disinfection chambers.

2.2 Standards

The sewage system treatment tank is considered a confined space under the Safety Management System.

2.3 Regulations

2.4 Owner Furnished Equipment

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

Part 3: TECHNICAL DESCRIPTION:

General

- 3.1** The intent is to keep the vessel's sewage system in use during this item.
- 3.2** The contractor is to provide a suitable sewage holding tank on the dock beside the ship and connect the tank to the vessel's sewage discharge fitting on the Upper Deck stbd side.
- 3.3** The tank is to be serviced as required and removed upon completion of this item.
- 3.4** The daily cost and servicing cost is to be quoted.
- 3.5** All effluent is to be disposed of by the Contractor.
- 3.6** Disposal certificates to be provided to PWGSC.
- 3.7** The contractor shall pump out the sewage treatment plant and dispose of contents ashore. The effluent, sludge and any solid wastes are to be disposed of in accordance with local environmental regulations.
- 3.8** With the ship's Electrical Officer the contractor is to ensure the Lockout/Tagout is in place. The contractor is to supply his/her own locks and tags but complete the vessel's Lockout/Tagout procedure.
- 3.9** Manhole covers to be removed to gain access to tank internals.
- 3.10** Ventilation to be provided from the sewage tank to an open deck and over the side of the vessel for the entire period the sewage tank is opened.
- 3.11** Prior to the commencement of cleaning, all tanks are to be certified gas free for worker entry by a marine chemist and certificates posted in conspicuous locations as required by the CLC. All Contractor workers entering any tanks are to be qualified as per CLC.
- 3.12** Tank internals to be pressure washed clean. All water remaining in tank after cleaning is to be pumped out and disposed of ashore by Contractor.
- 3.13** The tank internals including all piping and air manifolds are to be cleaned of all traces of effluent and liquid using a detergent and sanitized using disinfectant. MSDS for the cleaning and sanitizing chemicals to be provided to Chief Engineer before cleaning begins.
- 3.14** Cleanout plugs in the manifolds are to be removed and manifolds cleaned of any debris. Cleanout plugs to be reinstalled following inspection by the Chief Engineer.

- 3.15** All liquid remaining in tank after cleaning is to be pumped out and disposed of ashore by Contractor.
- 3.16** Tank to be rag wiped dry after cleaning.
- 3.17** Internals then to be cleaned to prepare surfaces for coating. Power tool cleaning to be to standard SSPC-SP-3.
- 3.18** All dirt and debris remaining in tanks after cleaning shall be removed ashore and disposed of by the Contractor
- 3.19** Contractor to supply any ventilation equipment required for the gas free Certificate and the certificate's continued validity for the duration of the work. Contractor also to supply ventilation as required during the cleaning and coating of tank internals.
- 3.20** All associated air piping on the tank top as well as all internal passages, orifices and piping are to be proven clear. Switch column to be disconnected from its piping, inlet and outlet openings and internals column to be thoroughly cleaned and reconnected.
- 3.21** After completion of thorough cleaning, bare metal surfaces to be primed with Royal Coatings Easy Prime. Tank internals are then to be given one coat of Royal Coatings Easy Novo – bid on 40 m² with a unit cost per m² for adjustment purposes. The level switches, probes and orifices are to be protected during painting to ensure operational integrity.
- 3.22** Upon completion, all level switches, probes and alarms shall be cleaned, inspected and function tested.
- 3.23** After sufficient time for coating to cure has passed, the contractor is to install the manhole covers using new contractor supplied gaskets and the tanks are to be refilled to the operating level with clean fresh water.
- 3.24** The ship's crew will pump down and shut down the ships vacuum system to allow the holding tank to be cleaned. Contractor will remove the tank cover and pressure wash the inside of the tank and remove all residues ashore. As shut down of this tank takes the ship's sewage system out of operation, cleaning is to be done in a timely manner to ensure the system is out of service for the shortest amount of time.
- 3.25** The float switches are to be cleaned and proven fully functional.
- 3.26** Tank is to be inspected and closed up again using a new contractor supplied gasket. System is to be put back in service and to be proven fully functional upon completion.
- 3.27** All work is to the satisfaction of the Chief Engineer.

3.28 Location

- a) The sewage system is located in the Auxiliary Machinery Space.
- b) The ship's sewage overboard discharge fitting is located on the Upper Deck, stbd side at Frame 79.

3.29 Interferences

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

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

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

4.2 Testing

N/A

4.3 Certification

N/A

Part 5: DELIVERABLES:

5.1 Drawings/Reports

N/A

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals

N/A

Spec item #: H-12	SPECIFICATION	TCMSB Field # N/A
H-12 : SIDELIGHT REPLACEMENTS		

Part 1: SCOPE:

1.1 The intent of this specification is to replace 6 sidelights with new owner supplied units.

Part 2: REFERENCES:

2.1

Cabin/Space	Occupant	Sidelights to be replaced
PO's Lounge		1
Crew's Lounge		2
Cabin 163	Deck Hand	1

Drawings

Drawing Number	Description	Electronic Number
15-0212-01	Window and Sidelight Schedule	
15-0212-02	Windows and Sidelight Arrangement and Details	

Part 3: TECHNICAL DESCRIPTION:

3.1 All materials to be contractor supply, unless otherwise noted. Replacements are to be done in conjunction with Spec items Above Water Line Coatings and Main Deck underlay and flooring replacement.

3.2 Contractor to remove all trim around the sidelight and all insulation shall be removed and discarded. The window box can be removed as required to gain access to the welds. Removed trim window boxes shall be saved and protected for reinstallation upon completion of installations. *Note there is asbestos in the fire stop spray on much of the insulation onboard, proper removal and disposal techniques to be followed.

3.3 Prior to any cutting or welding the accommodation spaces are to be properly protected against any damage.

3.4 The existing sidelights are to be removed from the ships side and the ship's hull is to be properly dressed for the new sidelight installation.

- 3.5 While the sidelights are removed contractor to ensure that the sidelight openings are made watertight to ensure no damage is done due to weather.
- 3.6 The new sidelights are to be fitted to the previous openings with 6mm of spigot on the outboard side. The sidelights shall be made square to the ships side. The spigots shall be fillet welded on both sides of the sidelight for the complete circumference.
- 3.7 Upon completion of all welding, new sidelights are to be hose tested and proven watertight to the satisfaction of the attending TC/MS inspector. All new welds and disturbed steel to be coated with two coats of contractor supplied primer.
- 3.8 The fitted deadlights shall be proven operational. The deadlight holdbacks shall be checked for position and adjusted as required to allow proper operation.
- 3.9 Upon completion of all testing, the areas around the sidelights shall be reinsulated as per original, with new Roxul insulation and protective canvas covering. The existing trim shall be reinstalled

Part 4: PROOF OF PERFORMANCE:

- 4.1 All work to be to the satisfaction of the Chief Engineer.
- 4.2 Upon completion of all installations, all sidelights shall be hose tested and proven watertight.
- 4.3 Provide details for certification of equipment items – i.e. TCMS sign offs, Classification certifications etc.

Spec item #: H-13	SPECIFICATION	TCMSB Field # N/A
H-13 : MAIN DECK UNDERLAY AND COVERING REPLACEMENT		

Part 1: SCOPE:

1.2 The intent of this item is to repair damaged sections of deck covering on the Main Deck, including the A60 fire-rated underlay.

Part 2: REFERENCES:

Drawing Number	Description	Electronic Number
15-0252-01	Deck Covering Plan	
15-0401-01	Joiner and Insulation Details	
22-0708-01	Scuppers and interior drains	

Areas of repair:

- 2.1 Main Deck, Crew’s Lounge #134A
Area of repair: The entire lounge; approx. 400ft²
Covering: Plank flooring
- 2.2 Main Deck PO’s Lounge
Area of repair: The entire lounge; approx. 240ft²
Covering: Plank flooring
- 2.3 Main Deck, Seaman’s Cabin #163
Area of repair: The entire cabin; approx. 100ft²
Covering: Plank flooring
- 2.4 Main Deck, ER Tech #192
Area of repair: The entire cabin; approx. 120ft²
Covering: Plank flooring

Part 3: TECHNICAL DESCRIPTION:

- 3.1 All materials are to be contractor supply unless otherwise stated in the specification.
- 3.2 Furniture, not including the bunks and vanities, is to be removed and safely stored to be reinstalled upon completion of the work. Cabins to be protected from damage and dust from the following work.
- 3.3 In all areas of repairs, carpeting and the existing “70 MM floating floor” system (which consists of tack-welded sheet metal over a dex-o-tex-like material, which is, in turn, laid over batts of fibreglass insulation) is to be removed to the steel deck in the areas of repair by hand tooling to reduce the production of dust. All debris to be removed ashore. The

steel decking to be primed, if required, as directed by the manufacturer's recommendations.

- 3.4** Any damage to bulkhead panels, doors or door frames, or any other part of the ship's interior furnishings will be repaired by the Contractor at no cost to the Crown.
- 3.5** A new trowel-applied magnesium oxychloride cement (magnesite) deck under-layment system such as Dex-o-tex Decklite is to be applied, as directed by the manufacturer's recommendations. Application will generally consist of a 1/8" thick layer of Magnabond #3 coating applied to the primed steel deck, followed by a 2" layer of Decklite. A final layer of Dex-o-tex Subkote 3/4" thick is then to be applied to give proper profile for laying the new floor covering. The Contractor is to quote a unit cost per ft² to remove the existing "floating floor" and to renew with the magnesium oxychloride system as detailed above. New underlayment to tie in with existing underlayment.
- 3.6** Contractor to quote on supplying Gerflor Streamo Karavel (152 mm x 914mm) class approved plank flooring(0262 Elm) and 4mm black decorative strips (item 0331) for placement between the planks. The Contractor is to allow \$12,000 for plank flooring; to be adjusted by 1379 action on proof on invoice. Flooring is to be installed, as per existing, in the cabin by the Contractor using best industry practices. Adhesive to be used is Styccobond F44.
- 3.7** Trim around hatch in PO's lounge, is to be removed to allow carpet installation and reinstalled upon completion. New carpet is to be installed on the hatch cover.
- 3.8** Contractor to supply and install new black baseboard 4" trim in the areas as per original.

Part 4: PROOF OF PERFORMANCE:

- 4.3** All work to be completed to the satisfaction of the Chief Engineer.
- 4.4** The removed interference items are to be reinstalled and proven operational upon completion of all work. Cabins to be cleaned upon completion of all work.

Part 5: DELIVERABLES:

- 5.1** Contractor to provide copies of class approval for the supplied carpet.

Spec item #: H-14	SPECIFICATION	TCMSB Field # N/A
H-14: Fixed FM 200 and CO2 Smothering System Inspection		

SCOPE:

- 1.1 The intent of this item is to perform required annual servicing of the fixed FM200 fire suppression system and obtain TCMS credit for the system.
- 1.2 This work shall be carried out in Conjunction with the following:

Part 2: REFERENCES:

2.1 Guidance Drawings/Nameplate Data

2 x FM-200 -675lb Cylinder ADS - Propulsion Motor Room				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288092 54	380.4	919.8	539.4	
288089 54	380.2	918	537.8	
1 x FM200 Fireboy - Barge				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
79304	0	0	15	
1 x FM200 - 40LB Cyclinder - ICS Room				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
290992	37.2	65.6	28.4	
1 x FM200 - 600LB Cyclinder - Bosuns's stores				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
28810732	377.2	750.6	373.4	
1 x FM200 - 600Lb - Cylinder ECS - Engine Control Room				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
28809154	377.4	911	533.6	
1 x FM200 - 600Lb - Cylinder ECS - Steering Gear				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
28811348	378.8	878.4	499.6	
1 x FM200 - 70Lb - Cylinder ECS - Fan Room 189			AHU #5	
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288537 50.5	51.2	95.2	44	
1 x FM200 - 70Lb - Cylinder ECS - Helicopter workshop				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288552	61.2	102.2	41	

1 x FM200 - 70Lb - Cylinder ECS - Heli-Fuel Pump Room				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288564	51.4	101.2	49.8	
1 x FM200 - 70Lb - Cylinder ECS – Carpenter’s Shop				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288542	51	97	46	
1 x FM200 - 70Lb - Cylinder ECS - Paint Locker Fwd				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288571	51.2	96.8	45.6	
1 x FM200 - 70Lb - Cylinder ECS - Radio Room				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288539	51.4	109.2	40.1	
1 x FM200 - 70Lb - Cylinder ECS - Salvage Diving Locker				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288591 54	69.1	109.2	40.1	
1 x 1LB CO2 Remote Pull - Cargo Hold				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
515896	3.31	5.51	2	2009
1 x 15Lb CO2 System – E/R Paint Locker Boat Deck				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
2005497	18	33	15	2014
1 x 2.5 Gallon Range Guard System - Galley				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
65092			2.5	2011
8 X 45KG CO2 System Ginge-Kerr - Cargo Hold				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
379404	72.7	117.7	45	2009
379253	73.7	118.7	45	2009
379252	71.8	116.8	45	2009
379271	70.6	115.6	45	2009
379349	72.6	117.5	45	2009
379254	71.5	116.5	45	2009
379213	72.1	117.1	45	2009
379393	72.7	117.7	45	2009
1 x 45 Kg CO2 System Ginge Kerr - Main Engine Center				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
379390	71.9	116.9	45	2009

1 x 45 Kg CO2 System Ginge Kerr - Main Engine Port				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
379411	75.8	120.8	45	2009
1 x 45 Kg CO2 System Ginge Kerr - Main Engine STBD				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
379386	72.4	117.4	45	2009
1 x 45 Kg CO2 System Ginge Kerr - Propulsion Motor Port				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
379201	72.4	117.4	45	2009
1 x 45 Kg CO2 System Ginge Kerr - Propulsion Motor STBD				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
379256	70.6	115.6	45	2009
1 x FM200 - 125Lb Cylinder Ecs - Electronics room				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
290515	91.2	162.2	71	
1 x FM200 - 1010Lb - Cylinder ADS - Casing Lower Stack				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288136 60	509.8	1316	806.2	
1 x FM200 - 1010Lb - Cylinder ADS - Casing Upper Stack				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288139 55.5	510	1279.6	769.6	
1 x FM200 -225Lb - Cylinder ADS - Generator Flat Bilge Port				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
268820 67	137.8	343.2	205.4	
1 x FM200 -225Lb - Cylinder ADS - Generator Flat Bilge STBD				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
268819 67	137.6	343	205.4	
1 x FM200 -225Lb - Cylinder ADS - Propulsion Motor room Bilge Port				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
176928 40	135	275.6	140.6	
1 x FM200 -225Lb - Cylinder ADS - Propulsion Motor room STBD				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
268821 40	138	279	141	
1 x FM200 -395Lb - Cylinder ADS - Main Engine room Bilge Port				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
290226 47.5cm	230.6	527.6	297	

1 x FM200 -395Lb - Cylinder ADS - Main Engine room Bilge STBD				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
290228 41.5	230.6	526.8	296.2	
2 x FM200 -675Lb - Cylinder ADS - Generator Flat and Heating				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
278092 69.5cm	367.6	1009.4	641.8	
27808 69.5cm	366.8	1006.6	639.8	
2 x FM200 -675Lb - Cylinder ADS - Main Engine Room Lower				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
298833 56	380.4	926.6	546.2	
278094 56	367	914.2	547.2	
2 x FM200 -675Lb - Cylinder ADS - Main Engine Room Upper				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
283589 71	380.2	1036.8	656.6	
283550 71	379.6	1034.6	655	
2 x FM200 -675Lb - Cylinder ADS - Propulsion Motor Room Lower				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
283547 54	381.2	921	539.8	
283578 54	383.4	923.2	539.8	
1 x FM200 - 125Lb Cylinder ECS - Fan Room 222 AHU#3				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
290529 20	91.2	168	76.8	
1 x FM200 - 20Lb Cylinder ECS - Battery Locker				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
286917	28.2	40.2	12	
1 x FM200 - 200Lb Cylinder ECS - AC Chiller Room				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288630 37.5	127.8	264.2	136.4	
1 x FM200 - 200Lb Cylinder ECS - Central Stores				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288644 50	127.4	291.4	164	
1 x FM200 - 200Lb Cylinder ECS - Emergency generator Room				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288633 50	127.2	282.4	155.2	
1 x FM200 - 200Lb Cylinder ECS - Fan Room #2/4				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288640 45	127.8	280.6	152.8	

1 x FM200 - 200Lb Cylinder ECS - Scientific Room/Chart Room				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
288628	27.5	127.8	239.4	111.6
1 x FM350 - 200Lb Cylinder ECS - Bubbler Room				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
282084	62	195.8	536.2	340.4
1 x FM200 - 350Lb Cylinder ECS - Heli-Fuel Cofferdam				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
284123	29.5	199.8	429	229.2
1 x FM200 - 350Lb Cylinder ECS -Incinerator Room				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
300042	62	127.8	315	187.2
1 x FM200 - 350Lb Cylinder ECS - Thermal Fluid Expansion AG2 Room				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
281978	29	196.2	410.8	214.6
1 x FM200 - 40Lb Cylinder ECS - Fan Room #1				
Serial Number	Tare Weight	Gross weight	Net Weight	Last H Test
290978		37.6	66.6	29

2.2 Standards

2.2.1

2.3 Regulations

- All work performed and any modifications made, must be compliant with the latest Canada Shipping Act Regulations and in particular to the Marine Machinery Regulations. All work shall meet Transport Canada approved class 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 FM200 and CO2 Fixed System

- 3.2 Ensure Contractor Notification of ACM form is signed off.
- 3.3 Ensure PJSA and Contractor Basic Safety Familiarization is signed off.
- 3.4 The Chief Engineer is to be notified prior to commencement of any work this system. Pipe to be made on ship's PA system notifying crew that systems are being worked on and are out of service. Another pipe to be made over PA when systems are placed back in service.
- 3.5 Contractor to supply certified Kidde FSR to service the vessel's FM200 and CO2 system.
- 3.6 All levers, valves, remote pulls, wires, wire junction boxes, pressure operated sirens and switches to be checked and confirmed in working order. Delay mechanisms to be checked for correct operation.
- 3.7 Contractor shall inspect all associated fire dampers to check if they have released during the testing of all systems. Contractor shall reset all fire dampers. Any deficiencies shall be rectified through the PWGSC work arising procedures.
- 3.8 Piping shall be disconnected from cylinders and blown through with Nitrogen gas. All multi jet nozzles shall be proven clear.
- 3.9 FM-200 cylinders shall be measured using an approved method to determine the existing quantities of FM-200 agent in each cylinder. The weights shall be recorded and the cylinders tagged and dated. Individual pressures shall be recorded for each cylinder.
- 3.10 As per Transport Canada Ship Safety Bulletin 04/2017, the contractor will perform a hydrostatic test and internal examination of 10 per cent of the system's extinguishing agent and pilot cylinders. If one or more cylinders fail, a total of 50 per cent of the onboard cylinders should be tested. If further cylinders fail, all cylinders should be tested. The contractor will coordinate a meeting between the Kidde FSR, the vessel Chief Engineer, TCMS Inspector, and the prime contractor to determine the initial 10 percent of cylinders to be inspected and hydro tested. The contractor will be responsible for all handling and shipping of the cylinders off the vessel to the Kidde FSR work shop and back to the vessel and installed. The contractor will submit a unit cost in their bid per cylinder should more than the 10 percent require further inspection and hydro test. For clarity, this item includes the disconnection, reconnection, emptying, refilling, all inspections and testing, and this work will be included in the QA package with certificates issued for the cylinders inspected and tested.
- 3.11 The entire system shall be properly reassembled, inspected and proven serviceable.
- 3.12 Remote release stations, fan shut downs as part of system alarm activated, etc., shall be reset and proven operational.

Part 4: PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1. All work shall be completed to the satisfaction of the Chief Engineer and attending TCMS Surveyor.

4.1.2. The Contractor is responsible for arranging TCMS Inspection.

4.2 Testing

As required by TCMS

4.3 Certification

4.3.1 Copy of Kidde Certification is to be given to the Chief Engineer prior to the commencement of work.

Part 5: DELIVERABLES:

5.1 Drawings/Reports

5.1.1 Two hard copies and 1 electronic copy of all readings and service report shall be given to the Chief Engineer..

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals

N/A

Spec item #: H-15	SPECIFICATION	TCMSB Field # N/A
H-15 : ANSUL FIXED FOAM SYSTEM		

Part 1: SCOPE:

1.1 The intent of this item is to perform required annual servicing of the Ansul fixed foam system and obtain TCMS credit for the system.

Part 2: REFERENCES:

Nameplate Data:

2.1 Unless otherwise stated all required materials to be Contractor supply.

Part 3: TECHNICAL DESCRIPTION:

3.1 The 150 gallon ANSUL AFFF fixed foam system located in the ship's helicopter hanger is to be serviced by a qualified technician. Inspection and testing of all equipment to be witnessed by a Ship's Officer and TCMS inspector. Contractor to arrange scheduling of TCMS inspector.

3.2 Note: Chief Engineer to be notified prior to commencement of any work on system. Pipe to be made on ship's PA system notifying crew that system is being worked on and is out of service. Another pipe to be made over PA when system is placed back in service.

3.3 The general appearance of the system is to be examined, checking component parts for mechanical damage and/or corrosion. All nameplates to be checked for readability, corrosion or looseness.

3.4 The contractor is to remove each foam hose from its respective reel and perform a hydrostatic test on each foam hose to 1.5 times the working pressure.

3.5 A sample of the foam is to be collected and sent for analysis. Three copies of report to be forwarded to Chief Engineer.

- 3.6** Contractor to confirm bladder tank valve positions are ring-pinned in the correct operating position.

Valve	Position
Water inlet	Open
Tank shell drain	Closed
Bladder drain/fill	Closed
Tank shell vent	Closed
Bladder vent/fill	Closed
Concentrate Isolation	Normal Operating Position
Sight Gauge	Normal Operating Position

- 3.7** Ensure all valve handles are placed in the operational position
- 3.8** Insert ring pins through valve handles into brackets and install visual inspection seals.
- 3.9** Record the date of the annual maintenance examination and any service performed.
- 3.10** Chief Engineer to be informed when system is operational The system is not to be left non-functional over a week-end period.

Part 4: PROOF OF PERFORMANCE:

- 4.1** All work to be completed to the satisfaction of the Chief Officer and attending TC Marine Safety Surveyor.
- 4.2** In addition to the Certificates required, the Contractor is to provide a Service Report including the as found condition, work performed, parts used for system. The report is to be provided electronically in Adobe pdf format.

Spec item #: H-16	SPECIFICATION	TCMSB Field # N/A
H-16 : WASHROOM DECK REPAIRS/SHOWER RENEWALS		

Part 1: SCOPE:

1.2 The intent of this specification is to refurbish the shower stalls and washroom decks in the listed washrooms.

Part 2: REFERENCES:

The following washrooms to have decks replaced.

Cabin/Space	Occupant	Locations	Deck approx. sq ft
341	Helo Eng	Boat Deck	32
262	Ice Observer	Upper Deck	32
260	Medical Officer	Upper Deck	32

Drawings

Drawing Number	Description	Electronic Number
15-0252-01	Deck Covering Plan	
15-0401-01	Joiner and Insulation Details	

Part 3: TECHNICAL DESCRIPTION:

- 3.1 All materials to be contractor supply unless otherwise stated in this specification.
- 3.2 The Cabins are to be protected against dust, debris and damage prior to any work on the washroom being carried out.
- 3.3 The contractor will replace the deck covering with a Dex-o-tex Terrazzo M system seamless floor system or equivalent.
- 3.4 The stainless steel trim in the washroom will be removed and set aside and protected for reinstallation upon completion of all work.
- 3.5 The toilet shall be disconnected and removed from the washroom deck to allow for the removal of the deck covering. The toilet shall be protected from damage and is to be reinstalled upon completion of repairs.
- 3.6 The washrooms have a 10 mm underlayment with an approximate 4 mm seamless deck covering. Contractor shall remove the deck covering in the shower and washroom of the upper 7 cabins to the steel deck. A 12 GA sheet metal coaming piece makes the shower

tray for these cabins. Care is to be taken not to damage the coaming when removing the deck covering. Deck is to be properly prepared as per manufacturer's recommendations for the installation of the new seamless deck covering.

- 3.7 The deck is to be power tool cleaned, as required, to obtain a suitable surface for the new deck covering. After the steel has been prepared, the entire deck is to be primed.
- 3.8 The Owner's representative will select the colour for the deck covering. The contractor is to provide a sample of the available colours of the deck covering to the owner's representative prior to application.
- 3.9 The washrooms will have the 10 mm underlayment and deck covering installed in the washrooms as per manufacturer's recommendations. Deck covering to be covered 100mm up from the deck in the washroom and 200mm from the deck in the shower.
- 3.10 Upon completion of deck covering renewals, the toilets are to be reinstalled.
- 3.11 The shower stalls are to be fitted with new shower liners, Altro Whitrock or equivalent, over the existing bulkheads.
- 3.12 Contractor will remove the shower fixtures as required, allowing for the proper fitting of the shower liners. Contractor to arrange with Chief Engineer to have the water shut down as required, allowing for removals. Water shut downs to be scheduled to reduce the effect on ships operations. Shower bulkheads are to be thoroughly cleaned prior to the installation of the shower liners.
- 3.13 New shower liners are to be installed and secured in the shower. Liners are to be completely sealed and made watertight.
- 3.14 Shower fixtures are to be reinstalled upon completion of liner installations.
- 3.15 The stainless steel trim is to be reinstalled over the top of the flooring and re-riveted in place. All trim shall be sealed with high quality clear silicon.

Part 4: PROOF OF PERFORMANCE:

- 4.1 All shower fittings to be tested and proven leak free upon completion of all work
- 4.2 All toilets to be proven operational.
- 4.3 All work to be completed to the satisfaction of the Chief Engineer

Spec item #: H - 17	SPECIFICATION	TCMSB Field # N/A
H - 17 : FIRE DETECTION SYSTEMS		

1.1 Identification

1.1.1 The intent of this specification is to carry out an annual inspection of the Notifier Fire Detection System and to obtain an inspection certificate to satisfy TCMS requirements.

1.1.2 All work shall be performed by authorized qualified technicians.

1.1.3 All work in this specification shall be inspected by the Chief Engineer and TCMS Surveyor.

1.2 References

1.2.1 Equipment Data

1.2.2 Detector & Module Test-Blank.pdf

Drawings

Drawing Number	Description	Electronic Number
NMF-0001-A.pdf	Navigation and Bridge deck layout	
NMF-0001-B.pdf	Void space Below Wheelhouse	
NMF-0001-C.pdf	Officers Deck	
NMF-0001-D.pdf	Boat Deck, Flight Deck and Foc'sle	
NMF-0001-E.pdf	Upper Deck	
NMF-0001-F.pdf	Main Deck	
NMF-0001-G.pdf	Lower Deck	
NMF-0001-H.pdf	Tank Top	

1.2.3 Regulations

1.2.3.1 All work performed and any modifications made, must be compliant with the latest Canada Shipping Act Regulations and in particular to the Marine Machinery Regulations. All work shall meet Transport Canada approved class regulations.

1.2.4 Standards

1.2.4.1 All work shall be completed in accordance with Canadian Coast Guard's Ship's ISM Fleet Safety and Security Manual. Contractor to supply certified personnel for the performance of work package and must be able to produce certification for the attending TCMS inspector.

1.2.5 Quality Assurance Standards

1.2.5.1 As per the Contractors QA Program.

1.3 Technical

1.3.1 Contractor to test all smoke detectors, heat detectors, fire pulls, mimics (including door switches) and alarms/lights for correct operation as per Notifier recommended test procedures. All defects to be noted and repaired by 1379 action.

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

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

1.4 Proof of Performance

1.4.1 Inspection

1.4.1.1 All work shall be inspected by the Chief Engineer.

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

1.4.2 Testing/Trials

1.4.2.1 All testing as per recommended Notifier test procedures. Where non Notifier equipment is used, that manufacturer's instructions to be used.

1.4.2.2 All testing shall be to the satisfaction of TCMS Surveyor.

1.4.2.3 100% of all devices are to be function tested.

1.4.3 Certification

1.4.3.1 All personnel to perform testing to be certified to work on Notifier fire detection systems.

1.5 Deliverables

1.5.1 Documentation (Reports/Drawings/Manuals)

1.5.1.1 The Contractor is to provide 3 hard copies of a written report and 1 electronic pdf format to the Chief Engineer detailing the as found condition, and any corrective action taken or recommended.

1.5.2 Spares

N/A.

1.5.3 Training

N/A.

Spec item #: E-01	SPECIFICATION	TCMSB Field # N/A
E-01 : PORT and STBD STERNSEAL		

Part 1: SCOPE:

- 1.1 The intent of this item is to unship the port and stbd shaft stern seals to facilitate removal of the port tailshaft and completely overhaul both shaft seals and obtain TCMS credit for the stern seal.

Part 2: REFERENCES:

2.1 Equipment Data

John Crane Marine Seal 750 Mod 720 Type MB Seal
Wartsila TM-MB-01 Issue D manual.

Drawing Number	Description
H76738-02 Rev 4	GA of 750 Mod 720 Type MB Seal

Part 3: TECHNICAL DESCRIPTION:

- 3.1 Contractor is responsible for all ancillary services necessary to complete the specification item. This includes, but is not limited to, strip out, cramage, staging , cleaning, debris removal and disposal, etc. All materials to be contractor supply unless otherwise stated.
- 3.2 The contractor is required to provide the services of an authorized John Crane Marine Seal FSR during the disassembly, overhaul and reassembly of the seal. Contact: Barry Brodrick: Phone; (709) 747-4600 email: barry.broderick@wartsila.com
- 3.3 Contractor to check free length of seal as per Sect 7.2.3 of the manual.
- 3.4 Disassemble necessary sea water and service air piping.
- 3.5 Disassemble seals as per Sect 12.6 of manual.
- 3.6 Seals are to be completely overhauled with new owner supplied parts. This includes but not limited to, the bellows assemblies, new faces and seats, o cords inflatable seals etc.
- 3.7 Reassemble the seal as per Sect 12.8 of the manual.
- 3.8 Restoration, cleanup, Lubrication.

3.9 All debris to be carried ashore, area to be left in good order.

Part 4: PROOF OF PERFORMANCE:

4.1 All work to be completed to the satisfaction of the Chief Engineer and attending TC/MS inspector

4.2 Test the seal installation as per Sect 12.8.12 of the manual and record findings.

4.3 Seals proper operation to be proven during sea trials

Part 5: DELIVERABLES:

5.1 Copies of inspection and test reports in paper and electronic formats.

5.2 Seal Test results from paragraph 9 of manual.

5.3 Seal compression readings as per paragraph 10 of manual.

Spec item #: E-02	SPECIFICATION	TCMSB Field # N/A
E-02 : TAILSHAFT BEARING WEARDOWN PORT AND STBD		

Part 1: SCOPE:

1.1 The intent of this specification is to take both tailshaft bearing clearances at the sterntube rope guards.

1.2 This item is to be done in conjunction with Spec item Port Tail Shaft Survey

Part 2: REFERENCES:

2.1

Drawings

Drawing Number	Description	Electronic Number

Part 3: TECHNICAL DESCRIPTION:

3.1 Contractor shall supply all equipment, enclosures, ventilation, staging, chain falls, craneage, slings, and shackles necessary to perform the work. All lifting equipment shall be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, of a safe working load for the expected duties.

3.2 The contractor is to take and record within eight hours of docking the ship the wear-down of the port and starboard tailshaft bearings with feeler gauges.

3.3 The port and stbd rope guards are to be removed in half sections and lowered to the dock bottom.

3.4 Upon completion and in conjunction with items the rope guards are to be reinstalled in good order.

Part 4: PROOF OF PERFORMANCE:

- 4.1 All work to be to the satisfaction of the Chief Engineer.
- 4.2 The completed installation is to be functionally tested during sea trials to the satisfaction of the Chief Engineer and attending TCMS Surveyor. All work is to be completed to the satisfaction of the Chief Engineer and attending TC Marine Safety Surveyor.
- 4.3 Provide details for certification of equipment items – i.e. TCMS sign offs, Classification certifications etc.

PART 5: DELIVERABLES

- 5.1 A typewritten and pdf copy of the readings obtained is to be passed to the Chief Engineer within 2 calendar days of being taken.

Spec item #: E-03	SPECIFICATION	TCMSB Field # N/A
E-03 : PORT SHAFT SURVEY		

Part 1: SCOPE:

- 1.1 The intent of this item is to remove the stbd tailshaft for survey by TC/MS.
- 1.2 This item shall be completed in conjunction with the following:
Specification Hull Coatings.

Part 2: REFERENCES:**2.1 Equipment Data**

Component Weights:

COUPLING = 3,252 KG;

PROPELLER = 14, 870 KG;

TAILSHAFT = 41,829 KG, 15.2 METERS LONG;

INTERMEDIATE SHAFT = 3,995 KG, 2 METERS LONG.

2.2 Drawings

Drawing Number	Description	Electronic Number
	Shaft Removal Cone 2 Pages attached	

2.3 Regulations

All work performed and any modifications made, must be compliant with the latest Canada Shipping Act Regulations and in particular to the Marine Machinery Regulations. All work shall meet Transport Canada approved class regulations.

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The Contractor shall supply all equipment, enclosures, ventilation, staging, chain falls, craneage, slings, and shackles necessary to perform the work. All lifting equipment shall be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, of a safe working load for the expected duties.
- 3.2 The Contractor shall be responsible to arrange for TC/MS survey when completing this specification item.

- 3.3** Due to the easily damaged nature of the tailshaft coating between liners, it is necessary to take special precautions during the removal and installation of the tailshaft to avoid contact between the coating and the ship's structure or lifting devices.
- 3.4** Whether supported on skids or slings, the weight of the tailshaft has to be carried in way of the bronze bearing surfaces only. Soft fabric slings or soft wood blocks are to be used.
- 3.5** A special skid is required to support the forward end of the shaft, and an end support piece with roller is bolted to the forward end of the tailshaft. Hardwood blocks, contractor supplied, are also required during removal operations to protect the shaft bearing staves.
- 3.6** A tailshaft extension cone has been fabricated to facilitate the removal and installation process. The contractor shall check this extension piece and be responsible for its safe usage and transportation from the Boat Deck to and from the Motor Room. (see attached sketches).
- 3.7** If the tailshaft needs to be turned over during this time, the contractor is to inform the Chief Engineer so that the lubricating water can be turned on. The turning gear is to be operated by ship's staff only.
- 3.8** Contractor is to note that the tailshaft cannot be removed from the sterntube using the lifting lugs on the ship. Separate lifting and support equipment is required.
- 3.9** It will be necessary to remove a section of an 8" support stanchion in way of the tailshaft coupling. While removed, the piece is to be made removable by welding flanges on each end of the removed section and also on the stanchions on the ship's structure, such that the section of stanchion can be bolted back in place. The removed section of stanchion is to be reinstalled after all work on the tailshaft/coupling using new contractor supplied grade 8 hex head capscrews c/w flat washers, lock washers and hex head nuts.
- 3.10** Any hull mounted lifting lugs required for removals are to be provided and installed by contractor. The contractor is responsible for testing and certification of such lugs. Upon completion of work lugs are to be cut off, ground flush, and coated as per Hull Coating Specification.
- 3.11** Contractor to note that no high voltage cable supports or high voltage cables are to be let go, moved, etc., until the Chief Engineer has concurred. In addition, Contractor to ensure that no chain falls, slings, etc., bear against cables or piping in the area during lifting, moving or support operations.
- 3.12** The Wartsila mechanical stern tube seal shall be disassembled prior to removal of the shaft to prevent damage to the seal components. A Wartsila FSR shall be present during the removal, disassembly, inspection, reassembly of the shaft seal. Seal is to be overhauled as per Specification Seal Survey

- 3.13** Weardown readings are to be taken on inside of sterntube after mechanical seal is removed and before tailshaft is uncoupled. Readings to be given to Chief Engineer.
- 3.14** Complete area forward of the forward sterntube bush is to be thoroughly scraped and wire brushed clean for application of Belzona metal compound. All holes and pitted areas to be properly prepared and filled with Belzona metal compound as per manufacturer's instructions. Surface preparation is to be to Power Tool Clean Standard SSPC-SP11.
- 3.15** After metal compound has completely cured, the Contractor is to apply two (2) coats of Interguard ENA 377, as per manufacturer's instructions - minimum thickness per coat = 6 mils dry.
- 3.16** Remove rope guard, propeller cone, and propeller. The propeller removal and fitting gear may be supplied by the Canadian Coast Guard and consists of hydraulic pump and fittings, pilgrim nut, special backing plate and other removal tools. Contractor shall be responsible for moving all tools from the ship to the drydock and returning and securing tools back on the ship after the work is completed. Propeller is removed with pilgrim nut, special backing plate, and ship supplied removal tools. All work is to be to as per manufacturer's instructions. Contractor is to note that lifting eyes in propeller bossing are for vertical lifts only and must not be used for pulls in any other directions. Any turning of the shaft required during this work is to be done by ship's personnel. Contractor to supply lubricating water for shaft if required.
- 3.17** Remove intermediate shaft/coupling bolts and motor/intermediate shaft bolts, supporting weight of intermediate shaft with slings. Morgrip bolts to be removed as per manufacturer's instructions with removal gear that may be supplied by the ship. Morgrip bolts are to be marked and reinstalled in their original holes. Morgrip bolts to be identified and put in a lathe and checked for trueness and bolt diameters measured. Both intermediate shaft flange face bolt holes to be checked for roundness and readings recorded. One typewritten copy of all readings to be given to Chief Engineer. Bolts are to be stowed in a traffic-free area.
- 3.18** Shaft brake disc to be unbolted and stowed if required. NOTE: Shaft brake chock fast to be renewed when brake reinstalled and proper alignment of brake maintained.
- 3.19** Withdraw tailshaft outboard sufficiently to install first lifting clamp on aft end of aft liner. Move intermediate shaft, complete with turning gear ring, to one side and secure. Turning gear unit may be unbolted at this time if required.
- 3.20** Coupling to be removed with Pilgrim nut and ship supplied tools. Chief Engineer to be in attendance at this time. It will be necessary to heat the coupling during removal operations. Coupling shall be heated from outside diameter; inside bore of coupling temperature range 144°C to 196°C maximum by electric heating blanket (Contractor Supply). Contractor to ensure this heating procedure does not damage or endanger any surrounding equipment or personnel. Flame heat is not to be used.

- i. **NOTE:** Maximum pressure to pump off nut = 1380 kg/cm² (2000 psi), this pressure is NOT to be exceeded.
- 3.21** Install skid support. Withdraw tailshaft outboard until coupling taper is over forward end of skid and install end support piece on shaft. (to trial the new extension support cone (see attached sketches).
- 3.22** Roller on shaft support piece to be adjusted to allow roller to roll on forward bush staves.
 - i. **NOTE:** Hydraulic jack should be used to support forward end of shaft when adjusting height of roller. (roller will not be required if support cone is used).
- 3.23** Withdraw tailshaft until forward end of coupling taper is at bulkhead 34. Install second lifting clamp on forward end of aft liner.
- 3.24** Remove tailshaft aft until shaft support piece is at the end of the forward bush. Install shaped hardwood blocks (Contractor supplied) on bottom radius of sterntube to allow tailshaft to continue to move out on roller. Alternate blocks as required.
- 3.25** During this stage, the aft liner will clear the aft bearing. Special care must be taken to maintain the shaft alignment to prevent damage to the shaft coating between the liners.
- 3.26** Withdraw tailshaft until it is clear of forward bearing. Check alignment to ensure the forward liner will enter the after bearing and continue to withdraw. When the end support piece is at the forward end of the aft liner, check alignment and move carefully onto aft bearing surface. Continue to withdraw until approximately one meter of forward liner is clear of aft bearing and install third lifting clamp on forward liner. The weight and alignment of the tailshaft should now be controlled by the shipyard lifting gear. The tailshaft is now completely withdrawn.
- 3.27** Tailshaft to be stowed in a suitable Contractor supplied cradle to allow for inspection by TCMS. Cradle supports on shaft to be in way of bronze liners only. If sandblasting or any other potentially damaging work is being done in the vicinity of the withdrawn tailshaft, Contractor to supply and install protective covering over shaft.
- 3.28** Contractor to supply and schedule a certified technician to perform non-destructive testing on the following: Propeller key, Shaft and propeller keyways, Interior propeller taper, Forward and aft tailshaft shaft tapers.
- 3.29** Key and keyways to be measured with micrometers, measurements recorded and clearances shown.
- 3.30** Wear-down readings, measured with inside and outside micrometers, to be taken between fwd and aft sterntube bearings and bronze liners on tailshaft and recorded. Three copies of the NDT test reports and micrometer readings shall to be given to the Chief Engineer within 2 calendar days of the testing.

- 3.31** While the tailshaft is removed the stern tube internals are to be inspected for defects. Particular attention is to be paid to inspecting the stern tube for'd end immediately aft of the seal. All sterntube and sterntube seal lubrication/cooling lines are to be proven clear and free from any obstructions.
- 3.32** Complete area in the stern tube between the forward and aft bushings (approximately 5m long x .75m dia.) to be thoroughly scraped and wire brushed clean to meet paint manufacturer's specifications. All debris to be completely removed ashore. All holes and pitted areas deeper than three millimeters (3mm) are to be properly prepared and filled with Belzona metal compound as per manufacturer's instructions. Surface preparation is to be to Power Tool Clean Standard SSPC-SP11.
- 3.33** After metal compound has completely cured, Contractor to apply two (2) coats of Intershield ENA 300, as per manufacturer's instructions - minimum thickness per coat = 6 mils dry.
- 3.34** All areas in sterntube fwd. flange face where metal has wasted to be cleaned as described above and filled with metal using approved electric arc welding procedures. Contractor to supply a copy of welding procedure used to Chief Engineer. Upon completion sterntube flange face to be ground smooth and level to accept new bulkhead gasket and to ensure no leaks exist between sterntube seal flange and bulkhead when the ship is re-floated.
- 3.35** Intershield ENA300 is to be applied to stern tube flange face and corresponding bulkhead area as per manufacturer's recommendations in two coats (minimum thickness per coating is 6 mils dry). Mechanical means of ventilation shall be provided for complete drying of the paint before reinstallation of the tailshaft.
- 3.36** Contractor to supply and schedule the services of a certified technician to perform a spark test on the coated sections of tailshaft with TCMS inspector and Chief Engineer in attendance. Should it be required to replace the existing tailshaft coating, as determined by spark test, Bidder to quote separately for this work, as specified under the following;
- i. Existing coating to be removed in its entirety with tailshaft in support cradle.
 - ii. Before any sandblasting to bring coated area to bare steel, ensure the following areas are protected: Stbd tailshaft stern tube opening to be completely sealed, bronze liners wrapped on Stbd shaft, and Port stern tube sealed in way of outer seal.
 - iii. Sandblast steel between liners to quality recommended by tailshaft coating manufacturer, see attached information sheets.
 - iv. The contractor is then to build a structure over the tailshaft such that the temperature and humidity within can be controlled and such that the temperature of the shaft can be brought up to that required for the application of the new protective coating.
 - v. New semi-transparent, glass-reinforced, epoxy-laminated shaft wrapping, Philadelphia Resins Phillyclad 1775/620TS, is to be supplied and applied in way of the previously covered areas.

- vi. New shaft wrapping to be applied according to Manufacturer's instructions under the direction of an authorized Service Representative, services who is the responsibility of the contractor. Allow \$8000.00 for FSR travel expenses, to be adjusted by 1379 action upon proof of invoices.
 - vii. Allow sufficient time for coating to cure before installing shaft. It is important to ensure the integrity of the coating between the liner/shaft interface to prevent the ingress of sea water under the bronze liners.
- 3.37** Inspection on the tailshaft will be carried out by the contractor and witnessed by the Chief Engineer and TC Marine safety with particular attention being paid to the following areas:
- i. Forward and aft keys and keyways on the shaft tapers
 - ii. Forward and aft shaft tapers
 - iii. The forward and aft ends of the aft liner where it meets the tailshaft.
 - iv. The forward and aft ends of the forward liner where it meets the tailshaft.
 - v. Forward and aft "Pilgrim" nut threads
 - vi. Fwd and aft liners in way of bearing surfaces.
 - vii. Fwd liner in way of the crane seal & liner extension.
 - viii. **NOTE:**Forward and aft bearing staves are to be lubricated with liquid soap, Contractor supplied, sufficient to provide lubrication during shaft installation but not block water cooling passages. All tailshaft bearing surfaces are to be wiped completely clean of any dirt, sand, etc., before tailshaft is installed. No sand or grit blasting to be carried out until tailshaft installation is complete.
- 3.38** Reverse procedure to be used to install shaft. Care to be exercised to ensure shaft is correctly aligned with sterntube and epoxy liner and staves are not damaged during installation.
- 3.39** Taper end of tailshaft and coupling bore to be thoroughly cleaned and degreased using electrolytic cleaner. Key to be installed and proven true.
- 3.40** Coupling to be heated from outside diameter by electric heating blanket (Contractor Supply). Inside bore of coupling to be heated to 144°C to 196°C maximum. NOTE: Heat blanket shall be left on during push up. Contractor to ensure this heating procedure does not damage or endanger any surrounding equipment or personnel. Ensure tire on Pilgrim nut has been fully compressed.
- 3.41** Coupling to be located over tailshaft and moved up the taper using the Pilgrim nut to the datum mark - maximum travel is 4mm, minimum is 3.8mm. Contractor to take care clearance is maintained on either side of keyway.
- 3.42** With pressure left on Pilgrim nut, allow coupling to cool to ambient temperature. Check and record keyway clearances. Secure Pilgrim nut as per manufacturer's instructions.

- 3.43** Install shaft disc brake ring if required at this point. Intermediate shaft to be installed and bolted to propulsion motor. If turning gear unit was removed, Contractor to reinstall using new chockfast and taking care to correctly alignment of the gearing.
- 3.44** Final alignment check and bolting up of intermediate shaft to coupling flange not to be completed until the ship has been afloat for a minimum of 24 hours.
- 3.45** Original propeller to be installed as per manufacturer's instructions.
- 3.46** Contractor to supply and install 2 new propeller 'O'-rings. 'O'-ring material to be 21mm DIA. nitrile rubber (hardness of 55/60). Shaft diameter in 'O'-ring location is approximately 754mm.
- 3.47** The propeller removal and fitting gear, which may be supplied by the Canadian Coast Guard consists of hydraulic pump and fittings, pilgrim nut, special backing plate and other removal tools. Contractor responsible for moving all tools from the ship to the drydock and returning and securing tools back on the ship after the work is completed.
- 3.48** Contractor to fit propeller to tailshaft. Contractor to quote on three fits plus price per fit for adjustment purposes. Fit between propeller and tail shaft to be to the satisfaction of attending TC/MS inspector and Chief Engineer.
- 3.49** For all fits except the last fit, propeller to be pushed up a maximum of 2mm travel. Start point load pressure on the hydraulic pump to measure the push up distance is 220 kN. Final push up distance and pressure to be as per ship supplied push up diagram.
- 3.50** After the propeller fit has been approved by TC/MS and the Chief Engineer the propeller and tailshaft mating surfaces are to be thoroughly degreased, tailshaft threads liberally coated with anti-seize compound and propellers pushed up on shafts with pilgrim nuts to required distance, as per Pilgrim Moorside recommendations and witnessed by the Chief Engineer. Final push up distances, pressures and key clearances (top & sides) to be recorded and given to Chief Engineer in three type written copies.
- 3.51** Pilgrim nut to be locked in place and grease pumped in circumferential grease fittings. Propeller cone to be installed and filled with tallow. Bolt holes to be cemented after bolts secured with stainless steel locking wire.
- 3.52** All welded lugs are to be removed and welding ground flush. Areas to be painted in conjunction with Hull Painting item- Hull Coatings.
- 3.53** After the ship has been afloat for a minimum of 24 hours, the final alignment readings between the intermediate shaft aft flange and the coupling flange are to be recorded. (See GAP and SAG graph supplied by Chief Engineer.) Coupling bolts to be installed.

- 3.54** All removals required for this work to be re-installed in good order and proven in working condition. All tools provided by CCG to be cleaned and returned to storage areas and secured under supervision of a Ship's Officer.

Part 4: PROOF OF PERFORMANCE:

- 4.1** The Contractor in conjunction with the Chief Engineer and TCMS Surveyor shall develop a list of hold points for inspection prior to the start of work.
- 4.2** The Contractor shall supply as much notice as possible that hold points are about to be reached.
- 4.3** It shall be the responsibility of the Contractor to arrange all inspection requirements to satisfy TCMS.
- 4.4** The completed installation shall be functionally tested at varying speeds and loads during sea trials to the satisfaction of the Chief Engineer and attending TCMS Surveyor. All work is to be completed to the satisfaction of the Chief Engineer and attending TC Marine Safety Surveyor.
- 4.5** Only certified trades persons shall complete the work as detailed in this specification.
- 4.6** All lifting appliances and accessories shall be certified to at least 1.5 times the actual weight of components lifted or as required by local regulations.

Part 5: DELIVERABLES:

Documentation (Reports/Drawings/Manuals)

- 5.1** The Contractor shall supply readings as specified two hard copies and one electronic copy are to be delivered to the Chief Engineer.

Spec item #: E-04	SPECIFICATION	TCMSB Field # N/A
E-04 : ANCHOR WINDLASS SURVEY		

Part 1: SCOPE:

- 1.1 The intent of this item is to open the electric hydraulic anchor windlass for inspection and survey by TC/MS and Chief Engineer. TC/MS credit is to be obtained.

Part 2: REFERENCES:

- 2.1 Drawings and Instructions-Hytac Manual

Make: Hytac Equipment Ltd

Model: HYTAC AWSO-48

SSB Field #: 3H049

Note: there are two (2) units to be dealt with, one Port and one Stbd.

Part 3: TECHNICAL DESCRIPTION:

- 3.1 Contractor is responsible for all ancillary services necessary to complete the specification item. This includes, but is not limited to, strip out, cramage, staging , cleaning, debris removal and disposal, etc. All materials to be contractor supply unless otherwise stated.
- 3.2 With the ship's Electrical Officer the contractor is to ensure the Lockout/Tagout is in place. The contractor is to supply his/her own locks and tags but complete the vessel's Lockout/Tagout procedure.
- 3.3 Anchors are to be lowered to the dock bottom and the anchor chains are to be removed from the wildcats and secured.
- 3.4 Brake bands are to be removed for inspection.
- 3.5 Brake drum to have a light skim machined from its surface (in situ).
- 3.6 Grease nipples and passageways to all brake assembly hinge pins to be proven clear.
- 3.7 Hinge pins to be proven free and operational.
- 3.8 Handwheel and shaft screw to be proven free and fully operational.
- 3.9 Condition of wildcat and cable stripper to be noted and recorded.

- 3.10** Windlass to be opened up to permit a full visual inspection of the gearbox internals. All removals required for this inspection are to be performed in a professional manner. Should any hydraulic removals be required, exposed hoses and ports are to be capped immediately upon removal and caps removed upon completion. Ship's Electrical Officer to be contacted prior to any electrical removals.
- 3.11** Oil to be drained from gear case. Oil to be disposed of ashore.
- 3.12** Gear case to be flushed and gear case internals wiped clean.
- 3.13** Windlass will have to be rotated to allow inspection of full circumference of both pinion and bull gear.
- 3.14** Backlash between pinion and bull gear to be measured and recorded. Condition of spherical bearings (4 of) and thrust washers to be noted and recorded.
- 3.15** All shaft bushing are to be exposed for inspection. Bushings and shafting in way of bushings to be thoroughly cleaned. Bushing clearances to be taken and recorded.
- 3.16** Grease passageways ways to each bushing are to be proven clear.
- 3.17** Clutch assembly to be inspected and proven free and fully operational.
- 3.18** Any defects noted during opening up and inspection of windlass to be brought to attention of Chief Engineer. Copies of all readings to be passed to Chief Engineer immediately after readings are taken. Three typewritten copies of all readings are to be passed to Chief Engineer upon to completion of refit.
- 3.19** Windlass internals are to be protected from the elements during the period they are exposed.
- 3.20** All hydraulic hoses on the windlass and on the hydraulic power pack are to be replaced with new contractor supplied hoses.
- 3.21** Upon completion, windlass to be filled with new contractor supplied Esso Spartan EP 220 oil, approximately 80 litres each is required.
- 3.22** All removals are to be replaced in good order, using new jointing.
- 3.23** Brake adjustment to be proven satisfactory and able to hold drum against the pull of the hydraulic motor.

Part 4: PROOF OF PERFORMANCE:

4.1 All work to be completed to the satisfaction of the Chief Engineer and attending TC/MS inspector

4.2 All control functions to be proven operational. Windlass to be subject to test run for one hour, to the satisfaction of Chief Engineer and TC/MS surveyor.

Part 5: DELIVERABLES:

5.1 Copies of all readings in paper and electronic formats.

Spec item #: E-05	SPECIFICATION	TCMSB Field # N/A
E-05 : PROPULSION MOTOR MITCHELL BEARING		

Part 1: SCOPE:

- 1.1 The intent of this item is to open up, survey for TCMS and reassemble both the Port and Stbd propulsion motor thrust bearing and the Port and Stbd motor pedestal bearings. TCMS credit is to be obtained.

Part 2: REFERENCES:

- 2.1 Drawings and Instructions- CGE Instruction Manual for Industrial Machines

“Michell” Thrust Bearing

Manufacturer:	Vickers Limited
Brg. No.:	91622 / S1
Fore & Aft Clearance:	0.040”
Journal Clearance:	0.026”
Lubricant:	Esso Teresso 100 (168.litres)

Fwd. Pedestal Bearing:

Manufacturer:	Vickers Limited
Brg. No.:	505 0336 9925 701
Lubricant:	Esso Teresso 100 (68.litres)

Part 3: TECHNICAL DESCRIPTION:

- 3.1 Contractor is responsible for all ancillary services necessary to complete the specification item. This includes, but is not limited to, strip out, cramage, staging , cleaning, debris removal and disposal, etc. All materials to be contractor supply unless otherwise stated.
- 3.2 Before any work on the thrust bearings occurs the Contractor is to take and record the axial thrust clearance on the thrust pads and Weardown on the journal bearing. Recording the axial thrust clearance will require jacking the shaft to record axial movement. Recording the journal Weardown will require use of a depth micrometer. Three typewritten copies to be passed to Chief Engineer before re-assembly.
- 3.3 Bearings to have oil drained from their sumps and oil disposed of ashore. Bearing sumps to be flushed and cleaned.
- 3.4 All removals necessary to gain access to bearings, including wiring and piping to be correctly marked to ensure correct replacement.
- 3.5 Before removing top cover of thrust bearing see CGE instruction manual Section 8, Page 8.
- 3.6 Top cover to be removed for inspection of bearing internals. Bearing alignment with shafting to be checked.

- 3.7 Pads and thrust shoes to be removed for inspection. Condition of thrust collar faces, oil scraper, oil catchers and cooling coils to be noted.
- 3.8 Journal bearings to be removed for inspection. Journal bearing oil passages to be proven clear. Journal thicknesses are to be measured and recorded. Three typewritten copies to be passed to Chief Engineer before re-assembly.
- 3.9 Grease nipples for oil seals to be checked and their passages proven clear. Condition of oil seals to be noted.
- 3.10 All temperature transducers, level switches and temperature thermometers to be proven operational.
- 3.11 Thrust bearing to be re-assembled and boxed up in good order using all new gasket material.
- 3.12 The pedestal bearing to be opened up in a similar manner to the thrust bearing. Inspection of internals, clearances and checking as per thrust bearing inspection, where applicable.
- 3.13 All four (4) bearings to be filled with new Contractor supplied oil to their operational level.

Part 4: PROOF OF PERFORMANCE:

- 4.1 All work to be completed to the satisfaction of the Chief Engineer and attending TC/MS inspector
- 4.2 Bearings to be operational tested during sea trials
- 4.3 The temperature probes to be proved operational to the vessel's Alarm and Monitoring system, via the monitors in the Motor Control Room.

Part 5: DELIVERABLES:

- 5.1 Copies of all readings in paper and electronic formats.

Spec item #: E-06	SPECIFICATION	TCMSB Field # N/A
E-06 : AIR RECEIVER SURVEY		

Part 1: SCOPE:

- 1.1 The intent of this item is to open the air receivers for inspection, test and survey by TC/MS and Chief Engineer. TC/MS credit is to be obtained.

Part 2: REFERENCES:

2.1 Air Tank Details

TANK	LOCATION	MAWP	TEST	VOLUME	SERIAL#
#1 Main	ER Stbd mid	464 PSI	700 PSI	1.1 M ³	166588-B
#2 Main	ER Stbd aft	464 PSI	700PSI	1.1 M ³	166588-A
Service	ER Stbd Fwd	125 PSI	188PSI	1.0 M ³	166589
Emerg Gen	E Gen Comp	464 PSI	700 PSI	0.7M ³	166590

Part 3: TECHNICAL DESCRIPTION:

- 3.1 Contractor is responsible for all ancillary services necessary to complete the specification item. This includes, but is not limited to, strip out, cramage, staging, cleaning, debris removal and disposal, etc. All materials to be contractor supply unless otherwise stated.
- 3.2 With the ship's crew the contractor is to ensure the Lockout/Tagout is in place. The contractor is to supply his/her own locks and tags but complete the vessel's Lockout/Tagout procedure.
- 3.3 After tanks have been drained the Contractor is to remove the handhole doors to access the internals of the air receivers. The internals of the receivers are to be thoroughly cleaned to remove all rust, scale, and sludge and then wiped down using a suitable degreasing solvent. The landing of each handhole door shall be suitably cleaned to provide a good sealing surface for the gasket. NOTE: Only one of the main air receivers is to be taken out of service at a time.
- 3.4 Any WHMIS controlled cleaners utilized will be accompanied by a current MSDS; any neutralizing chemicals or specialized protective equipment required shall be provided by the Contractor at all times these WHMIS-controlled products are onboard the vessel.

- 3.5** Upon the completion of cleaning, the receiver's internals are to be thoroughly wiped with clean water. The receivers are then to be inspected internally by the Technical Authority (or designate) and the attending TC/MS Inspector. Upon completion of inspection, the handhole door is to be reinstalled using a new gasket, suitable for compressed air service.
- 3.6** The relief valves removals from the air receivers are to be coordinated with specification item Relief Valve Recertification.
- 3.7** All valves and fittings are to be tagged to ensure installation in their original locations. All valves and fittings associated with each air receiver are to be removed to the contractor's workshop.
- 3.8** The Contractor is to install blanks and plugs on all flanges and tank openings; Contractor-supplied gaskets and thread sealant are to be used. Certified pressure gauges of the appropriate range for the test pressure of each receiver is to be provided; copies of the certificates are to be made available to the Technical Authority (or designate) upon request. NOTE: "As-fitted" pressure gauges are not to be used for test purposes.
- 3.9** The receiver is to be filled with fresh clean water, vented of all air, and pressurized to the test pressure indicated in section 2.1 above or to a pressure acceptable to the attending TC/MS Inspector. The length of the test is to be as directed by the Inspector.
- 3.10** Upon the successful completion of the hydrostatic test, the Contractor is to drain and open up each receiver, remove all the blanks, plugs and appliances required for testing and wipe down of the tank internals. Water is not to be drained into the vessels bilges. The contractor is responsible for disposing of the water.
- 3.11** Each valve is to be disassembled, cleaned, and laid out for inspection; valve seats and faces are to be machined and lapped-in using a suitable grinding compound. Valve packing is to be removed and discarded.
- 3.12** The valves are to be inspected by the Technical Authority (or designate) and the attending TC/MS Inspector; any valve judged defective is to be repaired, or replaced, by 1379 action. All valves are to be reassembled, using new Contractor-supplied gaskets, seals and packings.
- 3.13** Upon completion of all testing, cleaning and inspections, all valves and fittings are to be returned to the vessel and installed in their original location, using new Contractor-supplied gaskets, fasteners and thread sealant. The contractor is to apply marine grade never seize to all threaded fasteners before screwing together.
- 3.14** Lock-outs are to be removed; the air receivers are to be returned to operating pressure and proven free from leaks. All valves will be returned to their normal operating positions; this is to be confirmed in the presence of the Technical Authority (or designate).

Part 4: PROOF OF PERFORMANCE:

4.1 All work to be completed to the satisfaction of the Chief Engineer and attending TC/MS inspector

Part 5: DELIVERABLES:

5.1 Copies of inspection and test reports in paper and electronic formats.

Spec item #: E-07	SPECIFICATION	TCMSB Field # N/A
E-07 : RELIEF VALVE CERTIFICATION		

Part 1: SCOPE:

- 1.1 There are 17 air, and heating fluid safety relief valves which require recertification for TC/MS. The Contractor is to remove these valves and transport them to a recognized facility for testing and recertification

Part 2: REFERENCES:

VALVE	LOCATION	S/N	TYPE	SET POINT	SIZE
#1 Thermal Heating Unit	Heating Space	L85	Kunkle 910 J 122	100 PSI	2"X 3"
#2 Thermal Heating Unit	Heating Space	L85	Kunkle 910 J 122	100 PSI	2"X 3"
Emergency Air Receiver	Emergency D/G Rm	TH02745	Consolidated 1990C-1	3200 kpa	1"
Main Air Receiver (Fwd)	Upper Engine Room (S)	NV 3921	Kunkle 264	465 PSI	1"
Main Air Receiver (Aft)	Upper Engine Room (S)	NV 3924	Kunkle 264-1	465 PSI	1"
Ship Service Starting Air	Upper Engine Room (S)	N/V 3920	Kunkle 6010EEM01-KM	140 PSI	1"
Whistle Air Tank	Stack	N/V 3690	Kunkle 6010FFM01-KM	140 PSI	1 ¼ "
Main Starting Air Comp (Fwd)	Upper Engine Room (S)	630312	Hamworthy 40409	37 Bar	¾" Bsp
Main Starting Air Comp (Fwd)	Upper Engine Room (S)	93945	Hamworthy 40410	7 Bar	1 ¼ " Bsp
Main Starting Air Comp (Aft)	Upper Engine Room (S)	31862113	Hamworthy 40409	33 Bar	¾" Bsp
Main Starting Air Comp (Aft)	Upper Engine Room (S)	31852148	Hamworthy 40410	7 Bar	1 ¼" Bsp
Service Air Comp #1	Upper Engine Room (S)	09/07-00492	Lorch 2124	7.5 Bar	½" Bsp
Service Air Comp #1	Upper Engine Room (S)	92396	Hamworthy 40410	4.8 Bar	1" Bsp
Service Air Comp #2	Upper Engine Room (S)	90798	Hamworthy 40408	7.6 Bar	½" Bsp
Service Air Comp #2	Upper Engine Room (S)	31862154	Hamworthy 40410	6 Bar	1" Bsp

Service Air Reducing Station	Upper Engine Room (S)	NV1169	6010EDM01-AM	50 PSI	¾"
Reducing Station to Service Air	Upper Engine Room (S)		6010EEM01-AM	140 PSI	1"

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The Contractor is to be responsible for all inspections and is to consult with TC/MS, prior to commencement of work, to determine an inspection schedule; at each inspection point, the Contractor is to advise the Technical Authority, in advance, to allow his/her attendance.
- 3.2 Lock-out of air inlet valves shall be on a case-by-case basis by ship's personnel, with TFHU's being isolated at the respective circuit breaker/MCC by the ship's Electrical Officer.
- 3.3 Air relief valves shall be removed in such a way as to allow ship service air to the vessel to remain uninterrupted as much as possible; the Contractor is to provide 24 hours notice of any interruption of ship service air supply to allow ship's personnel to make alternative arrangements, if required.
- 3.4 Suitable blanks/plugs are to be installed in the piping/receivers while the safety valves are removed; the Technical Authority (or designate) are to witness the removal of the blanks/plugs upon reinstallation of the relief valves.
- 3.5 Contractor-supplied thread sealant or new gasket material is to be used on re-installation; connections are to be proven leak-free, using the medium normally contained in the receiver/piping at operating pressure.
- 3.6 The Contractor is to allow for any adjustments or repairs required as a result of the above recertification procedures. Any repairs required over and above cleanup, adjustment and recertification will be adjusted by 1379 action. Any valves failing to operate as required will be replaced by 1379 action.

Part 4: PROOF OF PERFORMANCE:

- 4.1 Original test certificates are to be supplied to the Technical Authority within three working days of the completion of all work.

Spec item #: E-08	SPECIFICATION	TCMSB Field # N/A
E-08: ANNUAL REFRIGERATION SYSTEMS INSPECTION		

Part 1: SCOPE:

- 1.1 The intent of this item is to ensure the refrigeration systems are operating in an efficient and environmentally safe manner under the Halocarbon Regulations.

Part 2: REFERENCES:

1. Domestic Refrigeration System: Carrier VM5F60-12 2 units MO79 (2 of)
2. Cargo Refrigeration System: Carrier VM5F40-12 2 units MO79 (2 of)
3. Accommodation A/C Chillers: Carrier 5H40 2 units R-22 (2 of)
4. Electronic Equip. Rm A/C unit: Bronswerk Type NSN-3B 1 unit R-22 (1 of)
5. A/C units for MCR Carrier 90 MA 012 2 units R-22 (2 of)

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The contractor is to provide the services of a service person properly licensed under provincial or federal regulations to perform such work to conduct a complete and thorough examination of the vessel's Halocarbon containing systems including compressor units, piping and evaporators and all associated components.
- 3.2 The Domestic refrigeration system, the Cargo refrigeration system, and the water chiller for the Air conditioning system each have two compressors and condensers. There are 5 cooled spaces on the Domestic system, and a single cooled space on the Cargo system. The contractor will note that there are two evaporators in the cargo freezer (cargo system), two evaporators in the domestic freezer (domestic system), one evaporator in the milk & dairy room (domestic system), one evaporator in the fruit & vegetable room (domestic system), one evaporator in the potatoe room (domestic system), and one evaporator in the galley walk in cooler (domestic system). There are two self-contained A/C units for the MCR and one self contained A/C unit for the Electronics Equipment Room.
- 3.3 The Contractor is to change all filter/drier elements systems. The Contractor is to perform oil and filter changes on the 9 compressors (1 through 5).
- 3.4 All materials are to be contractor supplied by 1379 action upon proof of invoice.
- 3.5 All systems are to be leak tested when systems are in operation. All the components and piping to be examined. Any necessary repairs to be by 1379 action, after estimates are reviewed by the Chief Engineer.

Part 4: PROOF OF PERFORMANCE:

- 4.1 The Contractor is to complete the vessel's halocarbon logbook noting all work performed on each system.
- 4.2 All work to be completed to the satisfaction of the Chief Engineer.

Part 5: DELIVERABLES:

- 5.1 The Contractor is to provide a Service Report including the as found condition, work performed, and any parts used.
- 5.2 The Contractor is to provide written documentation of inspection to satisfy Environment Canada regulations to the Chief Engineer.

Spec item #: E-09	SPECIFICATION	TCMSB Field # N/A
E-09 : MACHINERY SPACE BILGE CLEANING		

Part 1: SCOPE:

- 1.1 The intent of this item is to clean the tank top, bilges, piping, machinery seats and frames below the deck plates in the machinery spaces of all debris and oil and sludge.

Part 2: REFERENCES:

- 2.1 This item is to be scheduled for the last week of the contract period.
- 2.2 The contractor is to supply all material and labour to effectively degrease and clean the area beneath the deck plates in Generator Room, Auxiliary Machinery Room, Propulsion Motor Room, and Bubbler Manifold Compartment.
- 2.3
- | | |
|--------------------------------------|---------|
| Area of Generator Room | 283 m2. |
| Area of Auxiliary Machinery Room | 202 m2 |
| Area of Propulsion Motor Room | 228 m2 |
| Area of Bubbler Manifold Compartment | 34 m2 |

Part 3: TECHNICAL DESCRIPTION:

- 3.1 All water, oil, sludge and debris is to be removed ashore.
- 3.2 Any chemicals used are to be designed and approved for the intended use by the chemical manufacturer. Any chemicals are to be compatible with and intended for use with a marine Oily Water Separator system by the chemical manufacturer.
- 3.3 The contractor is to supply product details and instructions and current MSDS on cleaning chemical used to Chief Engineer before the chemical is used or brought aboard the vessel.
- 3.4 The contractor is not to use any cleaning chemical capable of generating toxic or excessively volatile fumes under any circumstances.

- 3.5 The contractor is to use warning Tape and Barriers to safely mark areas where the deck plates are up or are unsecured.
- 3.6 This work will include the marking, removal, and re-installation of a number of steel deckplates as well as the immediate removal ashore and disposal of waste water and solutions from the Bilges and Tank tops.
- 3.7 A pressurized water cleaning System is to be used to clean the bilges/tanktop of all water, oil, sludge and debris removed with a pumping/vacuum system.
- 3.8 Care is to taken to protect machinery using plastic barrier as necessary.
- 3.9 Areas and equipment above the deck plates are not to be over sprayed.
- 3.10 All liquids and debris remaining as result from the cleaning shall be continuously removed from the vessel. Ships Systems and equipment shall not be used to dispose of any liquids or debris.
- 3.11 All bilge wells shall be shown to be clean upon completion of all work. Bilge float alarms in the wells shall be proven operational.
- 3.12 Deck plates to be re-installed with all securing screws in place.

Part 4: PROOF OF PERFORMANCE:

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

Part 5: DELIVERABLES:

- 5.1

Spec item #: E-10	SPECIFICATION	TCMSB Field # N/A
E-10 : Starting air Compressors install		

Part 1: SCOPE:

1.1 The intent of this specification shall be to replace the two sets of Hamworthy Water-cooled Start Air Compressors with Sauer air cooled units. In addition, the contractor shall remove the existing cooling water lines for both air compressors.

Part 2: REFERENCES:

2.1

#	Description
501303-575	501303-575 - Control Panel, 575V, Soft Start, WP121L
121L- 8G0B02-169	Dwg - Production Release - Mech Assm, C17098A, WP121L, 8-30-17
EN Rev 6-1-2016	Installation Instructions Industry EN Rev 6-1-2016
34-0800 -07, Sht 1	Starting Air compressor #1
34-0800 -08, Sht 1	Starting Air compressor #2

2.2 Unless otherwise stated all required materials to be Contractor supply.

- Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- Coast Guard ISM Lock-Out and Tag-Out 7.D.19
- Coast Guard ISM Hot Work 7.D.11
- Transport Canada TP127E
- The Canada Shipping Act – Marine Machinery Regulations, will be followed in carrying out this work. Current edition of documents, at time of contract implementation, shall be used.

2.3 Supplier: Madsen Diesel and Turbine
 Contact: Alan Franklin
 Madsen Diesel & Turbine
 141 Glencoe Drive
 Mount Pearl (St. John’s), NL A1N 4S7
 T: (709) 726-6774
 C: (709) 769-7275

Part 3: TECHNICAL DESCRIPTION:

3.1 The Contractor is to be responsible for all inspections and is to consult with TCMS, prior to commencement of work, to determine an inspection schedule; at each inspection point, the Contractor is to advise the Technical Authority, in advance, to allow his/her attendance. The contractor will coordinate inspection by TCMS to ensure Division 3 Credit for the two new air start compressors. The contractor will conduct testing of the fitted alarms and shut

downs of both new air compressors to the satisfaction of TCMS and the vessel Chief Engineer.

- 3.2** Contractor is responsible for all ancillary services necessary to complete the specification item. This includes, but is not limited to, strip out, cramage, staging , cleaning, debris removal and disposal, etc. All materials to be contractor supply unless otherwise stated.
- 3.3** The vessel is currently fitted with two (2) Hamworthy Water Cooled Start Air Compressors that are attached to a single distribution line serving the start air receivers.
- 3.4** Each compressor is independently alarmed, monitored and controlled for low oil level, high temperature and high/low pressure start/stop.
- 3.5** Air compressors are to be locked out with the assistance of the ship's Electrical Officer. Air Compressor #1 is supplied from Breaker #P504-1, 100A, in MCC#1. Air Compressor #2 is supplied from Breaker #P505-1, 100A, in MCC#2.
- 3.6** The following items will be removed from the MCC doors and blanked off: hour meters, reset buttons, and the start, stop, auto-manual switches. The associated components from the MCCs as noted in this line item are to be removed. The contractor will ensure that the blanks installed meet the integrity of the MCC doors as per original. The original wiring terminal strip will remain for connection of ancillary wiring to the new compressor panels and the alarm and monitoring system.
- 3.7** The contractor will remove the existing Westinghouse 100Amp Breakers ,Part Number Westinghouse MCP331000S175D502G27 fitted with current Limiter Cat # EL3100R Style 2607D43G12 , and install contractor supplied 70 Amp breakers with current limiter in each MCC.
- 3.8** The original power cables from the MCC to the air start compressors will be removed in their entirety.
- 3.9** New contractor supplied 4/3 Marine cable will be run from the MCC to the new air compressor starter cabinets. Contractor to bid on replacing 90 metres of 4/3 Marine cable for the installation. The contractor will supply a unit cost per meter to be used for adjustment purposes. The contractor will ensure that all cables are Marine Type Approved and sized properly for the intended service.
- 3.10** The contractor will note that the power cable passes through a water tight bulkhead. Transit will be fitted with appropriate watertight blocks to match existing. The cable will have inner marine braid with an outer pvc jacket where cable passes through watertight bulkhead.
- 3.11** The two air start compressors have lead / lag functionality that will be required to be connected. The connection details are defined on Dwg 501302-575, sheet 5 of 5.

- 3.12** The original ammeter CT's will be reinstalled in the MCC cabinets as per the original installation.
- 3.13** Existing alarm wires are to be verified, marked and protected before compressor removals. Existing push button starters are to be removed and the wiring marked and protected.
- 3.14** Present air compressors will be isolated from the air receivers prior to any removals. All FW cooling lines will be isolated at the compressor prior to removals.
- 3.15** The air compressors c/w motors, bedplates and starting control panels are to be disconnected and removed in their entirety. The compressors shall be crated and put in storage for returning to Coast Guard. Existing welded foundation to remain. Stand for the control panels to be removed.
- 3.16** The compressors are to be removed from the engine room through the soft patch on the stbd side, boat deck.
- 3.17** The contractor will note that only the two air start compressors will be replaced during this refit period. The contractor will ensure that the cooling water and complete functionality of the service air compressors is not impacted by the replacement of the original water cooler Hamworthy compressors with the new Sauer Air cooled Air compressors.
- 3.18** With the assistance of the ship's crew the cooling water system will be isolated and drained prior to removing the compressor water cooling lines. The supply and return lines will be removed to the corresponding Victaulic "T"s in the main lines. The "T"s will be fitted with Victaulic blanks.
- 3.19** The water lines from the Air Compressor expansion tank will be removed and the header on the ship's side plugged.
- 3.20** All existing supports on the compressor foundation shall be removed and the foundation ground flush.
- 3.21** Once the existing compressors have been removed the deck inside the compressor foundation will be cleaned and scraped prior to the new compressors being installed. The deck in this area to be given two coats of contractor primer, followed by two coats of owner supplied grey paint.
- 3.22** The new air compressors are to be brought into the engine room through the soft patch on the stbd side. If necessary the air compressors can be disassembled if moving in one piece is not deemed feasible. All parts removed are to be protected and reinstalled as per original once the compressors are in place. Care is to be taken to ensure that the compressors are not damaged from straps, chain falls, etc. when moving the equipment.
- 3.23** The new compressors and foundations are to be installed on the existing bedplate and moved to their final mounting location as determined by Chief Engineer. The

compressors will be fitted with the intercooler facing forward. Air compressors to be temporarily removed to allow modifications of the bedplates if necessary. Any modifications required to the existing bedplates will be covered by 1379 action. New foundations are to be welded to the existing bedplates once final fitment is complete.

- 3.24** The existing compressor outlet lines shall be modified to fit the outlets from the new compressors. The outlets will be joined together and check valves shall be fitted in the outlet lines to ensure the compressors are isolated when just one is running. Unloader outlets to be connected to existing drain piping.
- 3.25** The air compressors will be connected such that the forward air compressor is number 1 and the aft air compressor is number 2.
- 3.26** The contractor will fabricate and install a suitable structure to attach the new starter cabinet to. The exact location will be agreed with the contractor and the vessel Chief Engineer.
- 3.27** Existing wiring for the alarm & monitoring system will be reused. The contractor will connect the original alarm & monitoring system to the alarm outputs from the new Sauer compressors and test. The existing wiring (P504-1-1, 6 C#14)will be connected to the following:
- a) Compressor running indication, Relay CR-M1,
 - b) Compressor remote enable interlock, Terminal I8 and common of panel
- 3.28** The existing alarm and monitoring wiring will be re-used. Existing wiring EC-10/39 2C#14 from the existing compressor starters will be connected to the new compressor panel, Relay CR-413, compressor alarm.
- 3.29** The compressor will be filled with contractor supplied oil.
- 3.30** Once all connections are made, the compressor will be given a bump test to ensure the motor has been connected properly. If the motor rotation is incorrect contractor will be responsible to correct it.
- 3.31** The contractor will co-ordinate the official FSR from :
- Alan Franklin*
Madsen Diesel & Turbine
141 Glencoe Drive
Mount Pearl (St. John's), NL A1N 4S7
T: (709) 726-6774
C: (709) 769-7275
All costs for the FSR will be handled through an existing contract with CCG.

Part 4: PROOF OF PERFORMANCE:

E-10 : Starting air Compressors install

- 4.1** All work to be completed to the satisfaction of the Chief Engineer.
- 4.2** Compressor is to be put on line and shown to fill tanks and all functions operate as designed. All alarms are to be proven operational.

Spec item #: E-11	SPECIFICATION	TCMSB Field # N/A
E-11 : Watertight Door Install		

Part 1: SCOPE:

- 1.1 The intent of this item is to remove the #4 and 5 Watertight Doors and Frames from the vessel and replace with a new owner supplied replacement.

Part 2: REFERENCES:

Drawing Number	Description	Electronic Number
MSI Dwg No. 2839-1-00	CCGS Larsen W/T door Removal and Repair Bid Specification	
NO. 23-0722-13	Arrangement of WT Door	
CEB 2403	Piping Layout Hydro Electric system	
AED 7301	Piping Layout	

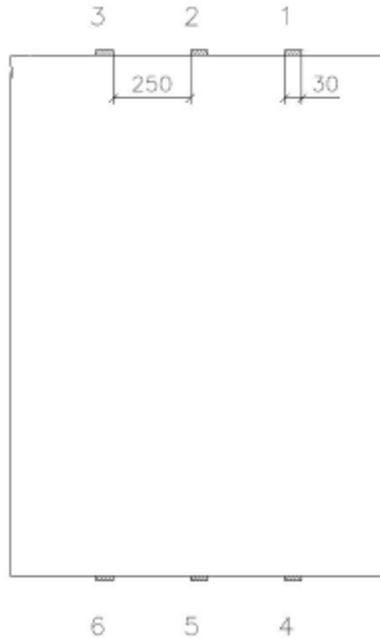
- 2.1 Tasks completed as part of this modification shall be in accordance with the following:
CSA W47.1/47.2, W59.1/59.2
- 2.2 Original Equipment Manufacturer: Stone Vickers
- 2.3 Replacement Watertight Door . Undetermined
- 2.4 FSM Hot Work Permit

Part 3: TECHNICAL DESCRIPTION:

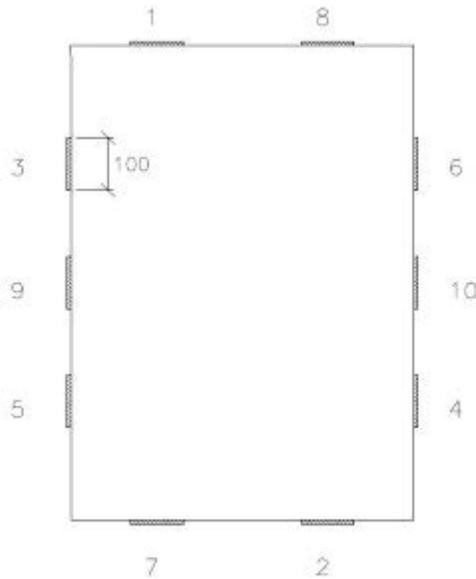
- 3.1 Contractor is responsible for all ancillary services necessary to complete the specification item. This includes, but is not limited to, strip out, crantage, staging, cleaning, debris removal and disposal, etc.
- 3.2 The Contractor is to be responsible for all inspections and is to consult with TC/MS, prior to commencement of work, to determine an inspection schedule; at each inspection point, the Contractor is to advise the Technical Authority, in advance, to allow his/her attendance.
- 3.3 Prior to any work starting on the removal of the watertight door, the contractor will witness a function test of the existing door to confirm: the remote light indicators function, the door buzzer functions properly, the limit switches function properly, the hydraulic power pack starts and stops correctly, the local manual opening and closing of the door functions correctly, the local opening and closing of the door functions correctly, and the remote closing of the doors function correctly.
- 3.4 The contractor will identify any oil leaks to the Chief Engineer before work starts on removals.

- 3.5** Prior to commencing the work, the contractor in conjunction with the ship's Electrical Officer will lock out the #4 and #5 Watertight Door Hydraulic systems.
- 3.6** The contractor will remove the following hydraulic items prior to removal of the doors.
- Watertight door hydraulic actuator ram and associated piping (Item C)
 - Door Control Valve (Item A)
 - Stop Valve (Item F)
 - Emergency Hand Pump, bracket and fittings (Items I,E,B)
 - Bulkhead signs/plaques
 - Bolted Roller Bar guide extension pieces on door frame.
- 3.7** The door is to be supported and then the sliding door and frame bolted closer plates and bolted door roller guide bars are to be removed. For bid purposes, Reference Dwg 2839-01-00 Fig 1a and b. The door is to be removed from the frame and temporarily secured out of harm's way.
- 3.8** Contractor to install 4"X6"X3/8" angle iron on the sides of the door frame to #5 W/T door to prevent bulkhead plate distortion.
- 3.9** The existing door frame welds are to be removed by grinding or gouging. The areas around the doors are to be suitably protected to prevent any damage from this work and to prevent any debris from entering the bilge in the Main Engine room. The door cutout is to meet the replacement door welded frame within a 4mm tolerance. The door frame is to be expected to be 2060mm x 820mm. The contractor is to confirm all dimensions with the Chief Engineer before any cutting is to take place.
- 3.10** #4 Door frame is to be removed from the bulkhead and door and frame are to be transported out of the engine room via the soft patch on vessels stbd side at boat deck level.
- 3.11** #5 Door frame is to be removed from the bulkhead and door and frame are to be transported out of the cargo hold via one of the adjacent cargo hatches. The contractor is responsible for all crantage .
- 3.12** New door manufacturers instructions. For bidding purposes, the door and frame is to be placed and tack welded as per sketch 1 below top and bottom and on the sides. After inspection by FSR, Chief Engineer and TCMS for initial fitment , final welding is to be performed as detailed in Sketch 2, final welding. Final welding to be performed in 10cm seams as detailed in sketch 2 with sufficient cooling time to prevent warpage of the door frame.

E-11: Watertight Door Install



Sketch 1 – Initial tack weld



Sketch 2 – Final weld procedure

3.13 The contractor will pay particular attention to the bottom area of the watertight doors in way of the originally fitted door boxes and deck. These areas are recognized as having limited access and the scope of work maybe more involved than is obvious with a quick look during a viewing.

3.14 The contractor will ensure the door frame remains square during the welding process.

3.15 Once the frame is installed the sliding door is to be reinstalled in the frame and re-secured.

- 3.16** The contractor will install a door sill lifting arrangement as per the original door as shown below. The existing radius plate may be removed from the original door. The lifting arrangement consists of 20mm curved plate and flat bar running the width of the door. The flat bar is to be a minimum of 6mm thick and 70mm high and 265mm from the bottom of the new door. The new arrangement is to be welded to the new door under the direction of the watertight door FSR.



- 3.17** All opening and closing hardware to be reinstalled as found.
- 3.18** All hydraulic items and piping and any removed interference items to be reinstalled to fit the new hydraulic ram. The contractor will include all modifications to hydraulic piping to connect to the new hydraulic ram.
- 3.19** Once connected the door is to be function tested to ensure correct operation. Shims to be adjusted under direction of the FSR as required ensuring that the proper seal is achieved around the entire sealing face of the door. The contractor will include \$25000 for FSR costs which will be adjusted by 1379 . The contractor will submit approved timesheets and proof of travel costs for the FSR.
- 3.20** The maximum tolerance between the new door and door frame will be as per the new watertight door manufacturer's specifications.
- 3.21** Upon completion of all work, all disturbed surfaces to be coated with two coats of marine grade primer and two coats of Matchless 700 white. All paint to be contractor supply.

Part 4: PROOF OF PERFORMANCE:

- 4.1** All work to be completed to the satisfaction of the Chief Engineer.
- 4.2** Contractor to verify operation and seal of the door to the satisfaction of the attending TCMS inspector.
- 4.3** Any removed interference items are to be reinstalled and proven operational upon completion of all work.

5: DELIVERABLES:

E-11: Watertight Door Install

5.1 NDT report for all welding

5.2 All measurements to confirm door meets manufacturers installed standards.

Spec item #: E - 12	SPECIFICATION	TCMSB Field # N/A
E-12 : STBD SILENCER RE-INSULATE		

Part 1: Scope

- 1.1 The intent of this item is to remove and replace the insulation on the stbd main engine silencers

Part 2: REFERENCES:

Drawing Number	Description	Electronic Number

Part 3: TECHNICAL DESCRIPTION:

- 3.1 All materials are to be contractor supply unless otherwise stated in the specification.
- 3.2 The stack, lower engine room and surrounding areas are to be protected against dust, debris and damage prior to any work on the silencers being carried out.
- 3.3 The Contractor will ensure that adequate protection is installed to prevent falling debris into the engine room.
- 3.4 The contractor will be responsible for cleaning all debris from the engine room and bilge as a result of stripout and re-insulation. The contractor along with the Chief Engineer will record the condition of bilges and E/R prior to starting this work.
- 3.5 All work is to be completed by a certified insulation contractor recognized by applicable Provincial Health and safety Regulations . The Port and Center silencers were previously insulated by Guilfords of Mount Pearl, NL and they also pre-fabricated 80% of the blankets required for this silencer which will be supplied by CCG.
- 3.6 The Contractor will install the previously fabricated blankets in the same manner as done on the other 2 silencers.
- 3.7 The contractor will supply and install the remaining 20% of blankets required. The contractor will supply a unit cost per square meter for the blankets to be used if additional blankets are needed above the 20%.
- 3.8 Contractor is responsible for all scaffolding required to complete this work. Scaffolding to be installed by a certified scaffolding company recognized under the applicable Provincial Health and Safety Regulations.

- 3.9 The existing insulation and cladding will be removed from the stbd main engine silencer. All removed insulation is to be disposed of according to local regulations. All debris is to be removed from the ship at the end of each working day.
- 3.10 Once all insulation has been removed from the silencer a system of removable insulated blankets shall be installed on the silencers. Covers to be made to include all openings, such as exhaust mounts and hangers and other obstacles. A minimum 2 inch overlap seam where joining to other covers or insulation is to be ensured.
- 3.11 The blankets will be in 2 layers. The inner layer blankets are to have 2” thick high temperature rated insulation core, Superwool 607 blanket by Morgan Thermal Ceramics, or equivalent, with stainless steel mesh facing on both sides.
- 3.12 Approximately 80% of the blankets have already been fabricated by Guilfords from a previous contract. These will be supplied by CCG.
- 3.13 The outer layer will consist of a 2” insulation core, Tri-L vitreous silicate needled blanket insulation, or equivalent, with stainless steel mesh face on the inner side and silicone cloth face on the outer side.
- 3.14 10 gauge steel weld pins are to be attached to the silencers to provide vertical support of the removable blankets.
- 3.15 The inner and outer blankets will have their seams staggered to reduce heat loss. Jacket seams to be drawn together with stainless steel wire secured through lacing anchors that are no less than 25 mm from any seam edge and secured through the entirety of the pad with a backing plate.

Part 4: PROOF OF PERFORMANCE:

- 4.1 All work to be completed to the satisfaction of the Chief Engineer.
- 4.2 Stbd main engine will be run up and new insulation tested and inspected to ensure proper coverage.
- 4.3 The removed interference items are to be reinstalled and proven operational upon completion of all work.

Part 5: DELIVERABLES:

- 5.1
N/A

Spec item #: E - 13	SPECIFICATION	TCMSB Field # N/A
E-13 : THERMAL FLUID UNITS MAINTENANCE		

E-13 Thermal Fluid Unit Overhaul

Part 1:

- 1.1 The intent of this specification is to service the 2 Fulton thermal fluid units. The contractor will be responsible for all cost associated with the labor/ travel and accommodations portion of the overhaul. All parts owner supply

Part 2: REFERENCES:

- 2.1 Fulton Thermal fluid unit FT-0600 /FT-0400 , NB 1285T151, 1285T152

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The contractor will be responsible for booking the services of 1 Fulton FSR to perform servicing of the 2 thermal fluid units.
- 3.2 The contact info for booking the Fulton FSR's is
Karen Chin/Chris Degeer
Fulton Boiler Works Canada Inc
75 Mary Street, Unit 10
Phone: Karen Chin 905-727-4013(ext 207)
Phone: Chris Degeer 905-727-4013 (ext 202)
Fax: 905-727-0104
Karen.chin@fulton.com
chris.degeer@fulton.com
- 3.3 All Parts are owners supply.

3.4 The following work is to be performed by the FSR's

- **Review System Installation**
- **Heater Inspection**
 - Remove and inspect pilot tube and associated components
 - Remove and inspect burner assembly
 - Repair or replace any burner and pilot components, as necessary
 - Inspect heater internals
 - Including spider assembly, refractories, tile, dresser plates, inner cover, coils
 - Reseal inner and outer cover dresser plates, if needed
 - Re-install pilot and burner assemblies
 - Inspect combustion fan assembly
 - Clean or replace, if necessary
 - Inspect strainer assembly
 - Clean basket, if necessary
- **Refractory Repair FT-0400**
 - Top and inner cover to be removed
 - Top refractory to be broken up and removed
 - New form installed at the proper height and new refractory poured into the heater.
 - Inner cover with dresser plates and top cover installed.
 - Allow a minimum of 24 hrs at 60°F for refractory to cure prior to firing heating unit.
- **Verify Heater Performance**
 - Set input and combustion at operating temperature
 - Test all safety circuits
 - At operating temperature, review flow circuit of system
 - Modify bypass valve settings as appropriate
- **Final Check**
 - Review all outstanding safety and operational issues with site contact(s).
 - Provide basic operator training with site contact(s), as needed.

Part 4: PROOF OF PERFORMANCE:

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

Part 5: DELIVERABLES:

5.1 Two 2 hard copies and 1 electronic pdf copy of all service reports, modified drawings and/or test sheets to be given to the chief engineer.

Spec item #: E - 14	SPECIFICATION	TCMSB Field # N/A
E-14 : PORT AND STBD CRANE CAB REPAIRS		

Part 1: SCOPE:

1.1 Contractor to make specified repairs to the Port and Stbd crane’s control cabins.

Part 2: REFERENCES:

Jacob Bros Crane Manual

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The Port and Stbd cranes are to be locked out as required to allow work to proceed in a safe manner. Ship’s lock out tag out system to be utilized. Both crane cabs are to be dealt with in the following manner.
- 3.2 The contractor shall disconnect all hydraulic hoses inside the cab and cap the lines. All lines are to be marked as to their positions to allow for proper reinstallation at the completion of the work. Hydraulic lines are to be removed from the cab and safely secured.
- 3.3 All electrical wiring is to be disconnected in the crane and wiring to be secured inside of the cab.
- 3.4 Welded guard rail is to be removed from the cab. Rail to be re-welded onto cab at completion of work.
- 3.5 Contractor is to release the bolts securing the cab to the crane. Crane cab is to be lifted off the crane by contractor supplied crane and taken to the contractors shop to be worked on.
- 3.6 The contractor shall remove the two lengths of flat bar on the bottom of the cab. The bottom of the cab shall be covered with a sheet of ¼” mild steel. The steel shall continue up the four sides of the cab for approximately 3”. The bottom steel plate shall be plug welded as required to allow proper attachment to the crane cab. The steel on the sides shall be continuously welded.
- 3.7 New ½”x 3” steel flat bar, complete with four ¾” studs (as per original cab bottom), shall be welded to the new cab bottom.
- 3.8 New steel is to be coated with 2 coats of contractor supplied primer and two coats of owner supplied top coat.

- 3.9** The cab is to be returned to the vessel and reinstalled on the crane. New ½” rubber strips are to be installed between the cab and the frame along the flat bar. New nuts and washers are to be installed and torqued.
- 3.10** All electrical wiring is to be reconnected as per the original.
- 3.11** Hydraulic lines are to be reconnected to their original positions.

Part 4: PROOF OF PERFORMANCE:

- 4.2** Upon completion of repairs the cranes hydraulic systems are to be proven to be free of leaks.
- 4.3** Cranes are to be tested by ship’s crew for proper operation upon completion of all work. .

Spec item #: E - 15	SPECIFICATION	TCMSB Field # N/A
E-15 : PORT AFT ICCP REFERENCE CELL REPLACEMENT		

Part 1: SCOPE:

- 1.1 The intent of this specification is to replace the Port Aft Impressed Current Cathodic Protection (ICCP) system reference Cell.

Part 2: REFERENCES:

Cathelco System Installation and Instruction Manual

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The new Reference Cell kit will be owner supplied. All other materials to be contractor supply
- 3.2 The contractor shall obtain the services of M. Yeatman, Andover Management Inc. 7 Canal St., Dartmouth, NS B2Y 2W1, cell 902 488 4119, andover@eastlink.ca to supervise the work, test on completion, and report to CCG to oversee the installation of the reference anode.
- 3.3 The contractor, in conjunction with the vessel's Electrical Officer shall complete the lock out tag out procedures for the ICCP system prior to commencing any work.
- 3.4 The reference anode is located inside the aft trim tank. This space is considered a confined space under the Safety Management system and contractor will be responsible for gas freeing the tank and maintaining safe work permits. This item to be completed in conjunction with ballast tank survey specification.
- 3.5 The contractor will note that the watertight integrity of the reference cell may be compromised and the cofferdam may be full of water.
- 3.6 The cofferdam shall be opened and the reference cell disconnected. Reference cell shall be removed from the hull. Reference cell to be returned to the vessel.
- 3.7 The cofferdam shall be inspected for any defects.
- 3.8 The electrical wiring shall be inspected and the wiring measured between the ICCP control cabinet and the reference cell for continuity, resistance and ground.
- 3.9 The cofferdam mating services for the reference cell shall be inspected and cleaned to ensure that the new cell will seal properly.

- 3.10** The new Reference Cell will be installed as per the Manufacturer's instructions. The securing nut will be tightened with a certified torque wrench. A copy of the calibration certificate shall be provided.
- 3.11** Once the new cell is installed the contractor will prove the integrity of the reference cell to the ship's hull by spraying with a fire hose for 15 minutes to ensure no leaks in the cofferdam. Once the hose test has proven successful a slight vacuum shall be applied to the inside of the cofferdam to prove it is watertight. This test shall be maintained for one hour.
- 3.12** The reference cell will be reconnected electrically and functionality will be confirmed to the satisfaction of the Cathelco Representative and the Senior Electrical officer.
- 3.13** Once in the water and proven leak free the cofferdam shall be filled with a non-conductive electrical isolating compound as per the Cathelco directions. The cover will be reinstalled with a new gasket.
- 3.14** Upon completion of all testing the manhole cover for the aft trim tank is to be reinstalled with a new contractor supplied gasket.
- 3.15** Once in the water the ICCP system will be reenergized and proven to be functioning correctly under the guidance of the Cathelco Representative.

Part 4: PROOF OF PERFORMANCE:

- 4.1** Upon completion of repairs and once the vessel is back in the water the cofferdam is to be proven free of leakage.
- 4.2** All work to be completed to the satisfaction of the Cathelco Representative and the Chief Engineer

Spec item #: E - 16	SPECIFICATION	TCMSB Field # N/A
E-16 : SEWAGE TREATMENT SKIMMER INSTALLATION		

Part 1: SCOPE:

- 1.1 The intent of this specification is to upgrade the sewage treatment system to install a new Red Fox OEM recommended sewage skimmer system. The skimmer system will involve new owner supplied piping to be installed and new sewage tank penetrations. This will also involve removing the original Ultra Violet (UV) system and installing a new owner supplier chlorination system.
- 1.2 Where sewage discharge pump is referenced, the scope of work will apply equally to both sewage discharge pumps.

Part 2: REFERENCES:

- 2.1 E-16 Red Fox Skimmer penetrations
- 2.2 Red Fox Modification –Skimmer Install For Facet & Canadian Built Units
- 2.3 Red Fox drawing indicating tank penetration details
- 2.4 Discharge Pumps, UV, and Filter



2.5 Discharge piping



2.6 Sight Glass Penetration to be replaced

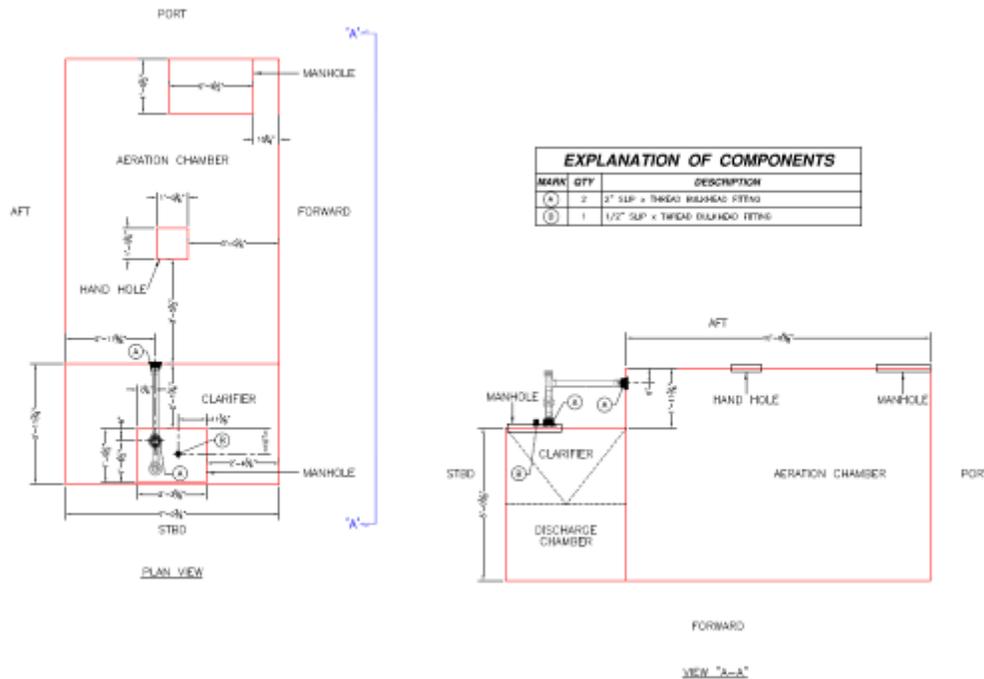


Part 3: TECHNICAL DESCRIPTION:

- 3.1 The contractor will coordinate the completion of this specification with the separate specification for the sewage tank maintenance.
 - 3.2 All materials to be contractor supply other than the SEACOR PVC piping, chlorine dosing tank, and the chlorine metering pump which will be owner supply. All parts are to be new and suitable for the application.
 - 3.3 The contractor will note that the Red Fox FSR is to attend the vessel to supervise the Skimmer installation after all of the sewage tank maintenance and preparation has been carried out. This is to be understood that all hotwork, cleaning, and coatings are complete. The contractor will ensure that the new chlorination tank and chlorine metering pump will be mounted and connected prior to the Red Fox FSR attending.
- Brady Duhon
Red Fox Environmental Services, INC
office: +1 337.856.3709
cell: +1 337.789.4359
brady@redfoxenviro.com
- 3.4 The contractor will remove the original UV system and associated piping.
 - 3.5 The contractor will remove the filter on the inlet to the UV system and associated piping.
 - 3.6 The contractor will remove the diverter valve and associated piping.

E-16: SEWAGE TREATMENT SKIMMER INSTALLATION

- 3.7 The contractor will install the new owner supplied Chlorine dosing tank in the area of the removed UV sterilizer. The final location of the new Chlorine tank will be directed by the vessel Chief Engineer. The contractor will note that modification of the existing mounting structure will be required and to ensure that this work is included in the bid price. All steel work will be connected by welding unless agreed to by the vessel Chief Engineer.
- 3.8 The contractor will fabricate and install a new mounting stand for the new owner supplied chlorine metering pump. The physical location for the new metering pump will be just forward of the new chlorine tank.
- 3.9 The contractor will install and mount the new metering pump on the new stand.
- 3.10 The contractor will connect the new chlorine tank, metering pump, and the sewage treatment tank together as per the attached drawing from Red Fox. The contractor will install a bypass connection around the metering pump with isolation valves. The contractor will note that this tubing, valves, fittings, etc will be used to pump Chlorine into the treatment tank and the materials supplied must be compatible. The contractor will note that the discharge from the new metering pump will be connected to a new contractor installed penetration as per the Red Fox drawing.



- 3.11 The contractor will install all new piping from the discharge side of the sewage discharge pumps to the 2" Gruv-lok connection Tee at the deckhead. The contractor will replace the 2" Gruv-lok Tee at the deckhead.
- 3.12 The contractor will use all new schedule 40 galvanized pipe.

- 3.13** The contractor will install a new 2” Gruv-lok Ball Valve to connect the discharge pumps to the 2” Gruv-lok Tee.
- 3.14** The contractor will replace all of the original discharge piping and ball valves from the discharge pumps to the 2” Gruv-lok Ball Valve at the deckhead. The contractor will note that the routing for the piping will be different due to the new chlorine tank and metering pump installed. The final routing of the new discharge piping will be agreed with the vessel Chief Engineer.
- 3.15** The contractor will note that since the new discharge piping will be routed different than original then there may be new pipe brackets required. The contractor will allow for five new pipe brackets and clamps. The contractor will submit a unit cost in excess of the five pipe brackets in the bid package.
- 3.16** The contractor will install new pressure gauges into threaded fittings. The pressure gauges will be installed into new brass ball valves. The new pressure gauges will be installed between the discharge of the pumps and the new isolation ball valve.
- 3.17** The contractor will cut out the tank penetrations as per the OEM drawings.
- 3.18** The contractor will install the new pipe brackets inside the tank as per the OEM drawings and description.
- 3.19** The contractor will note that the lower sight glass tank penetration requires replacement due to wastage. The contractor will note that the complete original welded nipple and threaded pipe nipple are sealed with Devcon. The contractor will remove the Devcon patch, original threaded nipple, and the original welded nipple from the tank.
- 3.20** The contractor will install a new schedule 80 steel welded nipple in the same location as the original.
- 3.21** The contractor will install a new schedule 80 steel threaded nipple to fit the original sight glass arrangement.
- 3.22** When the tank penetrations and hotwork are complete, the contractor will coordinate with the vessel Chief Engineer so that the owner can supply the services of a NACE Inspector to check the tank coatings. Of particular interest is the area in way of the new tank penetrations and pipe bracket installation. Prior to coating repair, the contractor will coordinate with the owner supplied NACE inspector to represent the CCG interests. The contractor will give the NACE inspector 24 hours’ notice before applying coatings.
- 3.23** All coatings will be applied and cured as per the manufacturer’s instructions.

E-16: SEWAGE TREATMENT SKIMMER INSTALLATION

- 3.24** The contractor will prepare and coat the areas affected by the tank penetrations and the hot work so that the tank is protected from all corrosion. The coatings will be as per the sewage tank maintenance specification.
- 3.25** The contractor will allow for 10 M2 of area to be prepped, coated and cured in relation to this specification item. The contractor will include a unit price per square meter in excess of this 10M2 as part of the bid package.
- 3.26** When all work is complete, the contractor shall supply and install all new gaskets to be installed on the access covers. The contractor is to ensure that the gaskets installed are only cut to fit the sealing surfaces and not the full size of the access covers.
- 3.27** The contractor shall submit a unit price for stud replacement, nut replacement, and washer replacement. Where replacements are required, the contractor is to supply grade 8.
- 3.28** The contractor is to apply marine grade thread lubricant to all nuts and bolts prior to screwing together.
- 3.29** The contractor is to apply thread sealant that does not permanently set on all new threaded connections.
- 3.30** The contractor will note that the new SEACOR PVC piping and fittings are not to be painted with primer or paint.

Part 4: PROOF OF PERFORMANCE:

- 4.1** Upon completion of all work, the sewage system will be put back in service by the vessel Chief Engineer and the system will be proven operational.
- 4.2** The contractor will coordinate with the Red Fox FSR to commission the new system and to take a sample from the new contractor installed sample cock.
- 4.3** The contractor will send the sewage sample to an accredited laboratory to test the relevant parameters to confirm the functioning of the complete sewage treatment system. The records will be submitted as part of the QA package.
- 4.4** The contractor will ensure the Red Fox FSR will issue a certificate and work report detailing that the skimmer upgrade installation and testing has been carried as per the OEM recommendations.

Spec item #: E-17	SPECIFICATION	TCMSB Field # N/A
E-17 : THERMOSTATIC CONTROL VALVE REPLACEMENT		

Part 1: SCOPE:

- 1.1 The intent of this item is to remove the Jacket Water (JW), Fresh Water (FW), and Lube Oil (LO) thermostatic control valves and replace these with new owner supplied units. The original load dependent JW and FW thermostatic control valves are obsolete and are to be replaced with new Wärtsilä owner supplied JW, FW, and LO AMOT thermostatic control valves.
- 1.2 The contractor will note that for each of the three main engines there is one JW thermostatic valve, one FW thermostatic control valve, and one LO thermostatic control valve. In total there are nine thermostatic control valves to be replaced.

Part 2: REFERENCES:

Drawing Number	Description	
22-0713-01	Central Cooling System	

- 2.1 Original Equipment Manufacturer:
- 2.2 Replacement Thermostatic Valves:
- 2.3 Supplied by Wartsila Canada, Contact: Barry Broderick
- 2.4 Fleet Safety Manual Lock Out Tag Out
- 2.5 FSM Hot Work Permit

Part 3: TECHNICAL DESCRIPTION:

- 3.1 Prior to starting this scope of work, the contractor will meet with the vessel Chief Engineer to go over in detail this specification item to ensure there is no misunderstanding.
- 3.2 All valves are to be installed as per manufacturer’s recommendations.
- 3.3 The contractor will lock out tag out and drain the cooling water system in way of the thermostatic control valves. The contractor will note this is not meant to drain the complete cooling water system.

E-17: THERMOSTATIC CONTROL VALVE REPLACEMENT

- 3.4** The contractor will ensure that the isolation valves for each of the JW, FW, and LO are sealed and no leakage is passing by the valves before dismantling the thermostatic control valves.
- 3.5** The existing control air line is no longer required on the new thermostatic valves. Air line valves are to be closed and the outlet lines capped off.
- 3.6** The new AMOT thermostatic control valves are oriented in the piping with the designations of “A”, “B”, and “C”. The thermostatic control valves are to be installed with the “A”, “B”, and “C” orientation as per the AMOT instruction manual and matching present configurations. The LO valves are fitted as mixing valves (A outlet) and the FW and JW valves are fitted as Diverting valves (A Inlet)
- 3.7** The new AMOT thermostatic control valves will be delivered with manual override functionality built into them. The new AMOT thermostatic control valves are to be installed such that there is ready access to these manual override features.
- 3.8** The contractor will note that there will be piping modifications required for each of the nine thermostatic valve installations. The contractor will ensure that each of nine newly fitted thermostatic valve locations will allow for the servicing of the new AMOT thermostatic control valves without removing the new valve from the pipework.
- 3.9** The contractor will ensure that the piping modifications for the new thermostatic control valves are such that the removal of the modified sections of pipe and new thermostatic control valves can be accomplished without completely draining the cooling water or lube oil systems. For clarity, the thermostatic control valve must be installed such that this is possible by simply closing the respective valves.
- 3.10** The Contractor will bid on modifying the present piping from the thermostatic valve’s inlets/outlets to the nearest corresponding flange or Victaulic coupling.
- 3.11** The contractor will supply and install all new pipes, flanges, couplings and gaskets suitable for the application. All piping to be ASTM A53 Grade A Schedule 40 black iron pipe. Galvanized pipe is not to be used. Piping is 6” dia with the FW outlet to cooler being fitted with a 6” to 8” adapter at the outlet valve.
- 3.12** For each of the JW, FW, and LO thermostatic control valves, the contractor will verify the final location and fitment before final welding of new pipe. If required the deck plates will be modified to fit the new piping positions.
- 3.13** New piping will include any gauges and fittings as per the original piping.
- 3.14** All new pipes to be shot blasted to remove all mill scale from the inside and outside of the pipe before installation.

E-17: THERMOSTATIC CONTROL VALVE REPLACEMENT

- 3.15** The contractor will clean all debris from inside the of each pipe modification. Cleanliness to proven to the vessel Chief Engineer upon completion of the hotwork and prior to assembly.
- 3.16** The contractor will ensure that only ANSI flanges will be used.
- 3.17** Gaskets supplied for the JW and FW thermostatic control valves must be suited for water treated with Maxigard and the gaskets for the LO thermostatic control valve must be suitable for regular mineral oil.
- 3.18** Two coats of Marine Primer will be applied to all new and disturbed pipe work. The new thermostatic valves are not to be painted. New JW pipes to be reinsulated with suitable fiberglass pipe insulation with sealed canvas cladding. (as per present configuration)

Part 4: PROOF OF PERFORMANCE:

- 4.1** All work to be completed to the satisfaction of the Chief Engineer.
- 4.2** The contractor will ensure that there is no leakage on any of the flanges.
- 4.3** The final inspection will be a performance test carried out on a sea trial to ensure that no leaks develop when the cooling water and lube oil are at the maximum normal operating level.
- 4.4**

Part 5: DELIVERABLES:

Spec item #: E-18	SPECIFICATION	TCMSB Field # N/A
E-18: STBD and PORT BUBBLER COMPRESSOR SERVICING		

Part 1: SCOPE:

- 1.1 The intent of this specification is to complete the recommended 3 year maintenance on the stbd compressor and replace the port bubbler compressor oil seal.

Part 2: REFERENCES:

Wartsila Air Bubbler System
Compressor Gardner Denver Reavell Type 9006 CH, Job No 90610/T, Machine No 9006 CH 102, Rated Capacity 6084 m³/sec Press 1.61 Bar ABS Speed 9559 rpm.

Manuals

Operating and Maintenance Instructions for 9006CH Overhung Turbo Compressor
Manufacturer’s Technical Data and Maintenance Data attached. (Bubbler tech and service info.pdf)

Manufacturer’s parts owner supplied.

Part 3: TECHNICAL DESCRIPTION:

- 3.1 Contractor is to perform a complete set of vibration analysis readings on the bubbler system prior to any work commencing.
- 3.2 In conjunction with the ship’ Electrical Officer and prior to commencement of any work contractor to ensure that bubbler system is locked out.
- 3.3 Contractor to supply the services of a Gardner Denver FSR for this servicing. Contractor to include an allowance of \$6000 for FSR travel expenses.

Boyd Kirby

Technical Support/Warranty Manager/Product Trainer

Gardner Denver Canada

Boyd.Kirby@gardnerdenver.com

Tel: 905-847-0688 x309

Cell: 416-553-1958

Fax: 905-847-8124



3.3 The 3 year manufacturer's recommended maintenance which includes:

Yearly Inspection

- Remove gearbox inspection cover and turn shafts checking freedom and tooth bedding. Start up auxiliary oil pump and check oil from gear spray.
- Fully drain oil filter and clean both baskets.
- Check all instruments including settings of oil relief valves, protective devices and controls.
- Clean any parts and check tightness of bolts that operating inspection experience or inspection deems necessary.

Three Year inspection

- In addition to yearly inspection carry out following:-
- Lift gearbox cover and run auxiliary oil pump to check for leaks from internal pipework.
- Remove oil seals, journal and thrust/location bearings, one at a time, for examination. Note all clearances specified on clearance record drawing - check they are within allowable limits.
- Check freedom of movement of IGVs.
- Inspect compressor impeller and seals - check clearances and tightness of all bolting.
- Examine oil cooler - clean as necessary. Check motor to gear alignment. Remove cover on L.S. Coupling and inspect rubber blocks, refer to Holset leaflet.

Part 4: PROOF OF PERFORMANCE:

- 4.1 Test run of compressor for 1 full hour with: no oil leaks, bearing temps within manufacturer's specifications, and RMS vibration levels below manufacturer's alarm level.
- 4.2 Complete set of vibration readings to be taken after all work is completed.

Part 5: DELIVERABLES:

- 5.1 Provide written service report including: as found condition, work performed, measurements recorded, and parts used, in pdf format.
- 5.2 The Bubbler Compartment is to be left in an as found condition

Spec item #: L-01	SPECIFICATION	TCMSB Field # N/A
L-01 : MACHINERY SPACE FAN OVERHAULS		

Part 1: SCOPE:

- 1.1 The intent of this item is to remove the following 4 ventilation fans. Motors and housing to be brought to contractor's shop for complete reconditioning and to replace the reconditioned units in good order to their original location, upon completion:

Part 2: REFERENCES:

2.1 Equipment Data

Generator Room Supply Fan: (2 of)

Make/ Supplier: Novenco/ Stork-Werkspoor
Type: Tube Axial
Fan Diameter: 925 MM
Static Pressure: 40/17.8 MM W.C.
Volume: 835/557 m3/ min
Motor: Hawker Siddley, TEA0
20HP, 1800/1200 RPM
575V/ 3/ 60 Hz
Frame: 286T
Serial numbers: 58111-3
58111-4

Aux Engine Room Exhaust Fan

Make/ Supplier: Novenco/ Stork-Werkspoor
Type: TEAD
Fan Diameter: 850MM
Static Pressure: 25/11 MM W.C.
Volume: 640/427 m3/ min
Motor: Hawker Siddley, TEA0
11.2 KW, 1800/1200 RPM
575V/ 3/ 60 Hz
Frame: 286T
Serial number: 581110-1

Main Generator Exhaust Fan Port

Make/ Supplier: Novenco/ Stork-Werkspoor
Type: TEAD
Fan Diameter: 925 MM
Static Pressure: 25 MM W.C.
Volume: 835/557 m³/ min
Motor: Hawker Siddley, TEAO
20 HP, 1800/1200 RPM
575V/ 3/ 60 Hz
Frame: 286T
Serial number: 58111-1

Part 3: TECHNICAL DESCRIPTION:

- 3.1 Contractor is responsible for all ancillary services necessary to complete the specification item. This includes, but is not limited to, strip out, cramage, staging , cleaning, debris removal and disposal, etc. Unless otherwise stated all materials to be contractor supply
- 3.2 Prior to commencement of work, the following information is to be recorded. Motor rotational direction, peak startup motor current , running current at all speeds and motor balance/vibration.
- 3.3 Megger readings of each phase of all motors to be conducted at 500VDC. Information to be delivered to the ship's Sr. Electrical Officer
- 3.4 Fans are to be electrically isolated by ship's Electrical Officer and locked out prior to removals commencing. Contractor to abide by ship's ISM Safety Lockout Procedures.
- 3.5 Each motor/fan assembly to be removed and transported to Contractor's shop for servicing. Any removal necessary to facilitate the removal of the fan/motor unit is the responsibility of the Contractor. Contractor to exercise care during the removal and installation and not to damage the flexible collars between the motor housings and the trunking ductwork. Contractor to be responsible for cost and replacement of any damages.
- 3.6 Each fan/motor unit to be dismantled for inspection, cleaning and bearing renewal. Bearings to be SKF or equivalent sealed bearings as per original. Motor exterior surfaces to be mechanically cleaned. All exterior surfaces of motor brackets, fans and axial tubes are to be grit blasted and mechanically cleaned to bare metal. All surfaces to be primed and painted to marine standards and match the surrounding.

- 3.7 Upon completion of overhauls the Tube Axial Fan units and access doors to be re-installed in place, using all new fastenings. Contractor to supply all new material including Tube Axial Housing rubber mount bushing inserts and gaskets.
- 3.8 Upon completion, checks for vibration, alignment and proper rotation are to be performed. Motor start current readings, megger readings and motor balance/vibration to be taken and recorded as before, as well as the numbers to identify the new bearing installed on each end of each motor. Typewritten copy and electronic copy to be passed to ship's Senior Electrical Officer and to Chief Engineer with all information listed as above.
- 3.9 Any paint work disturbed as a result of cutting, burning or welding is to be wire brushed clean and coated with primer.
- 3.10 Upon completion of all work all disturbed items to be installed in good order, as per original. All dirt and debris resulting from this work is to be disposed of ashore.

Part 4: PROOF OF PERFORMANCE:

- 4.5 The fans shall be run up and proven operational for a period of 1 hr.
- 4.6 All work to be to the satisfaction of the Chief Engineer and the Sr. Electrical Officer.

Part 5: DELIVERABLES:

- 5.1 One hard copy and one electronic copy off all readings and overhaul reports to be passed to ship's Senior Electrical Officer and to Chief Engineer with all information listed as above.

Spec item #: L - 02	SPECIFICATION	TCMSB Field # N/A
L-02 : Thermal Scan		

Part 1: SCOPE:

- 1.1 The intent of this specification shall be to conduct an annual IR Thermal Scan of the vessels electrical distribution system including the 4160 Vac Main and 600 Vac Auxiliary Switchboard breakers and each associated switchboard connections as a TCMS requirement (TP127E). This scan may only be done with the vessel under maximum obtainable electrical load which will require testing during sea trials.

Part 2: REFERENCES:

Control Room		
Description	Location	Comment
P-4002 STBD Air Bubbler	Control Room	IR Window
P-4003 STBD Main Generator cell 2	Control Room	IR Window
P-4003 STBD Main Generator cell 3	Control Room	IR Window
PP-4004 STBD Propulsion Excitation	Control Room	IR Window
PP-4002-1 STBD Propulsion XFMR T3	Control Room	IR Window
PP-4002-2 STBD Propulsion XFMR T4	Control Room	IR Window
P-04002 Center Main Generator cell 7	Control Room	IR Window
P-04002 Center Main Generator cell 8	Control Room	IR Window
PP-4001-2 PORT Propulsion XFMR T2	Control Room	IR Window
PP-4001-2 PORT Propulsion XFMR T1	Control Room	IR Window
PP-4003 PORT Propulsion Excitation	Control Room	IR Window
PP-4001 PORT Main Generator	Control Room	IR Window
PP-4001 PORT Main Generator	Control Room	IR Window
P-4001 PORT Air Bubbler	Control Room	IR Window
1A 575 Volt Breakers	Control Room	Removable Bolted Panel
1B 575 Volt Breakers	Control Room	Removable Bolted Panel
2A Meters	Control Room	Removable Bolted Panel
2B Shore Power Supply	Control Room	Removable Bolted Panel
2C Phase Sequence Switch	Control Room	Removable Bolted Panel
3A Meters	Control Room	Removable Bolted Panel
3B Aux Generator #1 Breaker	Control Room	Removable Bolted Panel
3C Aux Generator #1 Voltage regulator	Control Room	Removable Bolted Panel
4A Metering & Controls	Control Room	Removable Bolted Panel
4B Main tie Breaker	Control Room	Removable Bolted Panel

4C Ventilation & Fan XFMR	Control Room	Removable Bolted Panel
5A Controls & Metering	Control Room	Removable Bolted Panel
5B Emerg Tie Breaker	Control Room	Removable Bolted Panel
5C PT-B Transformer	Control Room	Removable Bolted Panel
6A 575 Volt Breakers	Control Room	Removable Bolted Panel
6B 575 Volt Breakers	Control Room	Removable Bolted Panel
7A Volt Metering & Controls	Control Room	Removable Bolted Panel
7B 230 Volt Breakers	Control Room	Removable Bolted Panel
BA 110 Volt Breakers	Control Room	Removable Bolted Panel
BB 110 Volt Breakers	Control Room	Removable Bolted Panel
9A Aux. Generator #2 Metering	Control Room	Removable Bolted Panel
9B Aux. Generator #2 Breaker	Control Room	Removable Bolted Panel
1A Metering	Emergency Generator Rm	Removable Bolted Panel
1B 575 Volt Breakers	Emergency Generator Rm	Removable Bolted Panel
1C 575 Volt Breakers	Emergency Generator Rm	Removable Bolted Panel
2A Tie Breaker Metering	Emergency Generator Rm	Removable Bolted Panel
2B Emergency Tie Breaker	Emergency Generator Rm	Removable Bolted Panel
3A Emergency Generator Metering	Emergency Generator Rm	Removable Bolted Panel
3B Emergency Generator Breaker	Emergency Generator Rm	Removable Bolted Panel
4A 120 Volts Metering	Emergency Generator Rm	Removable Bolted Panel
4A 120 Volts Breakers	Emergency Generator Rm	Removable Bolted Panel
Propulsion Motor Starboard	Propulsion motor room	Removable Bolted Panel
Propulsion Motor Port	Propulsion motor room	Removable Bolted Panel
Shore Power XFMR	Diving Locker Main deck	Removable Bolted Panel
Starboard Main Generator	Main engine rm	IR Window
Centre Main Generator	Main engine rm	IR Window
Port Main Generator	Main engine rm	IR Window
Auxiliary Generator #1	Aux machinery space	IR Window

Auxiliary Generator #2	AG2 compartment	IR Window
Emergency Generator	Emergency Gen compartment	Removable Bolted Panel
Emergency Power XFMR	Emergency Gen compartment	Removable Bolted Panel
STBD Vital MCC XFMR	Propulsion Mtr rm	IR Window
Buss Tie Feeder XFMR	Propulsion Mtr rm	IR Window
Port Vital MCC XFMR	Propulsion Mtr rm	IR Window
Port Prop. Excitation XFMR	Propulsion Mtr rm	Hinged Panel
Starboard Prop. Excitation XFMR	Propulsion Mtr rm	Hinged Panel
Propulsion XFMR. # 1	Propulsion Mtr rm	Louvered door
Propulsion XFMR. # 2	Propulsion Mtr rm	Louvered door
Propulsion XFMR. # 3	Propulsion Mtr rm	Louvered door
Propulsion XFMR. # 4	Propulsion Mtr rm	Louvered door
XFMR. 3x100KVA 575/230Volt	Control Room	Removable Bolted Panel
XFMR. 3x100KVA 575/120Volt	Control room	Removable Bolted Panel
XFMR. Laundry/Galley		

Regulations

All work performed and any modifications made, must be compliant with the latest Canada Shipping Act Regulations and in particular to the Marine Machinery Regulations. All work shall meet Transport Canada approved class regulations.

Standards

- 2.1 TP-127E Electrical Rules/Regulations, and Canadian Electrical Code
- 2.2 TCMS survey requirements for electrical machinery.

Part 3: TECHNICAL DESCRIPTION:

- 3.1 The Contractor and Electrical Officer shall inspect the MCC's and determine the order in which they will be tested.
- 3.2 The Contractor shall provide the services of certified Infrared Thermographer who will, survey the 4160 Vac Main and 600 Vac Auxiliary Switchboard breakers and each associated switchboard connections, and the required transformers. All surveys shall be done at Vessel's peak operating loads to the satisfaction of the Chief Engineer.

- 3.3 The contractor is to record the current and allow a minimum of 20 minutes for temperature to stabilize for each load before test performed.
- 3.4 The Contractor will prepare a written report, detailing any defects or deficiencies discovered and the proposed corrective action to the attending) TCMS Inspector and Chief Engineer.
- 3.5 Any defects to be brought to the attention of the Chief Engineer and will be repaired by 1379 action.

Part 4: PROOF OF PERFORMANCE:

- 4.1 All work to be completed to the satisfaction of the Chief Engineer.
- 4.2 This inspection is to be carried out in order to obtain TCMS credit.
- 4.3 The Contractor performing the survey is to be at least a Level 2 Thermographer.

Part 5: DELIVERABLES:

- 5.1 The Contractor shall produce three bound copies and one electronic copy of the reports of readings and digital images of deficiencies identified to be given to Chief Engineer. The contractor shall include an IR image and normal photographic views of each deficiency.

Spec item #: L - 03	SPECIFICATION	TCMSB Field # N/A
L-03 : HELICOPTER GAS DETECTION SYSTEM REPLACEMENT		

Part 1: SCOPE:

- 1.1 The intent of this item is to remove the existing Armstrong Helicopter leak detection system and replace it with a new Detcon X40 monitoring system and four new GD10 detectors.
- 1.1 The contractor will note that the areas in which the work associated with this spec item has sensitive equipment, limited access, as well as confined space.

Part 2: REFERENCES:

2.1 Equipment Data

2.2 Existing Monitor:

Location: Machinery Control Room (MCR) port side
Armstrong AMC-2011

Existing detectors:

Manufacturer: Armstrong

Location 1: Cargo Hold

Location 2: Pump Room

Location 3: Helicopter Fuel Tank Cofferdam Port

Location 4: Helicopter Fuel Tank Cofferdam Stbd

New Detection System:

Detcon X40 monitor

GD10 Detectors

Mounting location below of the new monitor in MCR



Part 3: TECHNICAL DESCRIPTION:

- 3.1 The contractor will lock out the existing Armstrong Helicopter Fuel Leak Detector System. The existing Armstrong Detection receives 120 Volt from TEP-101-12 which is physically located on the ships bridge and panel P101-8 in the MCR. The contractor will coordinate with the vessel Senior Electrical Officer for assistance with the lockout / tag out.
- 3.2 CCG will be supplying the Detcon X40 Monitor and Gas Detectors and 120Vac-24Vdc power supply. All other materials and consumable will be contractor supply.
- 3.3 The Contractor is to note that the fuel pump room and cofferdam are considered confined spaces , it is the contractors responsibility and cost to confirm spaces are safe for work. The spaces are considered to be dry and gas free, and any cleaning of spaces due to spillage from any other work will be covered by 1379.
- 3.4 The contractor will mount the new Detcon X40 monitor in the MCR port side on the mimic panel facing aft and just outboard of the emergency generator indicator lights.
- 3.5 The contractor will disconnect each of the four existing detectors from the existing Armstrong monitor. The contractor will clearly mark each wire as they will be used to reconnect the new system.

- 3.6 The contractor will remove in its entirety the existing Armstrong monitor from the console and dispose of it.
- 3.7 The contractor will note that the external power supply will have to be removed from the existing Armstrong cabinet in order to remove cabinet from the console.
- 3.8 The contractor will supply and install a 1/8" stainless steel flat plate of grade 316 to completely cover the hole left by removing the Armstrong monitor. The new cover plate will be attached by stainless steel nuts, bolts, and serrated lock washers which are also grade 316.
- 3.9 The contractor will supply and install a new terminal strip with a minimum of 30 terminal blocks. The terminal strip will be mounted on Din rail and the contractor will also mount a CCG supply Eaton PSG120E 120VAc-24Vdc power supply to the same Din rail.
- 3.10 The contractor will install the new terminal strip in the area of the removed Armstrong monitor. The final location of the new terminal strip will be agreed with the vessel Senior Electrical Officer. The contractor will supply terminal numbers on both side of the terminal strip.
- 3.11 The contractor will connect the removed wires from the original Armstrong system and connect to the new terminal strip.
- 3.12 The contractor will connect the new system as directed from the provisional connection diagram at the end of this specification **5.2 Gas detection connection Diagram**
- 3.13 The contractor will supply and install 2 new 14/3 core conductor for the power from TEP101-12 and the Eaton 24Vdc supply which is to be connected to the terminal strip. The contractor will allow 5 meters length overall for this line item.
- 3.14 The contractor will supply and install a new 14/3 core conductor for alarm signal to be connected to the new terminal strip. The contractor will allow 4 meters length overall for this line item.
- 3.15 The contractor will supply and install new 16 conductor (shielded 16/3 AWG) of marine cable to connect from the new terminal strip to the Detcon X40 for the new sensors. The contractor will allow 5 meters length overall for this line item.
- 3.16 The contractor will include all labour and materials to secure the new and disturbed cabling.
- 3.17 All new cable will be class approved.

- 3.18** The new cable glands for the detectors are to be contractor supply M20 explosion proof.
- 3.19** The contractor will route the new cables through the console up to the bottom side of the new mounting box. The contractor will secure the cable with stainless steel tie wraps. For clarity, this means that the new cable will have a new penetration in the mimic panel just below the new monitor and facing aft. The new cable will then be fed into the new monitor.
- 3.20** The contractor will remove each of the four existing Armstrong detectors noted in Part 2 REFERENCE and replace with the new GD10 units. The contractor will note that these are not a simple unbolt the old original gas detectors ones and bolt in the new gas detectors. Modification of the mounting arrangement will be required for each sensor. Below is typical mounting arrangement of 2 of the locations. The cofferdam is similar to the pump room sensor.

Pump room sensor



Cargo room sensor



- 3.21** The contractor will incorporate a 47K ohm resistor (contractor may re-use the existing resistor in the Armstrong panel) across a dry set of contacts in line with the alarm output to the Notifier Fire Alarm panel. This will be mounted inside the Detcon X40 cabinet in the MCR.
- 3.22** The commissioning of the new system will be by Novatech which supplied the new equipment. The contractor is responsible for any defects in their workmanship. Contractor to include an allowance of \$3000 for FSR travel expenses.

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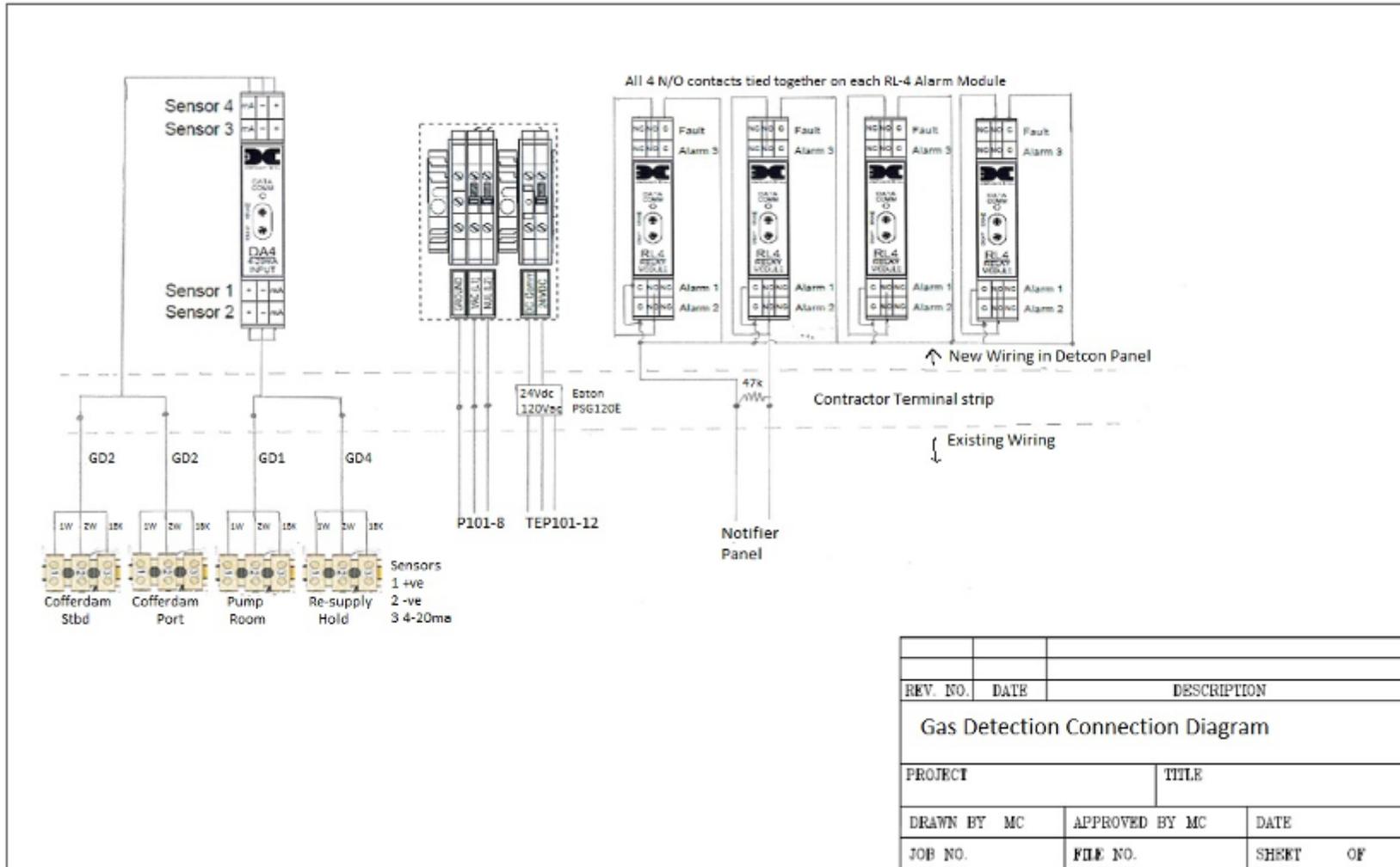
Part 4: PROOF OF PERFORMANCE:

- 4.1** All work to be to the satisfaction of the Chief Engineer and the Sr. Electrical Officer.

Part 5: DELIVERABLES:

- 5.2** The contractor will supply as fitted drawing in dwg as well as PDF.

5.2 Gas detection connection Diagram



REV. NO.	DATE	DESCRIPTION
Gas Detection Connection Diagram		
PROJECT		TITLE
DRAWN BY MC	APPROVED BY MC	DATE
JOB NO.	FILE NO.	SHEET OF

Spec item #: L - 04	SPECIFICATION	TCMSB Field # N/A
L-04 : IMPRESSED CURRENT SYSTEM WIRING REMOVALS		

Part 1: SCOPE:

- 1.1 The intent of this specification to remove the redundant wiring left after the removal of the port and stbd fwd impressed current anodes.
- 1.2 This item is to be done in conjunction with Spec items; Ballast Tank Survey, void tank survey and Multibeam Installation

Part 2: REFERENCES:

2.1

Drawings

Drawing Number	Description	Electronic Number

Part 3: TECHNICAL DESCRIPTION:

- 3.1 Contractor shall supply all equipment, enclosures, ventilation, staging, chain falls, craneage, slings, and shackles necessary to perform the work. All lifting equipment shall be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, of a safe working load for the expected duties.
- 3.2 The redundant cables which run from the aft end of the aft stab tank through the #2 Void tanks and aft through the pipe tunnel into the lower fwd engine room will be removed in their entirety. Each cable approx. 10 metres in length.
- 3.3 Once removed from the stability tank, the glands from the stability tank into the Port and Stbd #2 voids will be blanked off and made watertight.
- 3.4 The existing glands from the void spaces into the pipe tunnel will be removed and a blank plug, welded into the resulting hole to make the space watertight.
- 3.5 The wires will be removed through the watertight transit into the lower engine room and removed from the connection boxes located behind the purifier special tool board. The

transit from the pipe tunnel to the engine room will be closed where the wires have been removed and the gland made watertight.

- 3.6** The tanks and pipe tunnel are to be proven tight during the corresponding pressure tests completed as part of the referenced specs above.

Part 4: PROOF OF PERFORMANCE:

- 4.1** All work to be to the satisfaction of the Chief Engineer and attending TCMS surveyor.
- 4.2** Provide details for certification of equipment items – i.e. TCMS sign offs, Classification certifications etc.

PART 5: DELIVERABLES

Spec item #: L - 05	SPECIFICATION	TCMSB Field # N/A
L-05 : IRIDIUM PILOT INSTALLATION & MSAT REMOVAL		

Part: 1 SCOPE:

- 1.1 The intent of this specification is to remove the MSAT system equipment and cabling and Install owner supplied Iridium Pilot system equipment and cabling.
- 1.2 Contractor must supply all materials, and parts required to perform the specified work unless otherwise stated.
- 1.3 Contractor must complete the work within 28 days of start date.
- 1.4 Contractor must provide proof of cable being ordered within 4 days of contract being awarded.

Part: 2 REFERENCES:

2.1 Guidance Drawings

Drawing Number	Description	Electronic Number
	CCGS Henry Larsen Iridium Pilot Wiring Diagram (Drawing for New Installation)	
32-0871-01	CCGS Henry Larsen MSAT Stbd Block Diagram (Reference for removal)	M65409301
	Iridium Antenna Support Pedestal	65416501

2.2 Standards

- 2.2.1 Fleet Safety and Security Manual (DFO/5737)
- 2.2.2 TP127E – Ships Electrical Standards
- 2.2.3 IEEE 45:2002 – Recommended Practice for Electrical Installations on Ships
- 2.2.4 Specification for the Installation of Shipboard Electronic Equipment (70-000-000-EU-JA-001)
- 2.2.5 General Information for the Rules and Regulations for the Classification of Ships.

2.3 Regulations

- 2.3.1 Canada Shipping Act, 2001

2.4 Owner Furnished Equipment

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

Part: 3 TECHNICAL DESCRIPTION

3.1 General

- 3.1.1** The Contractor must supply all equipment, enclosures, ventilation, staging, chain falls, craneage, slings and shackles necessary to perform the work. All lifting equipment must be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, of an adequate safe working load for the expected duties. Any brackets or other welded attachments required in the performance of this specification must be welded into place by CWB-certified welders certified to welding Std. W47.1, Div. 1 and 2.
- 3.1.2** Prior to any hotwork taking place, the Contractor must ensure that the area of work and all equipment, wiring, transits, etc. have been sufficiently protected from any sparks or metal filings. The Contractor must also ensure that the area of work, the system, and the adjacent space is certified as gas free and suitable for hotwork as per the Fleet Safety and Security Manual.
- 3.1.3** The Contractor shall be responsible to ensure that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this specification item.
- 3.1.4** Contractor must follow existing cable trays throughout the vessel where fitted. Once installed, all cabling must be secured as per TP127.
- 3.1.5** The contractor must dispose of all cables that have been identified for removal indicated below.
- 3.1.6** The contractor must be responsible to ensure that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this specification item.
- 3.1.7** Prior to the commencement of any electrical work, the contractor must ensure that all electrical supplies feeding the systems have been isolated at the source following an established lockout/tagout procedure, and as per ISM fleet safety manual.
- 3.1.8** Upon final installation, testing must be carried out as per Section 4.2 of this specification item.
- 3.1.9** Contractor must remove the following equipment;
- MSAT Transceiver Unit (Radar Closet Nav Bridge).

- MSAT Antenna Unit (Radar Closet Nav Bridge).
- MSAT Antenna Power Injector (Radar Closet Nav Bridge).
- Space Comm Antenna (Main Mast Upper Spar Port)
- MSAT Handset (Nav Bridge)

MSAT Transceiver Unit, Antenna Unit, and Power Injector



MSAT Antenna



MSAT Handset



3.1.10 Contractor must remove and dispose of cables as per Table 1 below.

Table 1

Cable Label / Type	Cable Type	Equipment (From)	Equipment (To)	Length (metres)
N/A	RF Coax	Power Injector Junction Box (Bridge Radar Closet)	MSAT Antenna Unit (Bridge Radar Closet)	1
N/A	RF Coax	Power Injector Junction Box (Bridge Radar Closet)	MSAT Antenna (Main Mast Upper Spar Port)	25
N/A	Cat5	MSAT Transceiver (Bridge Radar Closet)	MSAT Handset Connection Box (Aft Bridge Bulkhead)	3
N/A	Data Cable	MSAT Transceiver (Bridge Radar Closet)	Connection Box (Aft Bridge Bulkhead)	3
N/A	Data Cable	MSAT Antenna Unit (Bridge Radar Closet)	MSAT Transceiver Unit (Bridge Radar Closet)	1
N/A	Data Cable	MSAT Transceiver Unit (Bridge Radar Closet)	GPS Distribution DD20 (Bridge Nav Console Stbd)	15
N/A	Power Cable	MSAT Transceiver Unit (Bridge Radar Closet)	Power Supply (Bridge Radar Closet)	1

3.1.11 Contractor must supply/install cable as per Table 2 below.

Table 2

Cable Label / Type	Cable Type	Equipment (From)	Equipment (To)	Length (metes)
SAC-1 / Supplied with Equipment	Cat5e	Iridium Antenna(Wheelhouse Top)	Iridium Transceiver (Bridge Radar Closet)	30
SAC-2 / Belden 1300SB	Cat5e	Iridium Transceiver (Bridge Radar Closet)	Electronics Equipment Room Rack	20
SAC-3 / Belden 8723SB	2 Shielded Twisted Pair	Connection Box (Bridge Radar Closet)	Navigation Bridge Aft Desk	3
SAC-4 / Belden 8723SB	2 Shielded Twisted Pair	Connection Box (Bridge Radar Closet)	ICS Room Equipment Rack	25
SAC-5 / Belden 8723SB	2 Shielded Twisted Pair	Connection Box (Bridge Radar Closet)	ICS Room Equipment Rack	25

3.1.12 Contractor must Fabricate/Install new Iridium Antenna Support Pedestal (All Material to be Aluminum) as per reference drawing in Part II. Support Pedestal must be primed and painted marine white.

3.1.13 Contractor must install new Iridium Pilot equipment below;

- Above Deck Equipment (Iridium Antenna) Wheelhouse Top Stbd Side forward on a new antenna support pedestal mount bolted to existing flange (see picture below).
- Below Deck Equipment (Iridium Transceiver) Bridge Radar Closet.
- One Telephone Bridge aft desk near weather station monitor.

Base for Iridium Support Pedestal



Similar Iridium Support Pedestal



3.1.14 Contractor must also add additional supports to the Iridium Pedestal to help minimize the movement caused by vibrations and wind gusts. Contractor must also install a gasket between the two dissimilar metals at the base.

3.1.15 The new support pedestal has a pipe sleeve incorporated into it as per drawing, contractor must supply/install a Roptex RS25 RS Seal depicted below. Cable entry will be via the bottom of the pedestal and exit via the pipe sleeve at the side of the pedestal.



Seal	For cable/pipe		For hole diameter		Weight		Art. No.
	(mm)	(in)	Ø (mm)	Ø (in)	(kg)	(lb)	
RS 25 AISI 316	0+3.6-12	0+0.142-0.472	25-26	0.984 - 1.024	0.04	0.093	RS00100251023

3.1.16 Contractor must be responsible for unpacking/repacking all cable glands.

3.1.17 CCG Technicians will complete the terminations with the exception of those for electrical supply.

3.2 Location

3.2.1 Navigating Bridge Deck

3.2.2 Wheelhouse Top

3.2.3 Bridge Crawl Space

3.2.4 Officers Deck

3.3 Interferences

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

Part: 4 PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1 All work must be subject to witness by the Chief Engineer of delegate and the attending TCMS surveyor.

4.2 Testing

4.2.1 All cables are to be checked for continuity after installation to ensure operational capability. Should any cable run fail to pass testing, the cable must be replaced at the contractor's expense.

4.2.2 All cable testing must be verified by a Coast Guard Technician.

4.2.3 New AC/DC circuits must be proven operational.

4.2.4 Electronic equipment which has been removed for the performance of this specification item must be returned to operational condition.

4.3 Certification

N/A

Part: 5 DELIVERABLES:

N/A

Spec item #: L - 06	SPECIFICATION	TCMSB Field # N/A
L-06 : SEATEL ANTENNA UPGRADE		

SCOPE:

- 1.1** The intent of this specification is to remove the Telesat Radome from the top of the aft mast and install new owner supplied Antenna Radome in its place.
- 1.2** Contractor must supply all materials, and parts required to perform the specified work unless otherwise stated.

Part: 2 REFERENCES:

2.1 Guidance Drawings/Documents

Drawing/Document Number	Description	Electronic Number
	Sea Tel 4012MK3-36 Installation Manual	
	VSCS Block and Level Diagram	65415001

2.2 Standards

- 2.2.1** Fleet Safety and Security Manual (DFO/5737)
- 2.2.2**
- 2.2.3** TP127E – Ships Electrical Standards
- 2.2.4** IEEE 45:2002 – Recommended Practice for Electrical Installations on Ships
- 2.2.5** Specification for the Installation of Shipboard Electronic Equipment (70-000-000-EU-JA-001)
- 2.2.6** General Information for the Rules and Regulations for the Classification of Ships.

2.3 Regulations

- 2.3.1** Canada Shipping Act, 2001

2.4 Owner Furnished Equipment

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

Part: 3 TECHNICAL DESCRIPTION

3.1 General

3.1.1 The Contractor must supply all equipment, enclosures, ventilation, staging, chain falls, craneage, slings and shackles necessary to perform the work. All lifting equipment must be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, of an adequate safe working load for the expected duties.

3.1.2 Prior to the commencement of any electrical work, the contractor must ensure that all electrical supplies feeding the systems have been isolated at the source following an established lockout/tagout procedure, and as per ISM fleet safety manual. Electrical Isolation is as follows:

- **Heater Plate via L104 CCT#19**
- **Antenna Electronics via UPS Electronic Equipment Room (Black Rack)**

3.1.3 Contractor must disconnect and remove two Antenna RF Cables (LMR600) and two AC Cables from the existing antenna radome. These cables must be reinstalled for the new Antenna Radome. **“Pay attention to what cable goes where”**

3.1.4 Contractor must remove the Telesat Seatel Radome from the top of the vessels aft mast following manufacturers recommended procedures.



3.1.5 Contractor must install the new Cobham Seatel Antenna Radome on the aft mast following the manufacturer's procedures on pages 18 - 22 of installation manual. Special attention is to be paid to the torque value for bolt sizes on page 19.

3.1.6 Contractor must re-install the four cables that were removed from the old antenna and reconnect the AC and RF Cables. Contractor must take note of the four cables as they have to be reconnected to the same places.

- AC Feed for Antenna Electronics (via new connector provided with antenna) from UPS in electronic equipment room rack.
- AC Feed for Antenna Heater Plate (via 15A double pole breaker) from L104 cct 19
- LMR600 RF Cable (TX)
- LMR600 RF Cable (RX)

3.1.7 Contractor must ground the Radome following the manufacturer's procedures in section 3.4 of Installation Manual. Use #6 green ground wire for the ground.

3.2 Location

3.2.1 Vessel Aft Mast

3.3 Interferences

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

Part: 4 PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1 All work must be subject to witness by the Chief Engineer of delegate and the attending TCMS surveyor.

4.2 Testing

4.2.1 All cables are to be checked for continuity after installation to ensure operational capability. Should any cable run fail to pass testing, the cable must be replaced at the contractor's expense.

4.2.2 All cable testing must be verified by a Coast Guard Technician.

4.2.3 New AC/DC circuits must be proven operational.

4.2.4 Electronic equipment which has been removed for the performance of this specification item must be returned to operational condition.

4.3 Certification

N/A

Spec item #: L - 07	SPECIFICATION	TCMSB Field # N/A
L-07 : SIMPLIFIED VOYAGE DATA RECORDER (S-VDR) INSTALLATION		

SCOPE:

- 1.1** The intent of this specification is install an owner supplied Danelec DM100 Simplified Voyage Data Recorder (S-VDR) that will record audio from bridge microphones, VHF radio, Radar Video, and several ships sensors via serial data in order to comply with Transport Canada Regulations.
- 1.2** Contractor must supply all materials, and parts required to perform the specified work unless otherwise stated.
- 1.3** Contractor must complete work within 28 days of start date.
- 1.4** Contractor must provide proof of cable being ordered within 4 days of contract being awarded.

Part: 2 REFERENCES:

2.1 Guidance Drawings

Drawing Number	Description	Electronic Number
	CCGS HENRY LARSEN DM100 SIMPLIFIED VOYAGE DATA RECORDER (S-VDR)	
	VDR Capsule Pedestal Drawing	

2.2 Standards

- 2.2.1** Fleet Safety and Security Manual (DFO/5737)
- 2.2.2** TP127E – Ships Electrical Standards
- 2.2.3** IEEE 45:2002 – Recommended Practice for Electrical Installations on Ships
- 2.2.4** Specification for the Installation of Shipboard Electronic Equipment (70-000-000-EU-JA-001)
- 2.2.5** General Information for the Rules and Regulations for the Classification of Ships.

2.3 Regulations

- 2.3.1** Canada Shipping Act, 2001

2.4 Owner Furnished Equipment

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

Part: 3 TECHNICAL DESCRIPTION

3.1 General

- 3.1.1** The Contractor must supply all equipment, enclosures, ventilation, staging, chain falls, craneage, slings and shackles necessary to perform the work. All lifting equipment must be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, of an adequate safe working load for the expected duties. Any brackets or other welded attachments required in the performance of this specification must be welded into place by CWB-certified welders certified to welding Std. W47.1, Div. 1 and 2.
- 3.1.2** Prior to any hotwork taking place, the Contractor must ensure that the area of work and all equipment, wiring, transits, etc. have been sufficiently protected from any sparks or metal filings. The Contractor must also ensure that the area of work, the system, and the adjacent space is certified as gas free and suitable for hotwork as per the Fleet Safety and Security Manual.
- 3.1.3** The Contractor shall be responsible to ensure that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this specification item.
- 3.1.4** Contractor must follow existing cable trays throughout the vessel where fitted. Once installed, all cabling must be secured as per TP127.
- 3.1.5** The contractor must be responsible to ensure that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this specification item.
- 3.1.6** Prior to the commencement of any electrical work, the contractor must ensure that all electrical supplies feeding the systems have been isolated at the source following an established lockout/tagout procedure, and as per ISM fleet safety manual.
- 3.1.7** Upon final installation, testing must be carried out as per Section 4.2 of this specification item.
- 3.1.8** Contractor must supply/install the cables listed in table 1 below and as per guidance drawing above. All cables listed below are Belden series cables.

3.1.9 Contractor must supply/install stamped metal tags on all cables listed in the table below (VDR-1 to VDR-17). Labels must be installed at each end of the cable as well as at the entry and exit of any transit they pass through.

Table 4

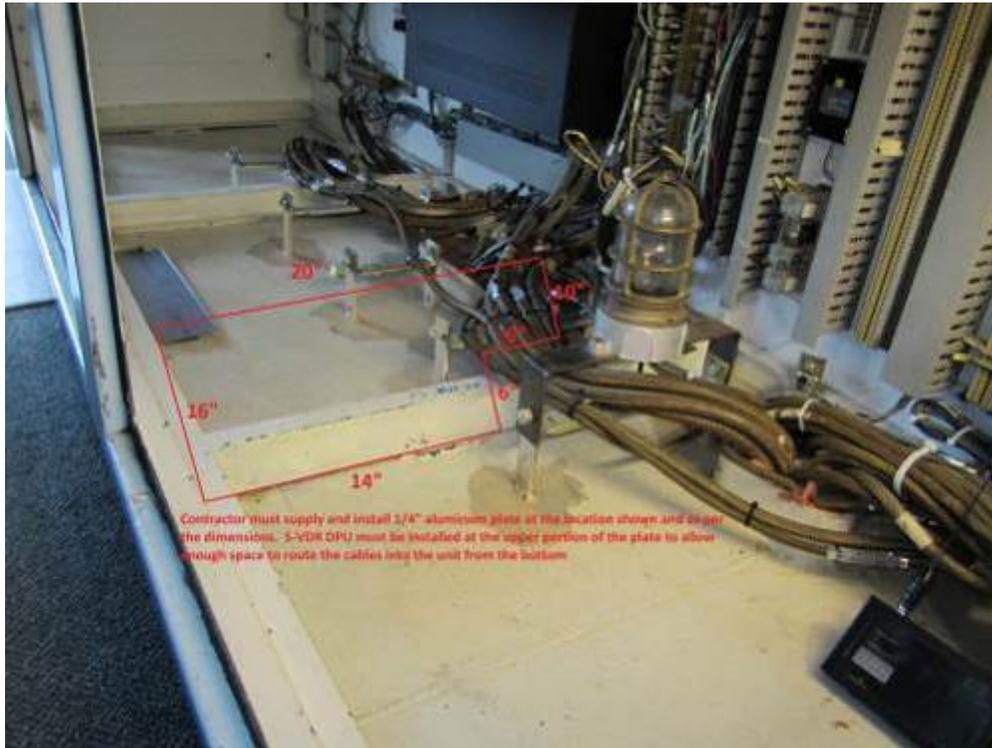
<i>Cable Label/Type</i>	<i>Source</i>	<i>Destination</i>	<i>Length (m)</i>
VDR-1 / Belden 9402	Bridge Microphone Unit Center above Helm	VDR DPU 100-01S BMU 1A	30
VDR-2 / Belden 9402	Bridge Microphone Unit Bridge Navigation Console Port	VDR DPU 100-01S BMU 1B	30
VDR-3 / Belden 9402	Bridge Microphone Unit Bridge Port Wing Console	VDR DPU 100-01S BMU2A	35
VDR-4 / Belden 9402	Bridge Microphone Unit Bridge Starboard Wing Console	VDR DPU 100-01S BMU3A	35
VDR-5 / Belden 9402	Bridge Microphone Unit Bridge Navigation Console Starboard	VDR DPU 100-01S BMU3B	30
VDR-6 / Belden 9402	GMDSS Console Bay #1	VDR DPU 100-01S VHF	20
VDR-7 / Belden 9883	Bridge Alarm Unit STBD Nav Console	VDR DPU 100-01S BAU	20
VDR-8 / Factory Cable SWE	Capsule Wheelhouse Top	VDR DPU 100-01S Capsule	50
VDR-9 / Belden 9402	AIS Data Distribution (DD20) Bridge Wooden Console Bay1	VDR DPU 100-01A S100 Port	10
VDR-10 / Belden 9402	Jastram Digital Steering Controller (DSC#1)	VDR DPU 100-01A S101	15
VDR-11 / Belden 9402	DGPS Data Distribution (DD20) Bridge Wooden Console Bay2	VDR DPU 100-01A S104	10
VDR-12 / Belden 9402	Speed Log RS422 Distribution Unit Fwd Bridge Steering Console	VDR DPU 100-01A S105	15
VDR-13 / Belden 9402	Gyro Data Distribution Unit Bridge Wooden Console Bay2	VDR DPU 100-01A S106	10

VDR-14 / Belden 9402	Wind Data Distribution (DD20) Bridge Wooden Console Bay2	VDR DPU 100-01A S107	10
VDR-15 / Belden 9402	Depth Sounder #1 50Khz Bridge Navigation Console	VDR DPU 100-01A S108	15
VDR-16 / Belden 9402	Depth Sounder #2 30Khz Bridge Navigation Console	VDR DPU 100-01A S109	15
VDR-17 / Belden 1300SB	RVI in X-Band Radar Display Console Port Side Nav Bridge Console	VDR DPU 100-01A RVI	10
VDR-17A / HD15 to RGBHV Adapter Cable	RVI in X-Band Radar Console	X-Band Radar Display (Video Splitter)	CCG Supply & Install
AC Marine Approved Cable 14/3	Information Console EP108 Panel Spare 15A Circuit	Information Console Duplex Receptacle (Contractor Supply/Install)	3

3.1.10 Contractor must install Simplified Voyage Data Recorder Equipment below;

- S-VDR DPU 100-01A (Inside Bridge Information Console as per picture below).
- Bridge Alarm Unit BAU (Starboard Side of Navigation Console as per pictures below Flush Mounted Remove from Back Box).
- Remote Video Interface RVI (X-Band Radar Console as per pictures below).
- Five (5) Bridge Microphones as per pictures below (Flush Mounted in Deck Head Panels as per pictures below).
- VDR Capsule (Wheelhouse Top as per pictures below).
- Duplex Receptacle Bridge Information Console near S-VDR DPU

VDR DPU



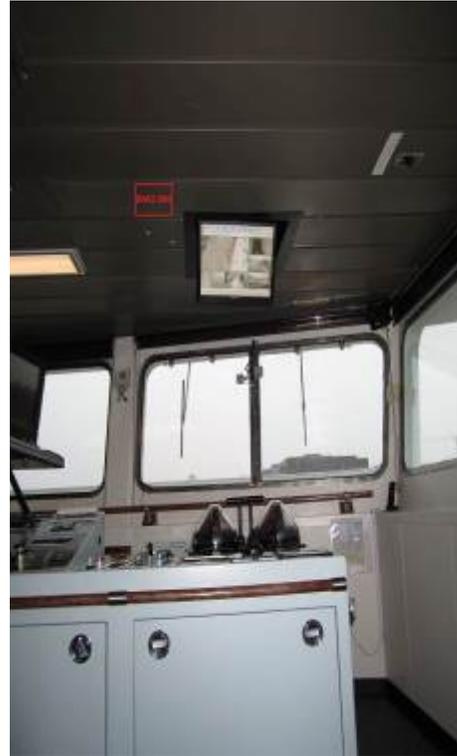
BRIDGE ALARM UNIT (BAU)



REMOTE VIDEO INTERFACE



BRIDGE





VDR CAPSULE

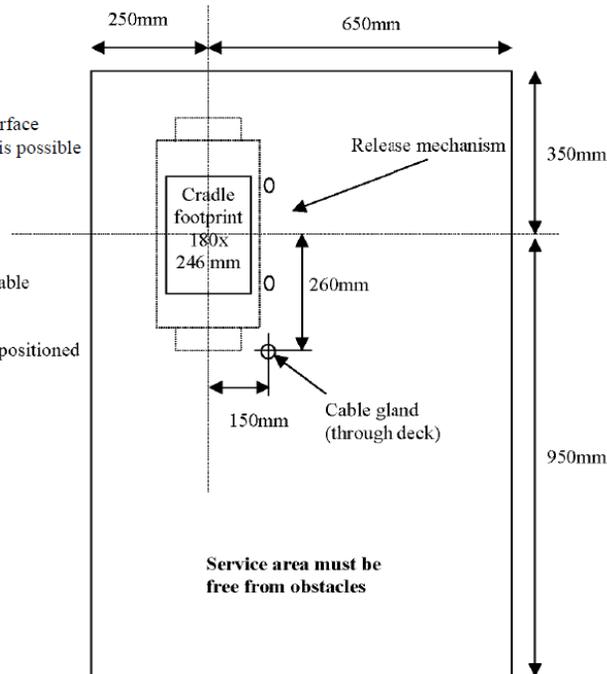
Contractor must fabricate, prime and paint a small pedestal, and weld it on wheelhouse top to mount the VDR capsule as shown in the picture below, and as per guidance drawing. The contractor must also supply/install/weld a pipe sleeve (goose neck configuration) with doubler plate. The gooseneck pipe sleeve must be 12” high with an inside diameter of between 25 - 26 mm this is the acceptable inside diameter for inserting a Roptex RS25 RS Seal. All surfaces must be primed and painted to match existing. This pipe sleeve must be welded at the location shown in the diagram below. Contractor must also supply and install the roxtec sealing gland depicted below.



Seal	For cable/pipe		For hole diameter		Weight		Art. No.
	(mm)	(in)	Ø (mm)	Ø (in)	(kg)	(lb)	
RS 25 AISI 316	0+3.6-12	0+0.142-0.472	25-26	0.984 - 1.024	0.04	0.093	RS00100251023

Notes:

- 1) The cable length is 50 meters.
- 2) Care must be taken during installation to prevent breaking of the cable.
- 3) The cradle must be mounted on a horizontal flat exposed surface where access by divers or a Remote Operated Vehicle (ROV) is possible
- 4) Observe the compass safe distance printed on the capsule
- 5) Compass safe distance is 1200mm.
- 6) Do not unwrap the cable service loop i.e. the two loops of cable strapped to the handles of the capsule.
- 7) Cable entry (through deck) shall be made through an upper positioned cable gland. Cable gland must accommodate a cable diameter between 9 - 10 mm.





3.1.11 Contractor must be responsible for unpacking/repacking all cable transits/glands.

3.1.12 Contractor must ground all equipment as per the wiring diagrams.

3.1.13 CCG Technicians will complete the terminations with the exception of those used for electrical supply.

3.2 Location

3.2.1 Navigating Bridge Deck

3.2.2 Bridge Crawl Space

3.2.3 Wheelhouse Top

3.3 Interferences

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

Part: 4 PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1 All work must be subject to witness by the Chief Engineer of delegate and the attending TCMS surveyor.

4.2 Testing

4.2.1 All cables are to be checked for continuity after installation to ensure operational capability. Should any cable run fail to pass testing, the cable must be replaced at the contractor's expense.

4.2.2 All cable testing must be verified by a Coast Guard Technician.

4.2.3 New AC/DC circuits must be proven operational.

4.2.4 Electronic equipment which has been removed for the performance of this specification item must be returned to operational condition.

4.3 Certification

4.3.1 CCG Technical Authority will arrange for FSR to complete the commissioning and certification on this system after system has been installed.

Part: 5 DELIVERABLES:

5.1 Drawings/Reports

N/A

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals

N/A

Spec item #: L - 08	SPECIFICATION	TCMSB Field # N/A
L-08 : MFHF RADIO UPGRADE		

SCOPE:

- 1.1** The intent of this specification is to remove the Micom X MFHF Radio system and install new Owner supplied ICOM M802 MFHF Radio System.
- 1.2** Contractor must supply all materials, and parts required to perform the specified work unless otherwise stated.
- 1.3** Contractor must complete the work within 28 days of start date.
- 1.4** Contractor must provide proof of cable being ordered within 4 days of contract being awarded.

Part: 2 REFERENCES:

2.1 Guidance Drawings

Drawing Number	Description	Electronic Number
	CCGS Henry Larsen Icom IC-M802 MFHF Radiotelephone System Wiring Diagram (Drawing for New Installation)	

2.2 Standards

- 2.2.1** Fleet Safety and Security Manual (DFO/5737)
- 2.2.2** TP127E – Ships Electrical Standards
- 2.2.3** IEEE 45:2002 – Recommended Practice for Electrical Installations on Ships
- 2.2.4** Specification for the Installation of Shipboard Electronic Equipment (70-000-000-EU-JA-001)
- 2.2.5** General Information for the Rules and Regulations for the Classification of Ships.

2.3 Regulations

- 2.3.1** Canada Shipping Act, 2001

2.4 Owner Furnished Equipment

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

Part: 3 TECHNICAL DESCRIPTION

3.1 General

- 3.1.1** The Contractor must supply all equipment, enclosures, ventilation, staging, chain falls, craneage, slings and shackles necessary to perform the work. All lifting equipment must be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, of an adequate safe working load for the expected duties. Any brackets or other welded attachments required in the performance of this specification must be welded into place by CWB-certified welders certified to welding Std. W47.1, Div. 1 and 2.
- 3.1.2** Prior to any hotwork taking place, the Contractor must ensure that the area of work and all equipment, wiring, transits, etc. have been sufficiently protected from any sparks or metal filings. The Contractor must also ensure that the area of work, the system, and the adjacent space is certified as gas free and suitable for hotwork as per the Fleet Safety and Security Manual.
- 3.1.3** The Contractor shall be responsible to ensure that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this specification item.
- 3.1.4** Contractor must follow existing cable trays throughout the vessel where fitted. Once installed, all cabling must be secured as per TP127.
- 3.1.5** The contractor must dispose of all cables that have been identified for removal indicated below.
- 3.1.6** The contractor must be responsible to ensure that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this specification item.
- 3.1.7** Prior to the commencement of any electrical work, the contractor must ensure that all electrical supplies feeding the systems have been isolated at the source following an established lockout/tagout procedure, and as per ISM fleet safety manual.
- 3.1.8** Upon final installation, testing must be carried out as per Section 4.2 of this specification item.
- 3.1.9** Contractor must remove the following equipment;

- Motorola Micom X Antenna Tuning Unit (Starboard Bridge Deckhead via access panel as per picture below).
- Motorola Micom X Control Head, Transceiver, and Speaker (Nav Bridge Console Stbd Side)
- Motorola Power Supply (Nav Bridge Console Stbd Side)
- Morad Antenna (Wheelhouse Top forward toward Stbd Side)

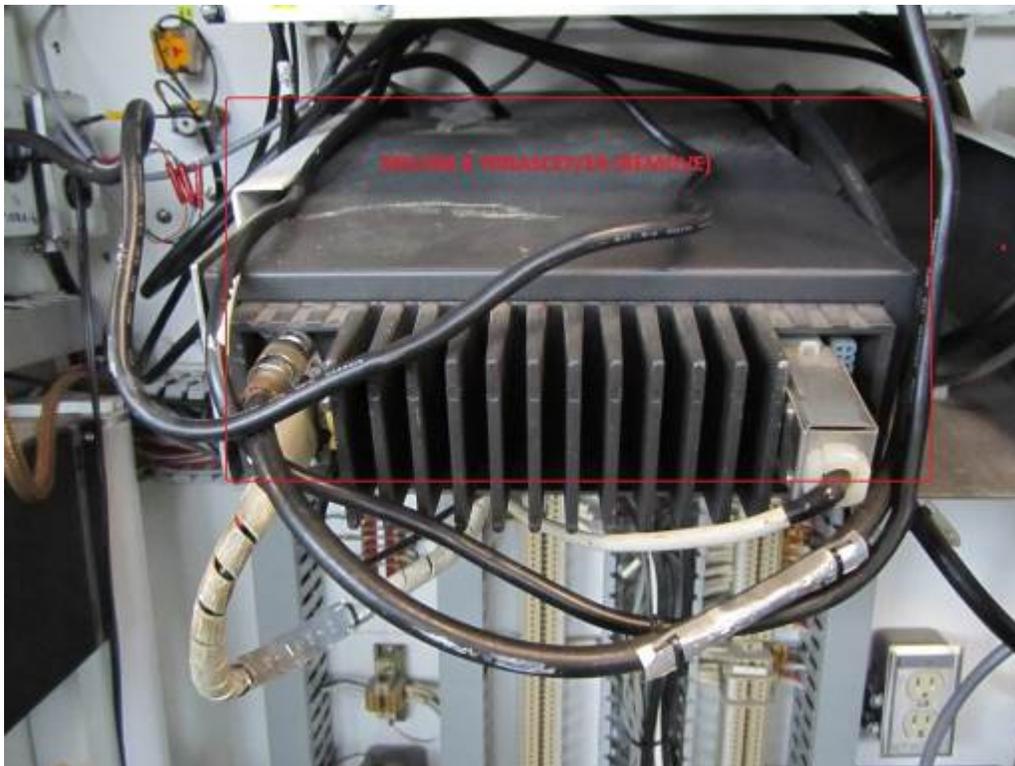
Micom X ATU



Micom X Control Head and Speaker



Micom X Transceiver



Motorola Micom X Power Supply



Micom X Antenna



3.1.10 Contractor must remove and dispose of cables as per Table 1 below

Table 1

Cable Number	Cable Type	Equipment (From)	Equipment (To)	Length (metres)
C-52	Multi-Cable	Motorola Micom X MFHF Radio (Bridge Nav Console Starboard)	Motorola Micom X MFHF Antenna Tuning Unit (Port Bridge Deckhead)	25
C-53	Coax RG213	Motorola Micom X MFHF Radio (Bridge Nav Console Starboard)	Motorola Micom X MFHF Antenna Tuning Unit (Port Bridge Deckhead)	25
C-56	Multi-Cable	Motorola Micom X MFHF Radio (Bridge Nav Console Starboard)	Motorola Micom X MFHF Antenna Tuning Unit (Stbd Bridge Deckhead)	25
C-57	Coax RG213	Motorola Micom X MFHF Radio (Bridge Nav Console Starboard)	Motorola Micom X MFHF Antenna Tuning Unit (Stbd Bridge Deckhead)	25
Unknown	3 Conductor Bronze Armour	Bridge Nav Console Starboard	Motorola Micom X MFHF Antenna Tuning Unit (Port Bridge Deckhead)	25

3.1.11 Contractor Must remove cables starting from the Motorola Micom X Antenna Tuning Units first

3.1.12 Contractor must install new MHHF Radiotelephone equipment below;

- Icom AT-140 Antenna Tuning Unit (Stbd Bridge Deckhead in place of one previously removed)
- Icom Transceiver (Nav Bridge Console Stbd Side on shelve inside console where old transceiver was removed).
- Icom Control Head and Speaker in space vacated by the old Micom X control unit and speaker. CCG will supply new 3RU rack panel contractor must install new equipment in this panel. Cutouts for Control Unit and Display can be obtained from CCG technical representative. Panel must be painted to match the color scheme of console.
- Newmar Power Supply mounted in place of one previously removed.

3.1.13 Contractor must supply/install new MFHF Radiotelephone cables as per Table 2 below and using **CCGS Henry Larsen Icom IC-M802 MFHF Radiotelephone System Wiring Diagram**.

3.1.14 Contractor must supply/install stamped metal tags on all cables listed in the table below (R-MF/HF-1 to R-MF/HF-5). Labels must be installed at each end of the cable as well as at the entry and exit of any transit they pass through.

Table 2

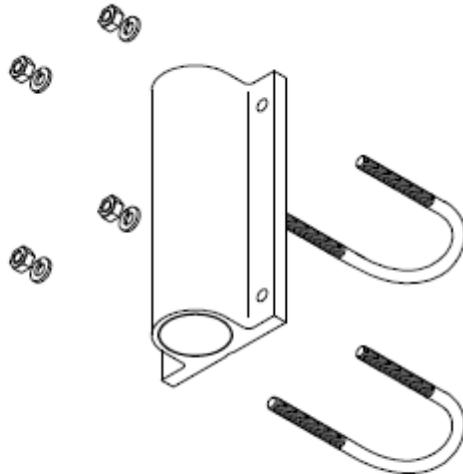
Cable Number	Cable Type	Equipment (From)	Equipment (To)	Length (metres)
R-MF/HF-1	LMR400 UF-FR	Transceiver Unit (Bridge Nav Console Starboard)	Antenna Tuning Unit (Stbd Bridge Deckhead)	25
R-MF/HF-2	LMR400 UF-FR	Transceiver Unit (Bridge Nav Console Starboard)	Electronics Equipment Room Antenna Multi-coupler	25
R-MF/HF-3	Belden 9260	Transceiver Unit (Bridge Nav Console Starboard)	Antenna Tuning Unit (Stbd Bridge Deckhead)	25
R-MF/HF-4	Factory Cable (SWE) 2M	Transceiver Unit (Bridge Nav Console Starboard)	Control Unit (Bridge Nav Console Starboard)	2
R-MF/HF-5	Factory Cable (SWE) 2M	Transceiver Unit (Bridge Nav Console Starboard)	Newmar Power Supply (Bridge Nav Console Starboard)	2
CCG Suplied	GTO High Voltage Cable	Antenna Tuning Unit (Stbd Bridge Deckhead)	Comrod Antenna (Stbd Wheelhouse Top)	0.5

3.1.15 Contractor must install 1 owner supplied Comrod Antenna at this locations on the Bridge Top.

STBD



- 3.1.16** Contractor must follow the instructions for mounting the new Comrod antenna. The supplied U-Bolts will not be used in this configuration as these antennas will be directly bolted to the structure as shown in the pictures above.



Mast mount

- 3.1.17** Contractor must be responsible for unpacking/repacking all cable glands.

- 3.1.18** Contractor must ground all equipment as per the MFHF Radio Instruction Manual (Page 54-55) using 3 inch wide copper strap at Transceiver and Antenna Tuner.

3.2 Location

3.2.1 Navigating Bridge Deck

3.2.2 Wheelhouse Top

3.2.3 Bridge Crawl Space

3.3 Interferences

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

Part: 4 PROOF OF PERFORMANCE:

4.1 Inspection

4.1.1 All work must be subject to witness by the Chief Engineer of delegate and the attending TCMS surveyor.

4.2 Testing

4.2.1 All cables are to be checked for continuity after installation to ensure operational capability. Should any cable run fail to pass testing, the cable must be replaced at the contractor's expense.

4.2.2 All cable testing must be verified by a Coast Guard Technician.

4.2.3 New AC/DC circuits must be proven operational.

4.2.4 Electronic equipment which has been removed for the performance of this specification item must be returned to operational condition.

4.3 Certification

N/A

Part: 5 DELIVERABLES:

5.1 Drawings/Reports

N/A

5.2 Spares

N/A

5.3 Training

N/A

5.4 Manuals

N/A