

CCGS LIMNOS DRYDOCK SPECIFICATION]

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Prepared by:

Marine Engineering Central Region

Integrated Technical Services

Canadian Coast Guard

520 Exmouth Street

Sarnia, ON

N7T 8B1

Table Of Contents

TABLE OF CONTENTS.....	2
G 1.0 GENERAL NOTES.....	5
G 1.1 VESSEL GENERAL PARTICULARS	5
G 1.2 HEALTH AND SAFETY	5
G 1.3 FLEET SAFETY MANUAL SAFETY PROCEDURES	6
G 1.4 LEAD CONTAINING MATERIALS AND LEAD CONTAINING COATINGS	6
G 1.5 ASBESTOS CONTAINING MATERIALS (ACM)	7
G 1.6 WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)	7
G 1.7 SMOKING IN THE WORK SPACE	7
G 1.8 VESSEL ACCESS	7
G 1.9 CONTRACTOR FURNISHED MATERIALS (CFM), EQUIPMENT AND TOOLS	7
G 1.10 GOVERNMENT SUPPLIED MATERIALS (GSM), EQUIPMENT AND TOOLS	7
G 1.11 REGULATORY APPROVAL AND INSPECTION	8
G 1.12 ACTS, REGULATIONS, STANDARDS, RULES, CODES, AND GUIDELINE REQUIREMENTS	8
G 1.13 PRE-WORK INSPECTION AND DOCUMENTATION OF WORK IN PROGRESS	8
G 1.14 SERVICE CONDITIONS	8
G 1.15 DOCUMENTATION	8
G 1.16 PAINTING	13
G 1.17 PIPING	13
G 1.18 WELDING & WELDING CERTIFICATION	17
G 1.19 TOUCH-UP/DISTURBED PAINT	17
G 1.20 ELECTRICAL INSTALLATIONS	18
G 1.21 CLEAN AND HAZARD FREE WORKSITE	18
G 1.22 ACCESS TO WORKSITE	18
G 1.23 ASSEMBLY OF COMPONENTS	18
G 1.24 REGULATORY APPROVAL AND INSPECTION	19
G 1.25 CCG EMPLOYEES AND OTHERS ON THE VESSEL	19
G 1.26 REMOVED MATERIALS AND EQUIPMENT	19
G 1.27 STORAGE AND PROTECTION OF EQUIPMENT	19
G 1.28 INSPECTION AND TEST PLAN	20
S 1.0 SERVICES	21
S 1.1 GENERAL	21
S 1.2 BERTHING	21
S 1.3 MOORING LINES	21
S 1.4 GANGWAYS	21
S 1.5 ELECTRICAL POWER	21
S 1.6 DECK PROTECTION	22
S 1.7 FIXED FIRE FIGHTING SUPPRESSION SYSTEMS	23
S 1.8 FIRE MAIN	23
S 1.9 CCG/PWGSC OFFICE SPACE & COMMUNICATIONS	23
S 1.10 STORAGE SPACE	24
S 1.11 SECURITY	24

S 1.12	GARBAGE	25
S 1.13	CRANAGE	25
S 1.14	BILGE WATER DISPOSAL.....	25
S 1.15	CLEANING	25
S 1.16	BLACK WATER AND GREY WATER SERVICES.....	25
10	SAFETY AND SECURITY [NOT USED]	26
11	HULL AND RELATED STRUCTURES.....	27
11.1	IDENTIFICATION	27
11.2	REFERENCES.....	27
11.3	DOCKING AND UNDOCKING.....	29
11.4	UNDERWATER HULL AREA (SURVEY ITEM)	32
11.5	TOPSIDES HULL AREA (SURVEY ITEM)	43
11.6	SHIP-SIDE VALVES (SURVEY ITEM).....	50
11.7	SEA BAYS (SURVEY ITEM)	55
11.8	KEEL COOLERS (SURVEY ITEM)	58
12	PROPULSION AND MANEUVERING.....	62
12.1	STARBOARD AZIPOD	62
12.2	STARBOARD AZIMUTHAL THRUSTER (SURVEY ITEM)	63
12.3	STARBOARD AZIMUTHAL THRUSTER HYDRAULIC POWER UNIT (SURVEY ITEM)	68
13	POWER GENERATION SYSTEMS [NOT USED]	72
14	POWER DISTRIBUTION SYSTEMS [NOT USED]	73
15	AUXILIARY SYSTEMS.....	74
15.1	TANKS, COFFERDAMS AND VOID SPACES (SURVEY ITEM)	74
15.2	SLUDGE/RECOVERED OIL/DIRTY OIL TANKS (SURVEY ITEM)	74
15.3	BALLAST WATER TANKS (SURVEY ITEM)	78
15.4	INSPECTION OF POTABLE WATER TANK TRANSFER PIPING	83
15.5	REPLACEMENT OF PW TANK PIPING.....	89
15.6	POTABLE WATER TANKS (SURVEY ITEM)	99
15.7	FUEL TANKS (SURVEY ITEM).....	108
15.8	LUBE & HYDRAULIC OIL STORAGE TANKS (SURVEY ITEM).....	112
15.9	COFFERDAMS, ECHO SOUNDER COMPARTMENTS AND AFT VOID SPACES (SURVEY ITEM).....	115
16	DOMESTIC SYSTEMS.....	130
16.1	REPAIR OF GREY- AND BLACK-WATER TANKS.....	130
17	DECK EQUIPMENT AND SUPPORT SYSTEMS [NOT USED].....	142
18	NAVIGATION AND CONTROL SYSTEMS	143
18.1	SPEED LOG INSTALLATION	143
18.2	UPS INSTALLATION FOR THE BACK-UP ECDIS	154
19	INTEGRATED CONTROL SYSTEMS [NOT USED]	162
20	SCIENCE EQUIPMENT [NOT USED]	163

A	APPENDIX A: ACTS, REGULATIONS, STANDARDS, RULES, CODES AND GUIDELINE REQUIREMENTS	164
A.1.0	ACTS, REGULATIONS, STANDARDS, RULES, CODES AND GUIDELINE REQUIREMENTS	164
A.2.0	HIERARCHY AND REFERENCES: ACTS, REGULATIONS, STANDARDS, RULES, CODES AND GUIDELINES (ARSRC&G).....	164
A.3.0	REGULATIONS PURSUANT TO THE CANADA SHIPPING ACT 2001.....	165
A.4.0	MARINE TECHNICAL REVIEW BOARD DECISIONS (MTRB) AND DETERMINATION OF CLOSEST POSSIBLE COMPLIANCE (AS APPLICABLE)	167
A.5.0	ADDITIONAL ACTS AND REGULATIONS.....	167
A.6.0	STANDARDS, RULES, CODES AND GUIDELINES:.....	167
A.7.0	CCG SPECIFICATIONS, STANDARDS AND FLEET SAFETY MANUAL (FSM) PUBLICATIONS.....	173
A.8.0	IACS	174
A.9.0	SPECIFIED RULES, CODES, STANDARDS OR GUIDELINES	175
B	APPENDIX B: GENERAL ASSEMBLY.....	180
C	APPENDIX C: PHOTOGRAPHS.....	182
D	APPENDIX D: CONDITIONS AND DEFINITIONS	183
E	APPENDIX E: ABBREVIATIONS	185

G 1.0 GENERAL NOTES

G 1.1 Vessel General Particulars

Vessel Name:	CCGS Limnos
Official Number:	328088
Type:	Twin Screw, Mid Shore Science Vessel
Shipbuilder:	Port Weller Dry Docks Ltd, St Catherines
Voyage Classification:	NC1 Limited, 1W1
Year Built:	1968
Principle Dimensions:	
Length Between Perpendiculars	44.8 m (147'-0")
Length Load Waterline:	41.3 m (135'-6")
Breadth, Molded:	9.75 m (32'-0")
Draft, Loaded:	2.80 m (9' -2")
Mean Draft, Moulded	2.43 m (8' -0")
Displacement, Fresh Water	615 Tons
Air Draft	18.1 m (59'-5")
Propulsion	Twin Thrustmaster azimuthing propulsion units; Twin Caterpillar C18 diesel engines @ 1000 total BHP
Gross Registered Tonnage (GRT)	489
General Arrangement	See Appendix B

G 1.2 Health and Safety

- G 1.2.1 The Contractor must refer to the Fleet Safety Manual (FSM) supplied with this Specification and will have access to an uncontrolled copy of the FSM when working on the vessel. The Contractor and representatives must attend a vessel safety orientation session provided by CCG personnel as detailed in FSM 10.A.7 Contractor Safety and Security. The orientation session must be attended before beginning work and before vessel custody is transferred (if applicable) to the Contractor. This session will familiarize the Contractor's employees with the dangers specific to the vessel, with the CCG permit systems for work protocols and with the procedures for safety, risk prevention, hazard response and pre-work safety assessments.
- G 1.2.2 The Contractor and all sub-contractors must follow Occupational Health and Safety (OHS) procedures in accordance with applicable federal and provincial OHS regulations ensuring

that Contractor activities are carried out in a safe manner and do not endanger the safety of any personnel.

G 1.2.3 The Contractor must follow the Government of Canada Vaccination policy in effect at the time of the contract.

G 1.2.4 The Contractor must detail, in writing, to the Technical Authority (TA), all COVID-19 related requirements to be followed by CCG Staff when accessing the Contractor's worksite.

G 1.3 Fleet Safety Manual Safety Procedures

G 1.3.1 Diving Operations

a) The Contractor must provide all requirements to meet or exceed FSM Procedure 7.B.1 Diving Operations.

G 1.3.2 Fall Protection

a) The Contractor must provide all requirements to meet or exceed FSM Procedure 7.B.2 Fall Protection.

G 1.3.3 Entry Into Confined Spaces

a) The Contractor must provide all requirements to meet or exceed FSM Procedure 7.B.3 Entry Into Confined Spaces.

b) Contractor must provide on-site Confined Space Rescue team during all confined space work and activities.

G 1.3.4 Hot Work

a) The Contractor must provide all requirements to meet or exceed FSM Procedure 7.B.4 Hot Work.

b) The Contractor must not use the ship's fire extinguishers except in an emergency. Should the Contractor have to use a ship's extinguishers the extinguisher must be recharged and re-certified at the Contractor's expense.

G 1.3.5 Lockout Tagout

a) The Contractor must provide all requirements to meet or exceed FSM Procedure 7.B.5 Lockout Tagout.

b) The Contractor must provide the padlocks and locking devices.

G 1.3.6 Working on Energized Electrical Conductors or Circuit Parts

a) The Contractor must provide all requirements to meet or exceed FSM Procedure 7.B.6 Electrical Safety – Working on Energized Electrical Conductors or Circuit Parts.

G 1.4 Lead Containing Materials and Lead Containing Coatings

G 1.4.1 The Contractor must not use coatings containing more than 90 mg/kg lead unless otherwise stated within an individual specification.

G 1.4.2 Paint containing lead has been found on various CCG vessels. The Contractor must refer to the most recent vessel specific coating data supplied with this specification.

G 1.4.3 The Contractor must identify any suspect materials containing lead prior to starting any work. The Contractor must notify the Technical Authority of any concerns regarding lead containing materials and any lead abatement work for areas not identified in the most recent vessel specific coating data will follow the PWGSC 1379 process.

G 1.4.4 The Contractor must ensure that disturbance of materials or coatings containing lead is performed by trained personnel and/or a company certified in the removal of lead in accordance with Federal, Provincial/Territorial and Municipal regulations.

G 1.4.5 The Contractor must provide the TA with disposal certificates for all lead containing material removed from the vessel indicating that the disposal was in accordance with Federal, Provincial and Municipal regulations in effect.

G 1.5 Asbestos Containing Materials (ACM)

G 1.5.1 The Contractor must not use any asbestos containing materials.

G 1.5.2 The Contractor must refer to the most recent Asbestos Risk Assessment Report and Asbestos Management Plan supplied with this specification.

G 1.5.3 The Contractor must identify any suspect materials containing asbestos prior to starting any work. The Contractor must notify the Technical Authority of any concerns regarding asbestos containing materials and any required asbestos abatement work for areas that are not identified in the most recent Asbestos Assessment Report and Asbestos Management Plan will follow the PWGSC 1379 process.

G 1.5.4 The Contractor must ensure that handling of any asbestos containing materials is performed by trained personnel and/or a company certified in the removal of asbestos in accordance with Federal, Provincial/Territorial and Municipal regulations.

G 1.5.5 The Contractor must provide the TA with disposal certificates for all asbestos containing material removed from the vessel indicating that the disposal was in accordance with Federal, Provincial and Municipal regulations in effect.

G 1.6 Workplace Hazardous Materials Information System (WHMIS)

G 1.6.1 The Contractor must provide the TA with Safety Data Sheets (SDS) for all Contractor and sub-contractor supplied WHMIS controlled products. SDS must be provided in the formats requested in the Documentation section of the General Notes. All SDS must be maintained in accordance with OHS procedures.

G 1.6.2 The TA will provide the Contractor with access to the SDS for all CCG controlled products on the ship for all specified work items. These are available on request.

G 1.7 Smoking in the Work Space

G 1.7.1 The Contractor must comply with the Non-Smokers' Health Act by ensuring there is no smoking, nor vaping onboard the vessel by contractor employees, including employees of any sub-contractor.

G 1.8 Vessel Access

G 1.8.1 Access to all areas of the vessel is restricted, except to perform work as stated in individual specifications.

G 1.9 Contractor Furnished Materials (CFM), Equipment and Tools

G 1.9.1 The Contractor must identify items for TA approval where a particular item is not specified or where substitution must be made

G 1.10 Government Supplied Materials (GSM), Equipment and Tools

- G 1.10.1 The Contractor must inventory and sign for receipt of all GSM, equipment and tools as witnessed by TA.

G 1.11 Regulatory Approval and Inspection

- G 1.11.1 The Contractor must coordinate and schedule regulatory approvals, inspections and surveys with the applicable authorities, such as Transport Canada (TC), Transport Canada Recognized Organization (RO), Health Canada (HC), Environment Canada (EC), as indicated by individual specifications and the Contractor's QA/QC and Inspection and Test Plan (ITP).
- G 1.11.2 The CCGS Limnos is enrolled in the Delegated Statutory Inspection Program and the Canadian Coast Guard has retained the American Bureau of Shipping as a Transport Canada RO.
- G 1.11.3 The TA is responsible for direct payment of all regulatory inspection fees.

G 1.12 Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements

- G 1.12.1 Work must be carried out in accordance with Appendix A: Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements

G 1.13 Pre-Work Inspection and Documentation of Work in Progress

- G 1.13.1 The Contractor must conduct a mutual inspection with the TA to document the as delivered condition of the vessel to the Contractor. The Contractor must provide digital photos or video, dated and named as to the compartment or location. Photos or video must include all work areas and common spaces that will be accessed by the Contractor during the work period.
- G 1.13.2 The Contractor is informed that the TA may document any work using various means such as photography and video.

G 1.14 Service Conditions

- G 1.14.1 Unless otherwise stated within individual specifications, Contractor Work and Contractor supplied equipment and materials must meet the following service conditions,
- b) in areas that are exposed to the elements:
 - i) air temperature of minus (-) 40 °C to plus (+) 35 °C
 - ii) wind and salt water spray velocity of up to 50 knots
 - iii) water temperature of minus (-) 2 °C to plus (+) 30 °C
 - iv) shock loading of 2.5g horizontal, 1.5g vertical
 - c) in areas that are not directly exposed to the elements:
 - v) air temperature of minus (-) 40 °C to plus (+) 35 °C
 - vi) relative humidity of zero to one hundred per cent
 - vii) shock loading of 2.5g horizontal, 1.5g vertical

G 1.15 Documentation

- G 1.15.1 Text Documentation: Unless otherwise noted, the Contractor must provide all text documentation in text searchable, non-password protected PDF format. Naming

convention for all documents must follow this format: [L-014 LIMNOS-{REPORT TITLE}-YYYY-MM-DD]

- G 1.15.2 Data Book: Prior to Acceptance the Contractor must provide a “Data Book” in electronic format containing all documentation generated as a result of specified deliverables. The Contractor must index the Data Book by the individual specification titles entries (i.e. G1.0 GENERAL NOTES) and must include all items from the Documentation section of each individual specification. Two duplicate USB flash drives containing the Data Book must be delivered to TA within 5 business days of the vessel’s departure from the Contractor’s facility. The Contractor must label each storage device with ‘L-014 LIMNOS 2023 DRYDOCK DATA BOOK’, the contract number and vessel name.
- G 1.15.3 E-mail Naming Convention: Any Contractor generated emails relating to the Work must include the PWGSC Contract Number, vessel name and specification title within the email subject line and a short description of the topic, e.g. [F7049-140284/001/MD, CCGS Limnos 11.0 Underwater Hull Paint {short description of topic}]
- G 1.15.4 Photographs: The Contractor must deliver all photographs in Joint Photographic Experts Group (JPEG) format and named in accordance with specification titles. Two duplicate USB flash drives containing these photographs must be delivered to TA. The Contractor must label each storage device with ‘PHOTOGRAPHS’, the contract number and vessel name.
- G 1.15.5 Test/Inspection Records and Certificates: Original copies of Test and Inspection Records must be provided to the TA.
- G 1.15.6 The Contractor must provide all documentation in English and French
- G 1.15.6.1 **Drawings**
- G 1.15.6.1.1 OEM Drawings
- a) The Contractor must ensure that OEM supplied drawings are legible and complete and are supplied in at least one of the following formats:
 - i) DWG format;
 - ii) DXF format;
 - iii) TIFF format;
 - iv) PDF format.
- G 1.15.6.2 **Developed & Working Drawings**
- a) The Contractor will develop working and final drawings as part of this specification. These will be used to assess suitability to the specific application and receive applicable regulatory approval(s).
 - b) The Contractor must ensure drawings are formatted according to standard ANSI paper sizes.
 - c) The Contractor must ensure all drawings required by this specification are AutoCAD drawings, where original AutoCAD drawings are provided for the associated components. If AutoCAD drawings were not provided for one or more of the associated components, scanned files (raster format) must be supplied to CCG in one of the following formats:
 - i) DXF format;
 - ii) TIFF format;

- iii) PDF format.
- d) If AutoCAD drawings are to be prepared to meet this specification, the Contractor must have on staff or through a sub-contractor a person qualified and experienced in the use of AutoCAD.
- e) The Contractor must comply with the CCG/8009-005 "Computer aided Design (CAD) using AUTOCAD", provided.
- f) The Contractor must ensure that no drawings, prints or plots contain markings or corrections by hand i.e. marker, pen, pencil, etc.. Drawings containing mark-ups must be revised and re-printed/plotted and must conform to CCG/8009-003 "Technical Drawings Modification (Redlining/Markup) & Workflow", provided.
- g) The Contractor must ensure schematic drawings of systems include all pertinent system information, including sizes, dimensions, labeling, equipment locations, and all information relating to system fittings.
- h) The Contractor must ensure that their drawing titles match the original drawings for clarity and include a revision number with date.
- i) The Contractor must use ASME Y14.100 as guidance for drawing deliverables.

G 1.15.6.3 **Manuals**

G 1.15.6.3.1 Manuals – General

- a) The Contractor must ensure manuals supplied for any installed equipment are included in the documentation. The covers of these manuals must have the following information printed thereon;
 - i) Name of Vessel;
 - ii) Equipment Identification;
 - iii) Equipment Manufacturer; and
 - iv) Date.
- b) The Contractor must ensure plastic tabbed indices are provided for all sections of the manuals. Major equipment components must be subdivided into separate sections of the manuals.
- c) The Contractor must ensure a master index be provided at the beginning of each binder indicating all items included in each section.
- d) The Contractor must ensure a list of names, addresses and telephone numbers of contacts associated with the equipment manufacturers be provided that can be used after the equipment delivery for maintenance and information data purposes
- e) The Contractor must ensure one (1) electronic copy of a bi-lingual (English & French) manuals be provided for each type of equipment installed within this specification
- f) The Contractor must ensure two (2) paper copies of bi-lingual (English and French) manuals and data sheets be supplied for each type of equipment installed within this specification.

G 1.15.6.4 **Operation Manuals**

- a) The Contractor must include operation manuals containing the following items:
 - i) Description of all equipment operating modes and sequences;

- ii) Step-by-step procedure to follow in installing and commissioning the equipment;
 - iii) Schematic wiring diagram for the fitted equipment;
 - iv) Schematic diagrams of other sub-systems (hydraulic, pneumatic, etc.) as applicable, including subsystem interfaces; and
 - v) All pertinent equipment performance criteria.
- b) Where software/hardware systems are fitted, the Contractor must ensure the operation manual includes the full software documentation manual, in paper form, for the system and an electronic copy in accordance with the Text Documentation Section. The minimum software documentation must include:
- i) System level diagrams describing the overall scheme of the software/hardware system;
 - ii) The functional specifications, which must describe in detail the functional capabilities of the system and each software components; and
 - iii) Project specific program listings including all comments describing the details of the code functions.

G 1.15.6.5 Maintenance Manuals

- a) The Contractor must ensure a copy of the As-fitted GA drawings be provided within the maintenance manual for each equipment installed under this specification. Said drawings will replace the proposed GA drawings provided by the equipment's supplier or manufacturer.
- b) The Contractor must ensure the maintenance manuals include:
 - i) Manufacturer's maintenance schedule for each maintenance task with operating hours and/or calendar based intervals that the task must be completed;
 - ii) Manufacturer's preventive and predictive maintenance instructions for each item of the equipment requiring maintenance activity;
 - iii) Instructions are to include installation instructions, part numbers, part lists, master drawings and exploded views with part identification for all mechanical, electrical and electronic parts, and name of suppliers;
 - iv) Summary list of each item of the equipment requiring lubrication, indicating the name of the equipment item, location of all points of lubrication, type of lubricant recommended, and frequency of lubrication; and
 - v) Troubleshooting sections must be included for all equipment in the maintenance manual, under a separate heading.

G 1.15.6.6 Nameplates & Labelling

G 1.15.6.6.1 Nameplates

- a) Nameplates are identified as a deliverable in the individual specification item requesting them.

- b) The Contractor must ensure all nameplates are in English, except where required in English and French by RO for reasons of emergency operation or federal regulations.
- c) The Contractor must ensure lettering is clear and concise with the minimum use of abbreviations. Primary information must be given in larger size lettering than secondary information
- d) For the exterior surfaces of all devices that are not exposed to the elements, the Contractor must provide laminated plastic nameplates, with the following additional requirements;
 - i) Nameplates must be secured to the equipment with machine screws;
 - ii) Nameplates fitted on existing equipment must be consistent in size and lettering and be legible for the anticipated viewing distance;
 - iii) Nameplates indicating feeder circuits must identify each circuit by name and number and the fuse size or trip element rating;
 - iv) Unless otherwise specified, nameplates must be black with white core engraved through to the center core
 - v) The Following Labels must be of laminated plastic, red with white core engraved through to the center core:
 - Safe Working Loads ;
 - Warning/Caution labels ;
 - Circuit Breakers with shunt trips requiring completion of remote circuits prior to being operated;
 - Equipment with multiple power sources;
 - Circuit breaks having a potential power source connected to both sides; and
 - Indication of any other potentially hazardous condition.
 - vi) For all devices that are exposed to the elements or in machinery spaces or susceptible to covering by paint, oil or grease, the Contractor must provide nameplates engraved on stainless steel or brass, with the following requirements:
 - Lettering must be accentuated by means of black wax unless otherwise noted, and secured with stainless steel or brass machine screws;
 - A complete list of nameplates, detailing size of plate, size of lettering and inscription must be submitted to the TA for review prior to ordering and/or manufacturing.

G 1.15.6.6.2 Wire and Terminal Strip Labelling

- a) The Contractor must ensure all wiring in panels specified to be labeled are identified with the Cable Number and their conductor # and must correspond to information provided in equipment manuals and drawings
- b) The Contractor must ensure all terminal strips in panels to be labeled are identified with the Cable Number of the cable which it is designated for.

G 1.16 Painting

- G 1.16.1 The Contractor must ensure the final top coats are not applied, as far as practicable, until all welding, burning, etc., is completed in order that all touch-up work must be generally confined to the priming coats. The final top coats must be protected from soiling or damage until the vessel is handed over to the TA. Care must be taken in the application of final top coats to ensure that furnishings, and in particular electronic or other equipment liable to more serious damage due to excess spray, must be adequately protected.
- G 1.16.2 The Contractor must ensure the following remains unpainted:
- a) Screw threads;
 - b) Grease fittings;
 - c) Bronze pins;
 - d) Door, vent and fire arrestor screens;
 - e) Nameplates;
 - f) Gaskets;
 - g) Stainless steel or Monel metal fittings;
 - h) Machined surfaces;
 - i) Instrumentation;
 - j) Interior gratings;
 - k) Electrical wires, insulation and fittings;
 - l) Electrical panels;
 - m) Rubber seals of watertight doors and hatches;
 - n) Fire door seals; and,
 - o) In general, all working parts.

G 1.17 Piping

G 1.17.1.1 General

- G 1.17.1.1.1 The Contractor must ensure all piping materials are chosen as per CCG/8022-002 "Piping Systems Material Selection Guide", provided.
- G 1.17.1.1.2 The Contractor must ensure all piping installed as part of this specification is identified and conforms to CCG/8023-011 "Colour Coding for Piping Systems", provided.
- G 1.17.1.1.3 The Contractor must ensure piping is installed so as not to interfere with:
- a) Operation of, or passage through doors, hatches, scuttles, openings covered by portable plates or working areas.
 - b) Operation of machinery, equipment, controls, and with routine maintenance of machinery and the ship's structure;
 - c) Designated equipment removal routes or removable structural portions of the ship provided for equipment access, removal, and/or maintenance.

G 1.17.1.2 Piping Fabrication for Piping Installations

- G 1.17.1.2.1 The Contractor must ensure flange faces are on a plane perpendicular to the longitudinal centerline of the pipe, tube or fitting to which they are attached.

- G 1.17.1.2.2 The Contractor must ensure piping runs are as direct as possible and utilize the minimum amount of fittings that would increase the frictional flow characteristics of the piping run.
- G 1.17.1.2.3 Where pipes pass through holes in non-watertight structure, the Contractor must make provisions to keep the pipes from bearing on the structure.
- G 1.17.1.2.4 The Contractor must ensure piping installations are located where it would not likely be subject to mechanical damage. Protection for piping must be provided wherever susceptibility to mechanical damage is unavoidable.
- G 1.17.1.2.5 The Contractor must ensure piping installations, in way of mechanical, electrical or hydraulic systems requiring periodic overhaul, are removable.
- G 1.17.1.2.6 Where high and low points in piping installations are unavoidable, the Contractor must ensure vent drains or other effective means are installed to assure proper system function.
- G 1.17.1.2.7 The Contractor must ensure installed pump suction piping are short and arranged to rise without forming bends likely to cause air pockets.
- G 1.17.1.2.8 The Contractor must ensure installed tank suctions are 0.5D above the bottom of the tank at the deepest point, where "D" is the inside diameter of the suction pipe.
- G 1.17.1.2.9 The Contractor must ensure bulkheads and decks are pierced close to boundaries of compartments. Piping installations must be arranged to avoid cutting bulkhead stiffeners, deck beams and plating butts and seams.
- G 1.17.1.2.10 The Contractor must ensure piping is not led through inner bottom tanks and voids, except as necessary to serve the tanks themselves, or as necessary to avoid penetrations of fuel tanks and ballast tanks.
- G 1.17.1.2.11 The Contractor must ensure piping normally under pressure is kept out of voids, cofferdams and other normally non-vented spaces.
- G 1.17.1.2.12 The Contractor must ensure deflections of bulkheads, decks and other structures due to air or water pressure or working of the ship are considered and the piping arranged for the necessary clearance and flexibility.
- G 1.17.1.2.13 The Contractor must ensure the amount of piping led through meeting, dining and living spaces is minimized. Piping in such places must be symmetrically and neatly arranged for the necessary clearance and flexibility.
- G 1.17.1.2.14 The Contractor must ensure piping is not led through the following spaces, except as necessary to serve the space:
- a) Chain lockers;
 - b) Fresh water tanks; and
 - c) Wiring trunks and enclosures.
- G 1.17.1.2.15 When systems other than those serving a tank are permitted to pass through fuel oil or diesel oil tanks, the Contractor must ensure piping is welded with Schedule 80 steel.
- G 1.17.1.2.16 The Contractor must ensure new piping installations are kept clear of the machinery control room.
- G 1.17.1.2.17 The Contractor must ensure supports are designed and located to safely support the weight of piping, its operating or test fluid (whichever is heavier) and its insulation and

lagging (where installed). The supports must also carry the loads imposed by expansion and contraction of the piping and working of the ship.

- G 1.17.1.2.18 The Contractor must ensure the number of supports installed, the type selected and their location prevents excessive vibration of the piping under all system operating conditions. They must not constrain the piping under any system operating condition, and they must not constrain the piping to such an extent so as to cause excessive transfer of load from support to piping or from support to support. The location and type of support selected must prevent excessive stress from being transmitted by the piping to machinery, equipment or the ship's structure.
- G 1.17.1.2.19 The Contractor must ensure rigid anchors are designed so that noise and vibration from piping system components and excessive heat from high temperature systems are not transferred through the anchor into surrounding areas.
- G 1.17.1.2.20 The Contractor must ensure changes in direction of piping are made by pipe bends and offsets where space permits; otherwise, straight length of pipe and pipe fittings for the system must be used. Miter joints are permitted only in piping such as air escapes, vents and overflows where their use would not cause objectionable pressure drop or turbulence in the fluid flow. Branch connections must be located to minimize turbulent flow and the type used, (crosses, single and double-sweep tees, Y and lateral fittings), must be suitable for the required flow characteristics.
- G 1.17.1.2.21 The Contractor must ensure direct reading thermometers, pressure, and/or compound gauges are located in positions where they can be easily read and safe from damage. All pressure and compound gauges must be provided with an isolating cock.
- G 1.17.1.2.22 The Contractor must ensure galvanic corrosion is minimized in the sea water systems that couple dissimilar metals of high potential differences. Control of galvanic corrosion must be obtained by the coupling of a relatively small area of cathodic material to a large area of anodic material, or the dissimilar metals may be separated with a short length of extra heavy galvanized steel pipe (waste piece).
- G 1.17.1.2.23 The Contractor must ensure raised face flanges are not used against bronze or other relatively low strength composition valves, fittings or flanges.
- G 1.17.1.2.24 Bending of hard drawn tubing is not acceptable. The Contractor must ensure straight lengths and fittings are used. All joints must be silver-soldered.
- G 1.17.1.2.25 The Contractor must ensure all components and assemblies of components are thoroughly cleaned after fabrication and before installation in the ship. Foreign matter, such as dirt, grit and shavings, must be removed by methods and materials compatible with the fluids employed in the service aboard ship.

G 1.17.1.3 Testing of Piping systems

- G 1.17.1.3.1 The Contractor must ensure all sub-assemblies and piping systems that are to be tested by the Contractor are hydrostatically tested to 1.5 times the system's working pressure and proven tight to the satisfaction of the TA.
- G 1.17.1.3.2 The Contractor must ensure clean fresh water or the service fluid are used when testing systems hydrostatically.
- G 1.17.1.3.3 The Contractor must correct any leakage arising from the testing. Costs associated with corrective work to repair leaks is at the expense of the Contractor.

- G 1.17.1.3.4 The Contractor must demonstrate to the TA during testing that all manually operated valves can be opened fully and closed tightly by one person without mechanical assistance.
- G 1.17.1.3.5 The Contractor must demonstrate to the TA during testing that the system can achieve operating conditions as a minimum. Costs associated with corrective work to achieve minimum operating conditions is at the expense of the Contractor.
- G 1.17.1.3.6 The Contractor must ensure machinery and equipment is not subjected to pressures higher than their maximum allowable operating pressure during system pressure tests. Valves at the components may be closed, or the connection blanked off to protect such components from excessive pressure. If there are any flanged joints in the piping between a tank isolating valve and the open end of the suction pipe, or where a tank isolating valve has not been installed, the flanged joint next to the open end of the suction pipe must be temporarily blanked off so the system may be pressure tested up to that point. Instruments, pressure switches and other components that could be damaged by excessive pressure of system tests must be removed or otherwise protected during the tests.
- G 1.17.1.3.7 Prior to testing, the Contractor must ensure calibrated pressure gauges are installed at the connections provided in the gauge piping. During tests, readings of installed gauges must be checked with the calibrated test gauges. Installed gauges must be adjusted where necessary to register pressure accurately.
- G 1.17.1.3.8 Individual lengths of shop fabricated and shop tested piping may be insulated before shipboard testing. The Contractor must ensure that all mechanical joints and all fittings installed during system assembly are left exposed until tests have been satisfactorily completed.
- G 1.17.1.3.9 The Contractor must not conduct tests of piping using liquids subject to freezing during freezing weather.
- G 1.17.1.3.10 When the duration of a pressure test is not specified, the Contractor must ensure test pressures are held a sufficient length of time to permit a thorough examination of the system for leaks, to the satisfaction of the TA and RO.
- G 1.17.1.3.11 The Contractor must ensure relief and safety valves and all other components installed to limit operating pressures are removed, blanked or bypassed where necessary to build up to the pressure specified for the test. After a system has satisfactorily passed these tests, such components must be reinstalled and tested under pressure to assure they operate at approved set pressures. Set pressures indicated on identification plates of these valves must conform to the approved set pressures.
- G 1.17.1.3.12 The Contractor must ensure all components necessary for the safe operation of the system are checked and adjusted during the operating tests to demonstrate compliance with the requirements and approved for the system. Operating tests must demonstrate that the piping design and installation adequately meet the service demands. Priming, venting, bleed-off, recirculating and other system provisions must be tested for proper operation. Components, such as spring hangers must be adjusted where necessary, and flexible piping connections, slip joints, expansion joints and noise isolation pipe fittings must be checked for satisfactory operation while the system in which they are installed is being operated.

- G 1.17.1.3.13 Where pumps have suctions from tanks or compartments, the Contractor must ensure the operating test demonstrates the ability of the system to remove the service liquid down to the level of the open end of the suction pipe, or to another level relative to the suction pipe when so specified for a particular system.
- G 1.17.1.3.14 The Contractor must ensure that open systems such as air escapes, overflows and deck drains are tested for unobstructed flow with compressed air or water at not more than 100 PSI.
- G 1.17.1.3.15 The Contractor must ensure that systems for hand pumps, portable drainage facilities and similar miscellaneous systems are given an operating test and the specified pressure test. Pressure tests must precede operating tests. All such systems must have a visual inspection and must be leak-free during the tests.
- G 1.17.1.3.16 The Contractor must ensure all of the system pressure and operating tests are completed before the system trials.
- G 1.17.1.4 **Rotating Machinery**
- G 1.17.1.4.1 Where a danger to personnel attending and/or working on newly installed machinery exists, the Contractor must ensure machinery is provided with shielding to prevent contact with rotating elements.
- G 1.17.1.4.2 The Contractor must ensure shielding is constructed in either steel or aluminum.
- G 1.17.1.4.3 The Contractor must ensure shielding arrangements are designed to be easily removed to conduct maintenance on the components being shielded.

G 1.18 Welding & Welding Certification

- G 1.18.1 For any work requiring the application of fusion welding for steel structures the Contractor and/or the sub-contractor welders must be certified by the Canadian Welding Bureau in accordance with CSA Standards W47.1-03, latest revision – Certification of Companies for Fusion Welding of Steel Division 2 Certification as a minimum. Current copies of certification (including those of the welders) must be provided to the TA.
- G 1.18.2 All welding and weld inspection work must be in accordance with CCG Welding Specification CT-043-EQ-EG-001.
- G 1.18.3 Welding of materials less than 3 mm in thickness must be in accordance with the requirements of the CCG Welding Specification CT-043-EQ-EG-001.
- G 1.18.4 For materials greater than 3 mm in thickness, the Contractor must meet the following:
- a) For structural steels greater than 3 mm in thickness, welding must meet the requirements of CSA Standards W47.1 and W59, except as modified by the CCG Welding Specification CT-043-EQ-EG-001.
 - b) For structural aluminum greater than 3 mm in thickness, welding must meet the requirements of CSA Standards W47.2 and W59.2, except as modified by the CCG Welding Specification CT-043-EQ-EG-001.
 - c) For structural stainless steels greater than 3mm in thickness, welding must meet the requirements of CSA Standard W47.1 and AWS D1.6, except as modified by the CCG Welding Specification CT-043-EQ-EG-001.

G 1.19 Touch-up/Disturbed Paint

G 1.19.1 The Contractor must prepare all disturbed steelwork to the paint manufacturer's standards prior to painting.

G 1.19.2 Unless stated otherwise, the Contractor must supply and apply two coats of marine primer and one layer of top-coat, compatible with the vessel's existing coating system, to all disturbed metal surfaces.

G 1.20 Electrical Installations

G 1.20.1 All electrical installations and repairs must be carried out in accordance with the latest revisions of Transport Canada Marine Safety Electrical Standard TP127E and IEEE Standard 45 Recommended Practice for Electrical Installation on Ships.

G 1.21 Clean and Hazard Free Worksite

G 1.21.1 The Contractor, during the work period, must maintain those areas of the vessel which Contractor personnel use to access areas where work is to be undertaken, in a clean condition, free from debris and remove garbage daily.

G 1.21.2 Areas that pose a hazard as a result of the specification work are to be secured and clearly identified by the Contractor with signage to advise and protect all personnel from the hazard in accordance with applicable Canada Labour Code requirements.

G 1.21.3 Upon completion of this contract, the Contractor must be responsible for the removal of all garbage generated from the work of this specification and for returning the vessel to the state of cleanliness in which the vessel was at the start of the contract period.

G 1.21.4 Once all known work and final clean-up has been completed, the Contractor's QA Representative and the TA must perform a 'walk through' of the vessel to view all areas where work was performed by the Contractor. Any deficiencies or damage noted must be recorded and compared to the photos and, if deemed to have been caused by the Contractor as a result of the work, the damage must be repaired by the Contractor at no cost to the CCG.

G 1.22 Access to Worksite

G 1.22.1 The Contractor must ensure the TA and CCG staff has unrestricted access to the worksite at all times during the contract period.

G 1.23 Assembly of Components

G 1.23.1 The Contractor must ensure that during installation of specified equipment, that parts and assembled equipment are cleaned of smudges, spatter or excess solder, weld metal and metal chips or any other foreign material which might detract from the intended operation, function, or appearance of the equipment. This would include any particles that could loosen or become dislodged during the normal expected life of the equipment. All corrosive material must be removed. This cleaning must take place before the parts are assembled into the equipment. All components must be assembled in accordance with original manufacturer's specifications and recommendations.

G 1.23.2 Covers, cowlings and components damaged by the Contractor must be replaced with new CFM covers, cowlings, or components.

G 1.23.3 Where torque specifications are not provided by the manufacturer, the applicable SAE, ANSI, or BS1083 nut and bolt standard torque must be used.

G 1.24 Regulatory Approval and Inspection

- G 1.24.1 In alignment with the Contractor's QA/QC and Inspection and Test Plan (ITP) and as indicated by this specification, the Contractor must contact, coordinate and schedule regulatory inspections and surveys with the applicable authority, such as TC, RO, Health Canada (HC), Environment Canada (EC) or others.
- G 1.24.2 The Contractor will not be responsible for cost/payment of inspection fees associated with inspections indicated within this specification, unless re-inspection is required due to Contractor's failure to prepare for inspection or any failed inspection that is determined to be the fault of the Contractor.
- G 1.24.3 The Contractor must provide a minimum of two (2) federal business days' notice of scheduled regulatory inspections and/or class surveys to the TA and RO so they may witness the inspection.
- G 1.24.4 The Contractor must retain all original signed and dated certificates and any other relevant documentation generated by the above inspections and/or surveys and must include all such documentation in the Data Book.
- G 1.24.5 The Contractor must not substitute inspection by the TA for the required regulatory inspections.

G 1.25 CCG Employees and Others on the Vessel

- G 1.25.1 CCG/DFO employees and other personnel such as manufacturer's representatives and/or TCMS may carry-out other work not included in this specification, onboard the vessel during this work period. Every effort will be made by the TA to ensure this work and the associated inspections and/or surveys do not interfere with the Contractor's work.

G 1.26 Removed Materials and Equipment

- G 1.26.1 All removed equipment as a result of this specification must remain the property of the CCG unless otherwise instructed in the specification sections.
- G 1.26.2 The Contractor must coordinate an inspection with the TA on the condition and location of items to be removed prior to carrying out the specified work or to gain access to a location to carry out the work.
- G 1.26.3 The Contractor must ensure that covers, cowlings and other items that need to be removed are stored in accordance with the equipment manufacturer's or equipment vendor's specific storage instructions. The Contractor must make these instructions available to the TA.
- G 1.26.4 The Contractor must ensure that all equipment and items are stored in such a manner so as to be easily accessible for inspection. No items are to be stored directly on floors.

G 1.27 Storage and Protection of Equipment

- G 1.27.1 Any damage incurred as a result of the Contractor's work must be repaired by the Contractor at their expense. Materials used in any replacement or repairs must meet the criteria for CFM noted above in section "Contractor Furnished Materials (CFM) and Tools".
- G 1.27.2 The Contractor must take precautions to ensure that surfaces and components of equipment installed on the vessel are protected against damage, soiling, and contamination as a result of contracted work.

- G 1.27.3 All electrical and electronic equipment and components must be protected during the contract against physical damage, internal damage, and by the effects of adverse temperatures or other environmental conditions.
- G 1.27.4 The Contractor must protect equipment that could be damaged as a result of movement of materials and equipment nearby. The Contractor must also protect equipment from nearby sources of contamination including but not limited to burning, welding, media (sand) blasting, grinding and painting.
- G 1.27.5 Any damage to surfaces, equipment, furnishings or decor incurred prior to acceptance must be returned to As-Delivered condition by the Contractor.
- G 1.27.6 All openings in machinery and/or systems must be kept covered by fitted solid inserts or covers prior to connections being made.
- G 1.27.7 The Contractor must obtain and follow instructions from its sub-Contractors for any special protection required for their equipment during the project work. Such instructions must be made available to the TA.
- G 1.27.8 The Contractor must protect the vessel from the possibility of vermin infestation (insect/mammal/bird). If an infestation does occur during the contract period, the Contractor must bear all costs to ensure the vessel is made vermin free before the vessel's departure and contract completion.

G 1.28 Inspection and Test Plan

- G 1.28.1 The Contractor must develop an Inspection and Test Plan (ITP) which must include all tests and trials stated in the specification. This ITP must be provided for TA review at least five (5) federal business days' prior to the scheduled inspections, tests and trials commencement.
- G 1.28.2 The Contractor must record dimensions to a precision of three decimal places (unless otherwise stated) in the measuring system currently in use on the vessel.
- G 1.28.3 The Contractor must provide to the TA current and valid calibration certificates for all instrumentation used in the ITP, showing that the instruments have been calibrated in accordance with the manufacturers' instructions.

S 1.0 SERVICES

S 1.1 General

- S 1.1.1 The Contractor must supply the following services to the vessel for the entire work period and disconnect upon completion of the work period. The Contractor must be responsible for the re-establishment of services if the vessel is moved during the work period.

S 1.2 Berthing

- S 1.2.1 The Contractor must provide, during the contract period and when the ship is not in the dry dock, a berth at the Contractor's wharf.
- S 1.2.2 The Contractor must, when berthing the vessel, ensure the length of the dock is a minimum of 90% of the length of the vessel (LOA).
- S 1.2.3 The Contractor must provide a berth to accommodate the vessel as described in Section G1.1 in local weather, tide, and sea conditions with a minimum keel clearance of [0.45 meters (1.5 feet)] at extreme low tide conditions.
- S 1.2.4 The Contractor must protect the vessel from contacting wharfs and other vessels with Contractor Furnished Material (CFM) fenders, when the vessel is berthed at the Contractor's facility.
- S 1.2.5 The Contractor must be responsible for all movements of the vessel, including berthing and mooring of the vessel for the contract period, as well as arrangements and costs for line handlers, tugs and pilots.

S 1.3 Mooring Lines

- S 1.3.1 The Contractor must secure the vessel at the Contractor's facility with CFM mooring lines. Vessel securing arrangement and physical inspection of mooring line condition, location and number of lines to be approved by Contractor dockmaster and witnessed by TA. The ship's mooring lines must not be used.

S 1.4 Gangways

- S 1.4.1 The Contractor must supply and maintain two means of accessing the vessel while at the Contractor's facility. As part of this requirement one means of access must be by gangway.
- S 1.4.2 The Contractor must supply all labour and services required for the installation and removal of all gangways, complete with handrails, safety nets, and lighting for the duration of the Contract while the vessel is berthed and while the vessel is docked.
- S 1.4.3 The Contractor must provide gangways that meet or exceed the Canada Labour Code and applicable provincial regulations at the Contractor's facility for the duration of the Contract period.
- S 1.4.4 The Contractor must ensure gangways are located sufficiently far apart to facilitate fire evacuation.
- S 1.4.5 Any movement of the gangways required by the Contractor will be at the Contractor's expense.

S 1.5 Electrical Power

- S 1.5.1 The Contractor must supply, connect and maintain electrical power through the vessel's shore power system, for the duration of the contract.
- S 1.5.2 The TA must be notified in writing of any changes to the ship's power system to accommodate the Contractor's supply.
- S 1.5.3 The Contractor must ensure the correct phase rotation on a three phase system is established prior to energizing the ship's distribution system from shore. Additional information is available on the vessel one line (single line) electrical diagram. Power transformers and cables to meet this requirement must be CFM.

S 1.5.4 Electrical Requirements:

Voltage	460 VAC
Current	200 A
Number of Phases	Three Phase
Frequency	60Hz

- S 1.5.5 The Contractor must ensure compatibility between ship and shore power connectors. Shore power plug is AR20034RS, 200 Ampere 3 wire, 4 pole.
- S 1.5.6 The Contractor must monitor the consumption with a CFM kilowatt-hour meter. The Contractor must record the initial and final meter reading and each time there is a change in custody of the vessel. The TA must witness each reading. The Contractor must not use electricity downstream of this meter.
- S 1.5.7 The Contractor must disconnect shore power upon completion of work. Any changes to the ship's power system to accommodate the Contractor supplied shore power connections must be returned to original. All work must be carried out by certified electricians.
- S 1.5.8 The Contractor must provide a unit price per kilowatt-hour for adjustment purposes and an initial contract price for 20,000 kWh of usage. The total power consumption will be adjusted up or down via PWGSC 1379 process.
- S 1.5.9 The Contractor must provide a calibration certificate for the kilowatt-hour meter.

S 1.6 Deck Protection

- S 1.6.1 The Contractor must, within two days of commencement of the Contract work period, supply and install 3 mm minimum thickness MDF fiberboard (e.g., Masonite) temporary deck protection to all interior alleyways throughout the ship. This supply and install must include sealant taping edge joints to prevent the ingress of dirt. The Contractor must maintain this temporary deck protection throughout the work period.
- S 1.6.2 The Contractor must ensure that temporary deck protection be also provided over the wheelhouse carpeting. All sheet-to-sheet joints must be taped and no tape should be fixed directly to the carpet.
- S 1.6.3 The Contractor must supply a price per square meter, with an initial contract area to be protected of eighty [80] square meters. The final price for this item will be adjusted via PWGSC 1379 process.

- S 1.6.4 The Contractor must, after the completion of physical works and before acceptance, remove and dispose of all temporary deck protection, tape and sealant. All tape and sealant residue must be removed prior to acceptance of the vessel by Canada. The TA must be afforded the opportunity to inspect the decks prior to contract completion.

S 1.7 Fixed Fire Fighting Suppression Systems

- S 1.7.1 While vessel custody is with the Contractor, the Contractor must isolate the vessel's main machinery space(s) fixed fire suppression system(s) to prevent accidental discharge. The TA must witness this.
- S 1.7.2 The Contractor must notify the TA and obtain written approval from the TA prior to disturbing, removing, isolating, deactivating, disabling or locking out any part of the fire detection or suppression systems, including heat and smoke sensors.
- S 1.7.3 The Contractor must ensure protection against fire at all times including when working on the ship's fire detection and/or suppression system(s). This may be accomplished as suggested below and only with the written permission of the TA:
- a) Disabling only one portion of a system at a time;
 - b) By maintaining system function using spares while work is in progress;
 - c) Other means acceptable to and approved by the TA.
- S 1.7.4 The Contractor must note that failure to take the necessary precautions while performing work on the vessel's fire suppression system(s) could result in the accidental discharge of fire suppression agent(s). The Contractor must recharge and certify at its cost, container(s) or systems that are discharged as a result of such work.
- S 1.7.5 Upon resumption of vessel custody by CCG, the Contractor must re-instate the fixed suppression system(s) by a qualified technician. The TA must witness the system being re-instated. An original certificate, dated and signed by the qualified technician must be provided to the TA.

S 1.8 Fire Main

- S 1.8.1 The Contractor must supply a separate and continuous uninterrupted water supply through CFM hoses, adapters, isolation valves and calibrated pressure regulator to the ship's fire main system. Pressure must always be maintained.

S 1.8.2 Fire Main Requirements:

Service	Supply Line	Pressure	Estimated Daily Consumption
Fire Main	2"	80-110 psi	N/A

- S 1.8.3 Provisions must be made by the Contractor to ensure that the water supply does not freeze during cold weather. The Contractor must inform the TA and security staff of the location of the shut-off valve(s).
- S 1.8.4 The Contractor must read the water meter at the beginning of the contract period and again at the end. The TA must witness each reading and these readings must be used to calculate the total Fire Main water usage.

S 1.9 CCG/PWGSC Office Space & Communications

- S 1.9.1 The Contractor must provide secure office space. The space must have four [4] desks. The office is for the exclusive use of government personnel, must have access to rest rooms within close proximity and must be environmentally controlled. The space must be available from one week prior to the work period, through to two weeks after vessel acceptance.
- S 1.9.2 Each desk must include a minimum of 2 chairs; have a minimum of 2 electrical receptacles; and be provided with Wi-Fi broadband high speed internet service.
- S 1.9.3 The Contractor must provide [4] parking spots adjacent to the building with the specified office spaces reserved for the exclusive use of government personnel.

S 1.10 Storage Space

- S 1.10.1 The Contractor must provide [150] square meters of storage space, ensuring the following requirements are met:
- a) Approximately 15 degrees Celsius with a maximum relative humidity of 70%;
 - b) Co-located with the vessel;
 - c) Contractor must provide controlled access and must maintain register of Contractor or Government equipment or material stored within.

S 1.11 Security

- S 1.11.1 The Contractor must provide a continuous security watch consisting of at least one mobile security patroller for the duration of the contract period.
- S 1.11.2 The Contractor's security measures must include:
- a) controlled access to the worksite with a lock and key;
 - b) key card access, and/or gate code, as well as fencing or other physical barriers in place to stop unauthorized personnel from accessing the worksite;
 - c) adequate lighting at the worksite day and night, ensuring the vessel is visible and may be observed clearly; and
 - d) High Definition video monitoring and recording to capture the vessel and the surrounding worksite directly on a 24hr continuous basis; video recording data must be retained for a minimum of 30 days.
- S 1.11.3 The Contractor must patrol the vessel for flood, fire and security. Rounds must be conducted and documented for each compartment, every four hours. The list of compartments and inspection points are:
- a) Wheelhouse;
 - b) Science Lab;
 - c) Sewage compartment;
 - d) Galley, crew and officers mess;
 - e) Engine Room;
 - f) Fan Room;
 - g) Thrustmaster machinery space;
 - h) Water service connection;
 - i) Electrical Service connection;

- j) Gangways; and
- k) Scaffolding and protective coverings.

S 1.12 Garbage

- S 1.12.1 The Contractor must provide a garbage container or dumpster of 6 cubic meters located adjacent to the vessel. Garbage must be emptied daily including week-ends and holidays. Ship's personnel will comply with any recycling and organic programs that the Contractor has in place, provided the appropriate containers are made available.
- S 1.12.2 The Contractor must provide a unit cost for garbage removal and must bid on 30 cubic meters of garbage removed. Cost adjustment up/down will be by PWGSC 1379 process.

S 1.13 Cranage

- S 1.13.1 The Contractor must provide ten (10) hours of general cranage as requested by the TA or their delegate. Lifts will nominally be one (1) tonne and generally be used for loading vessel stores and equipment. A unit cost per hour of crane usage must be provided for final cost adjustment via the PWGSC 1379 process.

S 1.14 Bilge Water Disposal

- S 1.14.1 The Contractor must remove and dispose of five [5] cubic meters of oily-water mixture from the vessel's bilges. The Contractor must dispose of the bilge water in accordance with Federal, Provincial and Municipal regulations. Disposal certificates must be provided to the TA.
- S 1.14.2 A unit cost per cubic meter for the removal and disposal must be provided for final cost adjustment via PWGSC 1379 process.

S 1.15 Cleaning

- S 1.15.1 The Contractor must ensure that all areas of the ship where work has been carried out and all interior alleyways within the ship, are cleaned to 'as-delivered condition' (G1.13) when work is completed. The cost of clean-up work must be included in the known work price for each specification item.

S 1.16 Black Water and Grey Water Services

- S 1.16.1 The ship's crew will isolate and put the vessel's black and grey water system out of service prior to the vessel entering the drydock.
- S 1.16.2 The Contractor must ensure that Contractor's and sub-contractors' employees do not utilize the vessel's washrooms and crew mess facilities. The Contractor must provide the necessary amenities at an adjacent area for the Contractor's and sub-Contractors' employees and ship's crew.
- S 1.16.3 The Contractor must remove and dispose of black and grey water. Refer to section 16: Domestic Systems.

10 SAFETY AND SECURITY [NOT USED]

11 HULL AND RELATED STRUCTURES

11.1 IDENTIFICATION

11.1.1 The CCG requires drydocking and regulatory five (5) year inspections of the hull and topsides, followed by general and spot removal of failed coatings where work will be required on the vessel's plating. The specification includes repair work, hull preparation work for recoating, as well as recoating work using products and techniques that are compatible with the existing coatings.

11.1.2 The Contractor must also complete ship-side valve inspections, inspection and maintenance of all sea inlets and keel coolers and replacement, as necessary, of sacrificial anodes.

11.1.3 A Naval Engineering Test Establishment (NETE) vessel condition survey was conducted on the vessel, using Pulsed Eddy Current (PEC) technology, in October 2022. This specification identifies portions that have survey results associated with it. The relevant portions of the survey results will be made available to the Contractor, on request by the Contractor, from February 2023.

11.1.4 The CCG will provide an independent National Association of Corrosion Engineers (NACE) Level 3-certified coating inspector to determine, supervise and report on coatings work for exterior and interior surfaces of the vessel identified in the Specification.

11.1.5 AkzoNobel/International Technical Service Representative (TSR)

Kevin Leigh, Senior Certified Coatings Inspector #13816

Cell: 519 328 6601

Email: kevin@jbicoatings.com

JBI Coatings

ON CANADA

www.international-marine.com

www.akzonobel.com

11.1.6 CCG Contracted NACE inspector

To be Confirmed

11.2 REFERENCES

11.2.1 Equipment Data

11.2.1.1 The following equipment data is provided for guidance.

Equipment	Manufacture/Equipment Details
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Hull plating	ASTM A131 Lloyds Grade “E” Shipbuilding Steel
AkzoNobel/International Hull Coatings – Below Waterline - 1st coat	Intershield 300 - ENA300/A – Bronze
AkzoNobel/International Hull Coatings – Below Waterline – 2nd coat	Intershield 300 – ENA301/A - Aluminum
AkzoNobel/International Hull Coatings – Below Waterline – 3rd coat	Intergard 263 FAJ034/A – Light Grey
AkzoNobel/International Hull Coatings – Below Waterline – Antifouling	Interspeed 640 BRA642 - Black
AkzoNobel/International Hull Coatings – Above Waterline - 1st coat	Intershield 300 - ENA300/A – Bronze
AkzoNobel/International Hull Coatings – Above Waterline – 2nd coat	Intergard 263 FAJ034/A – Light Grey
AkzoNobel/International Hull Coatings – Above Waterline – Top coat	Intersheen 579 LAF287- RAL3000 Flame Red
AkzoNobel/International Hull Coatings – Above Waterline - Diagonal strip, marks and lettering	Intersheen 579 LAF287- RAL9003 White
AkzoNobel/International Hull Coatings – Above Waterline - Boot stripe and anchor recesses	Intersheen 579 LAF287- RAL9004 Black

11.2.2 Drawings

11.2.2.1 The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File Name
47-H-200_01	General Arrangement 1 of 2	47-H-200-1.tif
47-H-200_02	General Arrangement 2 of 2	47-H-200-2.tif
00055	ME & Gen Keel Cooler Arrangement	00055_01.tif
47-H-3	Shell Expansion Plan	47-H-3.tif
47-H-16	After Skeg	47-H-16.tif

11.2.3 Manuals

11.2.3.1 The following Manuals are to be considered as Guidance documents.

Manual Title	Electronic File Name
Fenstrum Gridcooler - Installation & Maintenance Manual	Fenstrum Gridcooler - Installation & Maintenance - Form 170.pdf

11.2.4 Reports

11.2.4.1 The following Reports are provided as Guidance Documents.

Report Title	Electronic File Name
Dry Dock Coating Report – Limnos – 2019 (International)	2019-07-22 – International Ship Hull Coating Report – L014.pdf
CCGS Limnos M&R Report 2010 (International)	CCGS Limnos M&R Report 2010 (International).pdf
UT Thickness Survey Report #1, 2 & 3 CCG Limnos	2019 – UT Thickness Reports 1,2, and 3 – L014.pdf
CCGS Limnos - HIMP Inspection of Void Spaces & Cofferdams	Limnos - HIMP Void Spaces Report - 2022-12-02.pdf
CCGS Limnos Vessel Condition Survey 2022 – Naval Engineering Test Establishment (Available Feb 2023)	N/A

11.2.5 Regulations and Standards

11.2.5.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

11.3 DOCKING AND UNDOCKING

11.3.1 Identification

11.3.1.1 The CCG requires the CCGS Limnos to be dry-docked for the specified period and subsequently undocked at the completion of work. The specification includes stability studies and other pre-planning prior to dry-docking and undocking events.

11.3.2 References

11.3.2.1 **EQUIPMENT DATA [NOT USED]**

11.3.2.2 **DRAWINGS**

11.3.2.2.1 The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File
00055	ME & Gen Keel Cooler Arrangement	00055_01.tif
0001R	CCGS Limnos Docking Plan – ‘A’	001R_01.dwg
25092019	CCGS Limnos Docking Plan – ‘B’	25092019_01.dwg

11.3.2.3 **MANUALS [NOT USED]**

11.3.2.4 **REPORTS**

11.3.2.4.1 The following Reports are to be considered as Guidance Report.

Report Title	Electronic File
CCGS Limnos 2010 - Stability Book	2010 - Stability Book.pdf
UT Thickness Survey Report Coast Guard Vessel LIMNOS	2019 - UT Thickness Survey Report #1, 2 and 3 – L014.pdf

11.3.2.5 DOCKING

- 11.3.2.5.1** The Contractor must prepare blocks and shoring to maintain the alignment of the vessel's hull and machinery throughout the docking period.
- 11.3.2.5.2** The Contractor must refer to the docking plan drawing 47-H-248 and 00055 - ME & Gen Keel Cooler Arrangement.
- 11.3.2.5.3** In the 2019 drydock, the Contractor developed alternate block arrangements and used alternate Plan A at that time. For this contract, the Contractor must use Plan B.
- 11.3.2.5.4** The Contractor must record all tank soundings, draft, trim and list of the vessel, and perform the stability calculations for the docking of the vessel. Completed stability calculations must be forwarded to the TA at least two (2) business days prior to docking the vessel.
- 11.3.2.5.5** The Contractor must discuss with the TA any comments, concerns or observations they may have regarding the effect of work on the vessel's stability or carrying capacity. The Contractor must advise the Technical Inspector (TI) and TA of the details of any major changes in the distribution of weights on the vessel, while the vessel is in dry-dock.
- 11.3.2.5.6** The vessel must be docked so that all docking plugs, transducers, anodes and sea inlet grids and keel coolers are clear and accessible. A minimum clearance of 1.5 meters must be available below the keel. If any hull fittings are covered, the Contractor must provide all labour and materials and make alternative arrangements to drain tanks and/or move blocks to complete the specified work.
- 11.3.2.5.7** The Contractor must provide a ground cable between the vessel and the dock while the vessel is docked as per Ship Safety Bulletin 06/1989.
- 11.3.2.5.8** Any work item that, in the opinion of the Contractor may pose a vessel structural integrity problem, is to be brought to the attention of the TA. The Contractor must advise the Technical Inspector (TI) and TA of the details of any major changes in the distribution of weights on the vessel, while the vessel is in dry-dock.

11.3.2.6 UNDOCKING

- 11.3.2.6.1** The Contractor must ensure that all shipside openings, including valves, drain and docking plugs are secure before flooding the dry dock.

- 11.3.2.6.2** During the undocking of the vessel, the Contractor must have sufficient personnel on hand such that all devices penetrating the hull listed in Section 11, including ship-side valves, sea bays and keel coolers, can be inspected for leaks within 60 minutes of submersion. Once sufficient water depth has been obtained, all submerged valves must be opened, and verified that no bonnets, flanges or valve packings are leaking. All rectifications, including re-docking and re-inspections, will be at the Contractor's expense.
- 11.3.2.6.3** The Contractor must ensure all tanks are filled to the soundings recorded prior to docking. The Contractor must perform the necessary stability calculations for undocking the vessel, taking into account any weight distribution changes as a result of the work of these specifications. The calculations must be forwarded to the TA 24 hours prior to undocking.
- 11.3.2.6.4** Prior to undocking, the Contractor must provide the TA the opportunity to arrange the transfer of fuel from a double bottom tank to the Day Tank and Emergency Generator Tank using the shipboard system.
- 11.3.2.6.5** The Contractor must supply, install and remove upon completion, any necessary fittings and lugs required to carry out the work in this specification. Where lugs and/or fittings are installed and removed, the welds must be ground flush with the hull. Any damaged and/or disturbed paint work must be treated in accordance with the paint manufacturer's requirements and painted according to the vessel's paint scheme, CCGS Limnos M&R Report 2010 (International) and 2019-07-22 – International Ship Hull Coating Report – L014.
- 11.3.2.6.6** The Contractor must supply all labour necessary to handle the ship's lines during the undocking process.
- 11.3.2.6.7** The Contractor must be responsible for supplying the services of tugs to ensure that the vessel is undocked in a safe manner and not damaged during the procedure.
- 11.3.2.7 PROOF OF PERFORMANCE**
- 11.3.2.7.1** The Contractor, in the presence of the TA, must verify that all work on the hull is complete, all docking plugs and hull openings are secure and the vessel is ready to be undocked.
- 11.3.2.7.2** The Contractor must hydrostatically test to 1.5 times the system's working pressure, all sub-assemblies and piping systems that have been added, modified or repaired under this specification. All such systems must be tested and proven tight in the presence and to the satisfaction of the TA.
- 11.3.2.7.3** The Contractor must provide the initial tank soundings and stability calculations prior to the docking of the vessel.
- 11.3.2.7.4** The Contractor must provide the stability calculations and soundings prior to undocking the vessel.

11.3.2.7.5 The Contractor must provide above requirements in accordance with the Inspections, Test and Trials Plan.

11.3.2.7.6 The Contractor must include all work under this specification in the Data Book, with appropriate signatures confirming inspection and quality assurance.

11.4 UNDERWATER HULL AREA (SURVEY ITEM)

11.4.1 Identification

11.4.1.1 The CCG requires a high pressure fresh water cleaning of the entire underwater hull area promptly after drydocking the vessel, followed immediately by a survey of the shell plating. The purpose of the inspection is to identify areas of the underwater water hull seams that require to be grit blasted prior to recoating, as well as areas of coatings that are deficient and in need of recoating. The specification includes work to repair any butt and seam welds identified as deficient during the inspection, pressure testing of skegs, as well as recoating with epoxy identified areas of the hull, followed by new coatings of epoxy, tie-coat and antifouling over the entire underwater portion of the hull.

11.4.1.2 This specification item requires direction, oversight, inspections and reporting by a NACE Level 3 inspector.

11.4.1.3 The total underwater hull area of the vessel is approximately 519 sq. meters.

11.4.1.4 In parallel with work under this specification item, the CCG requires the cleaning and removal of corrosion and debris from the double bottom echosounder, cofferdam and void spaces. This is to permit one Ultrasonic Test (UT) survey to be conducted that is informed by inspections of both interior and exterior surfaces of the underwater hull. This work is covered in section 15.7 of this specification.

11.4.2 References

11.4.2.1 EQUIPMENT DATA

11.4.2.1.1 Refer to the beginning of this Hull & Related Structures Section for Equipment Data.

11.4.2.2 MANUALS

11.4.2.2.1 Refer to the beginning of this Hull & Related Structures Section for Manuals.

11.4.2.3 REPORTS

11.4.2.3.1 Refer to the beginning of this Hull & Related Structures Section for Reports.

11.4.2.4 DRAWINGS

11.4.2.4.1 Refer to the beginning of this Hull & Related Structures Section for Drawings.

11.4.2.5 REGULATIONS AND STANDARDS

11.4.2.5.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

11.4.3 Statement of Work

11.4.3.1 GENERAL

- 11.4.3.1.1** The Contractor must obtain the relevant and most up-to-date paint Technical Data Sheets from the AkzoNobel/International Technical Service Representative (TSR).
- 11.4.3.1.2** Unless otherwise stated, all staging, man-lifts, crantage, screens, heaters, other environmental control equipment, lighting and any other support services, equipment and material necessary to perform the tasks set out in this specification, including inspections by the RO, TA and NACE inspector, must be supplied by the Contractor and removed by the Contractor on completion of the work.
- 11.4.3.1.3** The Contractor must adhere to all coating system requirements for the application of the coatings, as directed by the NACE Inspector and as per CCGS Limnos M&R Report 2010 (International) and Dry Dock Coating Report Limnos 2019 (International).
- 11.4.3.1.4** The Contractor must ensure that all items not being grit blasted or being painted are protected with material that is resistant to and will not be easily displaced by the actions of grit blasting, throughout the execution of this specification item. All equipment protection and associated residues must be completely removed at completion. Where blasting grit and/or paint overspray damages equipment and/or other paint coatings, these defects must be rectified by the Contractor at the Contractor's expense, prior to the completion of the contract.
- 11.4.3.1.5** The Contractor must remove all sea bay and keel cooler grids, as well as keel coolers, prior to the hull survey.
- 11.4.3.1.6** The Contractor must prepare and coat the sea bay and keel cooler grids while disassembled from the vessel and using the same materials and procedures as for the underwater hull area.
- 11.4.3.1.7** The Contractor must store and protect the keel coolers until the hull underwater coatings work has been completed.
- 11.4.3.1.8** The Contractor must prevent ingress of blasting grit and/or overspray to the accommodation area of the vessel. All openings must be sealed. The Contractor must remove all blasting grit, debris and overspray from the vessel's interior, should any occur, at the Contractor's expense.
- 11.4.3.1.9** Throughout the preparation and recoating process, the Contractor must direct water discharge away from the ship's side to ensure that the quality of the finished work is not jeopardized by weather conditions or any other external factors. Therefore, prior to exposing any metal, the Contractor must plug scuppers, overboard discharges, hull openings and any other water/weather mitigation measures, in consultation with the TA. The Contractor must remove all such plugs and other water/weather mitigation measures

after the completion of repainting and at least 72 hours prior to the vessel leaving the drydock.

- 11.4.3.1.10** The Contractor must remove any blasting grit, debris and overspray from the exterior decks and superstructure, at the completion of blasting work.
- 11.4.3.1.11** CCG ships have been painted with lead containing paints in the past and as a result some of the Contractor's processes such as blasting, grinding, welding and burning may release this lead from the coatings. The Contractor must assume the presence of lead when taking appropriate abatement measures and when disposing of all blasting grit and debris, according to applicable Federal, Provincial, and Municipal regulations.
- 11.4.3.1.12** The Contractor must not perform any coatings work until all hot work and repairs in the vessel's identified Double Bottom(DB) void spaces are completed and approved by the RO and TA.
- 11.4.3.1.13** The Contractor must perform paint touch ups for temporary lifting points welded on hull, etc..
- 11.4.3.1.14** The Contractor's personnel engaged in preparing and applying the coatings must be experienced and thoroughly familiar with the required preparation and coating application procedures.
- 11.4.3.1.15** The Contractor must verify that all conditions during the application and curing of the coatings are within the criteria recommended by the manufacturer.
- 11.4.3.1.16** The Contractor must verify all coatings are in suitable condition for application as per the FSR.
- 11.4.3.1.17** The Contractor must apply all coatings within the allotted minimum cure periods as per coatings manufacturer and FSR, in order to allow for the full and proper curing of the coating to the vessel's hull, prior to immersion. Any application that results in an unacceptable coating, according to the NACE Inspector, RO and/or TA must be redone (blasting included) at the Contractor's expense within the allotted dry dock time period and allowing for the manufacturer's recommended cure period for the experienced environmental conditions.
- 11.4.3.1.18** The Contractor must allow the NACE Inspector, RO and/or TA unhindered access to the vessel during working hours to witness any work performed within the specification.
- 11.4.3.1.19** The Contractor must conform to CCG/8009-003 for all marked up drawings, including but not limited to, the shell expansion plan.
- 11.4.3.1.20** The NACE inspector will record all relevant data and findings in a Coatings Preparation and Application Report which will be provided to the TA and the Contractor.
- 11.4.3.2 UNDERWATER HULL CLEANING AND COATINGS INSPECTION**

- 11.4.3.2.1** The Contractor must water blast sweep the entire underwater hull surface of the vessel to the deep water load line within 24 hours of docking the vessel. The water blast pressure must be a minimum of 3000 psi. The Contractor must remove all marine growth, including slime, from the underwater hull surface of the vessel. If necessary, due to density of marine growth in the keel cooler recesses, the Contractor must remove marine growth by hand tooling.
- 11.4.3.2.2** The Contractor must remove the keel cooler and sea bay grids and keel coolers before water blast sweeping the sea bay and keel cooler recesses. The Contractor must include all sides of the removed sea bay grids and keel coolers in the water blast sweep cleaning.
- 11.4.3.2.3** The Contractor must protect all sacrificial hull anodes before water blast sweeping the hull. All anodes must be inspected for wasting and damage. The Contractor must consult with the TA on any anodes deemed to be in need of replacement. Replacement hull anodes are weld-on type Zinc anodes 66947KC and are GSM. Cost of replacement work to be arranged via PWGSC 1379 process.
- 11.4.3.2.4** Prior to inspection of the sweep blasted underwater hull are, the Contractor must remove equipment and other obstructions that would hinder inspection. The underwater hull area must be ready, in its entirety, for inspection within 72 hours of drydocking the vessel.
- 11.4.3.2.5** At a mutually agreed time, but no later than 3 business days after the Vessel is drydocked, the Contractor must arrange for the TA and the NACE inspector to perform an inspection of the underwater area of the hull. The Contractor must visually inspect, with the TA and NACE inspector, the entire underwater area of the hull, up to the design load line draft, to identify where the hull coatings have been damaged, exhibiting corrosion, blistering, peeling or other signs of failure for any reason(s). Based on the inspection, the Contractor must mark up, on a copy of the Shell Expansion Plan, where the coatings need to be removed.
- 11.4.3.3 UNDERWATER HULL CONDITION SURVEY (REGULATORY SURVEY ITEM)**
- 11.4.3.3.1** Prior to commencing hull survey work, the Contractor, TA and RO must review Shell expansion drawing, 2019 UT Survey and CCGS Limnos - HIMP Inspection of Void Spaces & Cofferdams report to determine the areas for inspection. The Contractor must provide any necessary equipment required for the surveyor, TA and RO to perform/witness the required inspections and measurements. The Contractor must provide a certified aerial work platform operator, for a total of 16 hours at an hourly rate, with actual hours to be adjusted up/down via PWGSC 1379 process.
- 11.4.3.3.2** Within 48 hours after the vessel has been dry-docked, the Contractor must conduct a visual inspection, with the TA and RO over the entire underwater area of the hull, up to the design load line draft, to identify where damage or deterioration has occurred to the hull plating, structures and/or welds.

- 11.4.3.3.3** Within 72 hours after the vessel has dry-docked, the Contractor must take ultrasonic readings (UT Shots) to determine plate thicknesses on the underwater hull, up to the design load line draft. The Contractor must provide personnel certified to Level II of CAN/CGSB 48.9712-2000 for the taking of UT Shots. Proof of current certification of the ultrasonic personnel and calibration certificate of equipment used must be provided to the TA prior to the commencement of readings.
- 11.4.3.3.4** The Contractor must refer to UT Thickness survey Reports #1, 2 & 3 – CCGS Limnos to ensure UT shot locations do not coincide with those taken in the previous drydock
- 11.4.3.3.5** The Contractor must conduct no less than four (4) UT Shots in each of the following areas:
- a) From each hull plate. In the previous drydock, hull plate readings were taken at the corners of each panel. In this specification, the Contractor must take readings at the mid-points of each side;
 - b) Of each panel inside each sea chest, each sea bay; and
 - c) Inside each pipe connection for shipside valves.
 - d) No less than one reading per 100 square cm in areas identified in section 15.7 as areas of significant corrosion
- 11.4.3.3.6** The Contractor must provide a per unit cost for UT Shots, including prepping and priming. The Contractor must bid on a total of 240 UT shots for the hull underwater survey. Actual cost of UT Shots will be adjusted up/down via PSGWC form 1379 process.
- 11.4.3.3.7** The Contractor must pay particular attention to plating in way of hull openings and to areas of visible damage and corrosion.
- 11.4.3.3.8** The Contractor must remove the drain plugs from the two (2) skegs and hydrostatically or pneumatically pressure test the skegs. The TA and RO must be given the opportunity to witness this test. Any leaks must be included in the mark-up of the shell expansion plan for repair:
- a) If Hydrostatically tested, the test pressure must be a minimum of 2.4 meter of head (3.4 PSI) for a one-hour period.
 - b) If pneumatically tested, the test pressure must be between 1.5-2.0 PSI for a one-hour period. The Contractor must use a flexible, clear U-tube open water manometer and leak identification by soap/water mixture.
 - c) If pneumatically tested, the manometer must be set up to overflow when pressure exceeds 2.0 PSI, allowing venting of tank pressure. For this purpose the inner diameter of the tube must be 2x the diameter of the air inlet hose. The Contractor must also fit a calibrated gauge (range of 0-10 PSI or less) after the inlet air regulator of air supply.
- 11.4.3.3.9** The Contractor must vacuum test the skeg plugs after installation, in the presence of the TA.

11.4.3.3.10 Based on the inspection, The Contractor must mark up a copy of the shell expansion plan with all identified plating, butt and seam welds requiring repair and provide a copy to the TA. This marked up drawing must be included in the Data Book.

11.4.3.3.11 The Contractor must complete the hull condition survey and present a repair plan to the TA within five (5) working days of dry-docking the vessel.

11.4.3.4 UNDERWATER HULL REPAIRS

11.4.3.4.1 All Contractor welding must conform to CSA Standards W47.1:19 - Annex M and W59-18 and acceptable to the RO.

11.4.3.4.2 The Contractor or Sub-contractors performing the welding fabrication work must be certified by the CWB in accordance with CSA Standards W47.1:19-Annex M, Division 1 or 2 "Certification of Companies for Fusion Welding of Steel" and Qualification of welding personnel and welding procedures for marine applications". Current copies of the following must be supplied to the TA:

- d) company certification validation certificates;
- e) welding procedures specifications (WPS) and data sheets (WPDS) with supporting procedure qualification records (PQRs);
- f) welding supervisor and welder qualification certificates and cards; and,
- g) visual Inspector qualification card.

11.4.3.4.3 The Contractor must arrange all completed welds to be examined by third-party welding inspectors that are certified by the Canadian Welding Bureau (CWB) to CSA W178.2, Level 2 or 3 having code endorsements for CSA Standards W47.1:19 and W59. Current copies of certification must be provided to the TA in advance of performing the inspections and formal inspection reports must be supplied to the TA upon request.

11.4.3.4.4 The Contractor must repair by gouging and re-welding the hull welds identified by the RO as deficient during the inspection. The Contractor must submit in the bid a price per meter cost for preparation and repair of the hull seams and butts welds and must provide a price on a total of five (5) linear meters single bead pass. Pricing to be adjusted up/down by PWGSC 1379 process.

11.4.3.4.5 The Contractor must ensure the following are protected from blasting grit and debris, as well as the underwater hull paint recoating:

11.4.3.4.6 All hull mounted equipment such as anodes, echo sounders and speed log;

11.4.3.4.7 Above-waterline hull coatings;

- a) All scuttles;
- b) All port holes;
- c) All windows; and
- d) All deck machinery.

- 11.4.3.4.8** The Contractor must grit blast any weld seam to be repaired to bare metal to a distance of 80 mm on either side of the weld.
- 11.4.3.4.9** The Contractor must gouge the affected welds to a depth of 6 mm and must re-weld the seam areas with multiple passes finishing the weld off with a cap pass. The TA must be given the opportunity to inspect and approve the completed gouging/grinding work, before welding work has commenced.
- 11.4.3.4.10** The Contractor must supply the welding procedure to the TA and RO for the seam and butt welding at least 24 hours prior to commencement of welding. Reference must be made to CCG Welding Specifications.
- 11.4.3.4.11** The Contractor must ensure the finished weld profile is between 2 mm to 3mm above the adjoining plate, but in no place more than 3 mm above.
- 11.4.3.4.12** The Contractor must ensure all weld repairs to plating and skegs are subjected to Non-Destructive Testing (NDT) by visual means and checked 100% by a certified welding inspector certified to at least level 2, according to CSA W 178.2.
- 11.4.3.4.13** The Contractor must ensure all weld repairs to plating and skegs are inspected by the RO and TA for conformity and acceptance prior to the application of the hull coatings.
- 11.4.3.4.14** The Contractor must gouge out and re-weld all weld repairs that fail the welding inspector's NDT. Repaired welds must be inspected by a third-party CWB certified welding inspector. All additional work as a result of failed NDT, including the cost of the re-inspections, must be at the expense of the Contractor.
- 11.4.3.4.15** Weld procedures for skeg welds must conform to the procedures outlined in this specification for hull plating butt and seam welds. Any such work on skegs will be arranged by PWGSC 1379 process.
- 11.4.3.4.16** If repairs are made to the skegs, the Contractor must hydrostatically or pneumatically pressure test the repaired skegs for a one-hour period. The TA and RO must be given the opportunity to witness this test:
- e) If Hydrostatically tested, the test pressure must be a minimum of 2.4 meter of head (3.4 PSI).
 - f) If pneumatically tested, the test pressure must be between 1.5-2.0 PSI and the Contractor must use a flexible, clear U-tube open water manometer and leak identification by soap/water mixture.
 - g) If pneumatically tested, the manometer must be set up to overflow when pressure exceeds 2.0 PSI, allowing venting of tank pressure. For this purpose the inner diameter of the tube must be 2x the diameter of the air inlet hose. The Contractor must also fit a calibrated gauge (0-10 PSI or less) after the inlet air regulator of air supply.
- 11.4.3.4.17** The Contractor must re-install the skeg drain plugs upon completion of work and testing.

11.4.3.5 UNDERWATER HULL COATING RENEWAL

- 11.4.3.5.1** Upon completion of all repairs and inspections, the Contractor must prepare for the application of the new coating system, as per ISO 8501-1:2007 and the NACE Inspector's "Underwater Hull Coatings Inspection" report.
- 11.4.3.5.2** All repaired weld seams and butts and all deficient areas of the existing coatings must be grit blasted to near-white metal (Sa2-½ / SSPC-SP10), providing a recommended surface profile amplitude of 75 microns (3.0 mils).
- 11.4.3.5.3** The Contractor must protect all sacrificial anodes from damage by shot blasting of the underwater hull.
- 11.4.3.5.4** The Contractor must ensure that all sacrificial anodes are kept free of any coatings throughout the drydock work.
- 11.4.3.5.5** During grit blasting, the Contractor must feather all transitions between the bare metal and painted areas.
- 11.4.3.5.6** All removed sea bay and keel cooler grids must be grit blasted to near-white metal (Sa2-½ / SSPC-SP10), providing a recommended surface profile amplitude of 75 microns (3.0 mils).
- 11.4.3.5.7** The Contractor must ensure that all traces of grit are swept away with compressed air. The Contractor must demonstrate to the TA and NACE Inspector that the surface cleanliness for invisible contaminants, after blasting, is between 10-15 µg/cm² (SSPC-SC2). Any additional high pressure washing required to achieve the SSPC-SC2 will be at the Contractor's expense.
- 11.4.3.5.8** The Contractor must verify all surfaces of underwater hull, including all grids, to be painted, are thoroughly clean, dry and free of grease or oil before painting is commenced.
- 11.4.3.5.9** The Contractor must inform the NACE Inspector and TA and provide a notice of at least 24 hours of any scheduled activities related to the work described within this specification item.
- 11.4.3.5.10** The Contractor must allow the NACE inspector to verify the Contractor's conformity to the manufacturer's required procedures for the application of the coating product.
- 11.4.3.5.11** The Contractor must present the NACE Inspector and TA with a coating schedule. The contractor must update the NACE Inspector and the TA of any changes to this schedule.
- 11.4.3.5.12** Prior to coating application, the Contractor is informed that the NACE inspector will take profile readings at regular intervals of the grit blasted areas, using a cast micro-finish comparator. Measurement intervals will not be less than one per five (5) square meters.
- 11.4.3.5.13** Based on the NACE inspector findings, the Contractor must correct, at the Contractor's expense, any areas where the surface profile readings have been determined to be less than 60 microns (2.5mils) or greater than 90 microns (3.5mils).
- 11.4.3.5.14** The NACE Inspector will inspect all materials immediately prior to their application. The Contractor must not use any materials that are rejected by the NACE inspector.

- 11.4.3.5.15** The Contractor must re-coat the grit-blasted underwater areas of the hull and all grids with Intershield 300 ENA300/A (Bronze), as per the recommendation of the NACE Inspector and after the RO and TA have inspected and approved all repaired areas of the hull. Contractor must bid on 25 square meters of spot application. Pricing to be adjusted up/down by PWGSC 1379 process.
- 11.4.3.5.16** The Contractor must then 100% recoat the underwater portion of the hull (hull plating, all sea bays, sea bay covers, bilge strakes, and all grids) with Intershield 300 ENA301/A (Aluminum). Recoat thickness and interval must follow the coatings manufacturer guidelines and as per the further recommendations of the NACE inspector.
- 11.4.3.5.17** The Contractor must 100% coat the underwater portion of the hull with Intergard 263 FAJ304/A (Light Grey). Recoat thickness and interval must follow the coatings manufacturer guidelines and as per the further recommendations of the NACE inspector.
- 11.4.3.5.18** The Contractor must 100% coat the underwater portion of the hull with two (2) coats of Interspeed 640 BRA642 (Black), with the exception of the starboard-forward sea bay which must remain free of antifouling. Recoat interval must follow the coatings manufacturer guidelines and as per the further recommendations of the NACE inspector.
- 11.4.3.5.19** The Contractor must complete all underwater hull coatings work a minimum of 10 calendar days prior to the undocking of the vessel.
- 11.4.3.5.20** The Contractor must record the environmental conditions each time any hull coatings are applied. This must include:
- a) Location(s) on the hull where the coating is applied;
 - b) Start and stop times of coating application;
 - c) Coating product temperature, after mixing but before application;
 - d) Temperature of the surface to be painted;
 - e) Dry and wet bulb temperatures just prior to coating application;
 - f) Relative humidity of ambient air just prior to coating application; and
 - g) Dew point, just prior to coating application.
- 11.4.3.5.21** The Contractor must allow each coating layer to be inspected by the NACE Inspector and TA. The NACE inspector will measure and record the wet film thickness (WFT) after each application of the coating and Dry Film Thickness (DFT) after drying of each new coating. Gauge readings will be performed regularly throughout the underwater hull area but not less than one reading for every 5 square meters of coated surface area.
- 11.4.3.5.22** If the NACE inspector fails any part or all of the work, for any reason that is due to the Contractor's planning, preparation or execution of work, additional work required to pass the inspection must be at the expense of the Contractor.
- 11.4.3.5.23** The Contractor must provide Health Canada (HC) product approval for underwater hull surface paints controlled by HC and the Pest Management Regulatory Agency.

11.4.4 Inspections

11.4.4.1 The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional work that is required, due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor's expense:

- a) Hold Point #1 - The Contractor has provided a marked up copy of the Shell Expansion Plan and results of skeg pressure test to the RO and TA for approval prior to any hull repair work;
- b) Hold Point #2 - Prior to blasting to remove coating from plating requiring repairs, the Contractor has removed the keel cooler grids, sea bay grids and keel coolers. The Contractor and TA have inspected and approved all protective measures from grit blasting and weather;
- c) Hold Point #3 – The Contractor has arranged for and confirmed that the TA inspected and approved the gouging/grinding, before welding has commenced;
- d) Hold Point #4 - The Contractor has arranged for and confirmed that the RO and TA inspected and approved all repaired areas, prior to blasting for profile;
- e) Hold Point #5 – The Contractor has arranged for and confirmed that the TA and NACE inspector inspected all grit-blasted areas;
- f) Hold Point #6 - The Contractor has provided a coating schedule to the TA and NACE Inspector for approval prior to application of any coatings;
- g) Hold Point #7 - The Contractor has arranged for and confirmed that the NACE Inspector certified the paint product and preparation before application;
- h) Hold Point #8 – The Contractor has arranged for and confirmed that the NACE inspector and TA inspected and approved the preparation of the underwater hull area, prior to first paint application;
- i) Hold Point # 9 - The Contractor has arranged for and confirmed that the NACE Inspector verified and approved each coat after application; and
- j) Hold Point #10 – The Contractor has verified with the NACE inspector and TA that the underwater hull coatings have sufficiently cured to allow the vessel to be submersed.

11.4.5 Testing/Trials

11.4.5.1 The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the following tests are conducted at the appropriate stages, as described in the specification:

- a) Ultrasonic readings of underwater hull plating. Test performed by Contractor, witnessed and approved by RO and TA;
- b) Compressed air test of skegs. Test performed by Contractor, witnessed and approved by RO and TA;
- c) Underwater hull surface cleanliness after grit blasting. Test performed by Contractor, witnessed and approved by NACE Inspector and TA;

- d) Underwater hull profile measurements of all grit blasted area. Test performed and approved by NACE inspector, witnessed by Contractor and TA; and
- e) Underwater hull WFT and DFT measurements of each coating. Test performed and approved by NACE inspector, witnessed by Contractor and TA.

11.4.6 Documentation and Deliverables

11.4.6.1 GENERAL

11.4.6.1.1 The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book at the end of the contract.

11.4.6.1.2 The Contractor must provide all documentation according to the Documentation section of the General Notes.

11.4.6.2 CERTIFICATES

11.4.6.2.1 The Contractor must provide to the TA:

- a) The AkzoNobel/International underwater coating certificates.
- b) survey credit documentation as per the Canada Shipping Act and associated regulations inspection requirements for the work within this section of the specification.

11.4.6.3 REPORTS

11.4.6.3.1 The Contractor must provide to the TA an "Underwater Hull Area Final Report", The report must include the following;

- a) An Underwater Hull Quality Assurance (QA) report indicating that all areas as defined in this specification have been inspected by the Contractor's QA Department and all areas of defects established by this survey have been identified for remedial action;
- b) An Underwater Hull Plating Inspection and Repairs report, providing details of the completed seam and butt welding. This must include the following:
 - i) A detailed report of the ultrasonic readings showing the exact location of each test point marked up copy of drawing 47-H-3 - Shell Expansion Plan. The report must also include a table identifying the test points by strake and plate number, steel thickness found, the corresponding original thickness and percent wastage. The report must include location of any replaced steel plates. The copy must be signed by the TA and RO;
 - ii) Detailed report of the seam and butt welding that was completed. This report must detail the location and length of all failed welds, RO's signed approval for each weld repair and any testing results required in way of each weld repair.

The report shall also include details of any replaced steel resulting from ultrasonic testing;

- iii) RO's signed approval for each section/stage of work;
 - iv) Records of all failed weld inspections, if any; and
 - v) Records of re-inspection and signed approval of additional welding work, if any.
- c) An Underwater Hull Coating Preparation and Application Report, prepared by the NACE Inspector.

11.4.6.4 MEASUREMENTS, CALIBRATIONS AND READINGS

11.4.6.4.1 The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

11.4.6.5 REDLINED DRAWINGS

11.4.6.5.1 The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

11.4.6.6 SPARES [NOT USED]

11.4.6.7 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

11.4.7 Training [Not used]

11.5 TOPSIDES HULL AREA (SURVEY ITEM)

11.5.1 Identification

11.5.1.1 The CCG requires a thorough cleaning of the hull topsides area promptly after dry docking of the vessel as well as a survey of the topsides hull coatings to identify areas that must be grit blasted and have new hull coatings applied that are compatible with the existing coatings. The specification includes new spot-coatings of epoxy in the grit-blasted areas, followed by new tie-coat and acrylic topcoats over the entire hull above the waterline. Work includes painting of hull marks and lettering as well as application of CCG decals.

11.5.1.2 The total topsides hull area of the vessel is approximately 259 square meters.

11.5.2 References

11.5.2.1 EQUIPMENT DATA

11.5.2.1.1 Refer to Section 11.2 for Equipment Data.

11.5.2.2 MANUALS

11.5.2.2.1 Refer to Section 11.2 for Manuals.

11.5.2.3 REPORTS

11.5.2.3.1 R Refer to Section 11.2 for Reports.

11.5.2.4 DRAWINGS

11.5.2.4.1 Refer to Section 11.2 for Drawings.

11.5.2.5 REGULATIONS AND STANDARDS

11.5.2.5.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

11.5.3 Statement of work

11.5.3.1 GENERAL

11.5.3.1.1 The Contractor must obtain the most up-to-date paint Technical Data Sheets from the AkzoNobel/International TSR.

11.5.3.1.2 The Contractor may request the 2022 NETE Steel Condition survey results, which included the starboard side topsides hull plating from frames 22-46 and from the rub rail to top of antifouling paint.

11.5.3.1.3 Unless otherwise stated, all staging, man-lifts, crantage, screens, heaters, other environmental control equipment, lighting and any other support services, equipment and material necessary to perform the tasks set out in this specification, including inspections by the RO, TA and NACE inspector, must be supplied by the Contractor and removed by the Contractor on completion of the work.

11.5.3.1.4 The Contractor must ensure all coatings are based on the CCGS Limnos M&R Report 2010 (International) and Dry Dock Coating Report Limnos 2019 (International). All coating products and tools must be CFM.

11.5.3.1.5 The Contractor must provide a manlift and a certified aerial work platform operator, as well as any other necessary equipment required for the Contractor to perform the work within this specification, as well as for the TA, RO and NACE inspector to attend the required survey, coatings removal, coatings preparation and applications.

11.5.3.1.6 For use of the manlift and operator during coatings removal and renewal, the Contractor must provide a unit price per hour for adjustment purposes and an initial contract price of seventy-two (72) hours of usage. The total usage is to be adjusted up/down via PWGSC 1379 process.

11.5.3.1.7 The Contractor must prevent ingress of blasting grit and/or overspray to the accommodation area of the vessel. All openings must be sealed. Any grit, debris or overspray that enters the vessel's interior must be removed by the Contractor at the Contractor's expense. The Contractor must repair or replace any of the vessel's interior surfaces or items damaged by the presence of such materials and will be at the Contractor's expense.

11.5.3.1.8 The Contractor must ensure the following are protected from blasting grit and debris, as well as the coatings overspray:

- a) All exhaust outlets on top of the stack;
- b) All tank vents;
- c) All air intake and exhaust plenums;
- d) All scupper pipes;
- e) All overboard discharges;
- f) All openings into the vessel where dry abrasive blasting material may gain ingress and cause damage;
- g) Rub rails;
- h) Below-waterline hull coatings;
- i) All scuttles;
- j) All port holes;
- k) All windows;
- l) All deck machinery; and
- m) All exposed navigation equipment such as radars.

11.5.3.1.9 The Contractor must have completed the removal of all blasting grit, debris and overspray from the exterior decks and superstructure, as well as all plugs and protective coverings, at least forty-eight (48) hours prior to the vessel's departure from the drydock.

11.5.3.2 TOPSIDES HULL CLEANING & COATINGS INSPECTION

11.5.3.2.1 The Contractor must verify that personnel engaged in preparing the hull are experienced and thoroughly familiar with the required coatings removal and surface profiling procedures.

11.5.3.2.2 The Contractor must brush blast with 40 grit media the entire topsides hull surface of the vessel to the deep water load line within 24 hours of docking the vessel. The Contractor must remove all marine growth, stencils, fender marks and abraded residues, from the topsides hull surface of the vessel.

11.5.3.2.3 Prior to inspection of the sweep blasted topsides hull area, the Contractor must remove equipment and other obstructions that would hinder inspection. The topsides hull area must be ready, in its entirety, for inspection within 72 hours of drydocking the vessel.

11.5.3.2.4 The Contractor must visually inspect, with the TA and NACE inspector, the entire topsides hull area, to identify where the hull coatings have been damaged, exhibiting corrosion, blistering, peeling or other signs of failure for any reason(s). Based on the inspection, the Contractor must mark up, on a copy of the Shell Expansion Plan, where the coatings need to be removed.

11.5.3.3 TOPSIDES HULL COATING REMOVAL

11.5.3.3.1 The Contractor must punch mark onto the hull any non-embossed lettering or markings, prior to blasting the hull.

- 11.5.3.3.2** Upon completion of all inspections, the Contractor must prepare for the application of the new coating system, as per ISO 8501-1:2007. All deficient areas of the existing coatings must be grit blasted to near-white metal (Sa2-½ / SSPC-SP10), providing a recommended profile amplitude of 75 microns (3.0 mils).
- 11.5.3.3.3** The Contractor must protect the ship's integrated fendering from grit blasting and hull recoating. The Contractor must ensure that no coating is removed from between the fendering and the steel retention system.
- 11.5.3.3.4** If a substantial part of the borders of the white and black diagonal stripes or boot stripes have to be removed in the spot removal, the Contractor must punch mark the borders prior to blasting, for reference when re-painting.
- 11.5.3.3.5** During grit blasting, the Contractor must feather all transitions between the bare metal and previously painted areas.
- 11.5.3.3.6** The Contractor must repair/replace any items damaged by the blasting process, to the satisfaction of the TA and at the expense of the Contractor.
- 11.5.3.3.7** The Contractor must ensure that all traces of grit are swept away with compressed air. The Contractor must demonstrate to the TA and NACE Inspector that the surface cleanliness for invisible contaminants, after blasting, is between 10-15 µg/cm² (SSPC-SC2). Any additional high pressure washing required to achieve the SSPC-SC2 will be at the Contractor's expense.
- 11.5.3.3.8** The Contractor must submit a unit price per square meter and for a total of ten (10) square meters of topsides hull coating to be grit blasted to bare steel. To be adjusted up or down by PWGSC 1379 process.
- 11.5.3.3.9** Reference must be made to the Dry Dock Coating Report Limnos 2019 (International).
- 11.5.3.4 TOPSIDES HULL COATINGS RENEWAL**
- 11.5.3.4.1** The Contractor must arrange for the TA to inspect the hull topsides for cleanliness, masking and water mitigation prior to painting. Any preparatory work that is not approved by the TA must be made to the satisfaction of the TA at the Contractor's expense.
- 11.5.3.4.2** The NACE Inspector will inspect all materials immediately prior to their application. The Contractor must not use any materials that are rejected by the NACE inspector
- 11.5.3.4.3** The Contractor must inform the NACE Inspector and TA and provide a notice of at least 24 hours of any scheduled activities related to the work described within this specification item.
- 11.5.3.4.4** The Contractor must present the NACE Inspector and TA with a coating schedule. The contractor must update the NACE Inspector and the TA of any changes to this schedule.
- 11.5.3.4.5** The Contractor must verify all surfaces to be painted are thoroughly clean, dry and free of grease or oil before painting is commenced.

- 11.5.3.4.6** Prior to coating application, the Contractor is informed that the NACE inspector will take profile readings at regular intervals of the grit blasted areas, using a cast micro-finish comparator. Measurement intervals will not be less than one per five (5) square meters.
- 11.5.3.4.7** Based on the NACE inspector findings, the Contractor must correct, at the Contractor's expense, any areas where the surface profile readings have been determined to be less than 60 microns (2.5mils) or greater than 90 microns (3.5mils).
- 11.5.3.4.8** For all coating applications, the Contractor must follow the coatings manufacturer guidelines (min/max thickness, coating interval, preparation between coats, etc.) and as per the further recommendations of the NACE inspector.
- 11.5.3.4.9** The Contractor must verify with the NACE inspector that all environmental conditions during the application and curing of the coatings are within the coatings manufacturer's recommended ranges.
- 11.5.3.4.10** The Contractor must spot coat the entire grit-blasted topsides areas of the hull with Intershield 300 ENA300/A (Bronze), as per the recommendation of the NACE Inspector and after the RO and TA have inspected and approved all repaired areas of the hull.
- 11.5.3.4.11** The Contractor must then 100% recoat the topsides areas of the hull with Intergard 263 FAJ304/A (Light Grey).
- 11.5.3.4.12** The Contractor must then 100% coat the topsides areas of the hull with Intersheen 579 LAF287 using the colours provided below:
- a) For all red painted topsides, use Flame Red RAL3000;
 - b) For white diagonal hull stripes, use White RAL9003; and
 - c) For the boot stripe, anchor pockets and diagonal stripe borders, use Black RAL9004.
- 11.5.3.4.13** The Contractor must submit a price per square meter cost for preparation and recoating of topsides areas of the hull and must bid on a total of ten (10) square meters for the Intershield Bronze repair coat, two-hundred forty (240) square meters for the Intergard Light Grey, two hundred-twenty (220) square meters for Intersheen Flame Red, twenty (22) square meters for Intersheen White and seventeen (18) square meters for Intersheen Black. Pricing to be adjusted up/down by PWGSC 1379 process.
- 11.5.3.4.14** The Contractor must record the environmental conditions each time any hull coatings are applied. This must include:
- a) Location(s) on the hull where the coating is applied;
 - b) Start and stop times of coating application;
 - c) Coating product temperature, after mixing but before application;
 - d) Temperature of the surface to be painted;
 - e) Dry and wet bulb temperatures just prior to coating application;
 - f) Relative humidity of ambient air just prior to coating application; and

g) Dew point, just prior to coating application.

11.5.3.4.15 The Contractor must allow each coating layer to be inspected by the NACE Inspector and TA. The NACE inspector will measure and record the wet film thickness (WFT) after each application of the coating and Dry Film Thickness (DFT) after drying of each new coating. Gauge readings will be performed regularly throughout the topsides hull area but not less than one reading for every 5 square meters of coated surface area.

11.5.3.4.16 The Contractor must complete all topside coatings within the manufacturer's recommended cure period for topside coatings, given the experienced ambient temperature and humidity variations, or four (4) calendar days prior to the undocking of the vessel, whichever comes first.

11.5.3.4.17 If the NACE inspector fails any part or all of the work, for any reason that is due to the Contractor's planning, preparation or execution of work, additional work required to pass the inspection (including, but not limited to, re-blasting and re-application and removal of water/mitigation measures) must be at the expense of the Contractor.

11.5.3.5 DECALS, MARKS & LETTERING

11.5.3.5.1 The Contractor must bid on the renewal of the Federal Identity Program Canada Word Mark decals. The word mark decals must be applied according to CCG/6016 and in the same location as they are currently. If there is a discrepancy between the standard and the existing decals and their locations, the Contractor must consult with and obtain approval from the TA prior to final application. The Federal Identity Program Canada Word Mark decals will be GSM.

11.5.3.5.2 The Contractor must apply two (2) coats of Intersheen 579 White (RAL 9003) paint to outline and paint all ship's side marks and lettering. The contractor must apply these coatings only when the NACE inspector confirms that the undercoats have sufficiently cured.

11.5.3.5.3 The Contractor must re-coat the following marks and lettering:

- a) Forty (40) draft marks;
- b) Two (2) Plimsoll marks;
- c) The words "LIMNOS" located at the bow, port and starboard; and
- d) The words "LIMNOS OTTAWA" located at the stern.

11.5.4 Inspections

11.5.4.1 The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional work that is required, due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor's expense:

- a) Hold Point #1 - The Contractor has provided a marked up copy of the Shell Expansion Plan and NACE inspector and TA for approval prior to any topsides hull coatings spot removal work;
- b) Hold Point #2 - Prior to blasting to remove coating from coating damaged areas, the Contractor and TA have inspected and approved all protective measures from grit blasting and weather;
- c) Hold Point #3 - The Contractor has provided a coating schedule to the TA and NACE Inspector for approval prior to application of any topside coatings;
- d) Hold Point #4 - The Contractor has arranged for and confirmed that the NACE Inspector certified the paint product and preparation before application;
- e) Hold Point #5 – The Contractor has arranged for and confirmed that the NACE inspector and TA inspected and approved the preparation of the topsides hull area, prior to first paint application; and
- f) Hold Point # 6 - The Contractor has arranged for and confirmed that the NACE Inspector verified and approved each coat after application; and
- g) Hold Point #7 – The Contractor has verified with the NACE inspector and TA that the hull coatings have sufficiently cured to allow the vessel to be removed from drydock.

11.5.5 Testing & Trials

11.5.5.1 The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the following tests are conducted at the appropriate stages, as described in the specification:

- a) Topsides hull surface cleanliness after grit blasting (test performed by Contractor, witnessed and approved by NACE Inspector and TA);
- b) Topsides hull profile measurements of all grit blasted areas (test performed and approved by NACE inspector, witnessed by Contractor and TA); and
- c) Topsides hull WFT and DFT measurements of each coating (test performed and approved by NACE inspector, witnessed by Contractor and TA).

11.5.6 Documentation and Deliverables

11.5.6.1 GENERAL

11.5.6.1.1 The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book at the end of the contract.

11.5.6.1.2 The Contractor must provide all documentation according to the Documentation section G1.15 of the General Notes.

11.5.6.2 CERTIFICATES

11.5.6.2.1 The Contractor must provide survey credit documentation as per the Canada Shipping Act and associated regulations inspection requirements for the work within this section of the specification.

11.5.6.3 REPORTS

11.5.6.3.1 The Contractor must provide to the TA a Topsides Hull Area Final Report, within 24 hours of the completion of the final coating. The report must include the following;

- a) A Topsides Hull Quality Assurance (QA) report indicating that all areas as defined in this specification have been inspected by the Contractor's QA Department and all areas of coatings defects established by this survey have been identified for remedial action; and
- b) A Topsides Coating Preparation and Application Report, prepared by the NACE Inspector.

11.5.6.4 MEASUREMENTS, CALIBRATIONS AND READINGS

11.5.6.4.1 The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

11.5.6.5 REDLINED DRAWINGS

11.5.6.5.1 The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

11.5.6.6 SPARES [NOT USED]

11.5.6.7 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

11.5.7 Training [Not used]

11.6 SHIP-SIDE VALVES (SURVEY ITEM)

11.6.1 Identification

11.6.1.1 The CCG requires that all suction, overboard discharge and storm valves on the Limnos' hull be opened up, dismantled, cleaned, inspected, reassembled and pressure tested. All ship-side valve installations will have to be confirmed as watertight subsequent to submersion.

11.6.2 References

11.6.2.1 EQUIPMENT DATA

11.6.3 The following equipment data is provided for guidance.

Valve #	Description	Type & Size	Location
1	Grey water discharge valve	SDNR, 2"	Sewage space, port side. forward

2	In hull lab water supply valve	SLGV, 3"	Sewage space, starboard side, aft
3	Sub fire pump suction valve	SLGV, 4"	Sewage space, port side, aft
4	Sub fire pump discharge valve	SDNR, 4"	Sewage space, port side, aft
5	Storm valve, lab deck drain valve	NR, 6"	Engr's shower, port side
6	Storm valve, lab deck drain valve	NR, 6"	OIC's shower, port side
7	Lab sink drain valve	NR, 3"	Engr's cabin, utility locker
8	A/C condenser drain valve	NR, 3"	Dry stores, port side
9	Low sea suction valve	SLGV, 6"	Engine room, port side, fwd., below deck
10	High sea suction valve	SLGV, 6" angle	Engine room, port side fwd., at deck level
11	Low sea suction valve	SLGV, 6"	Engine room, starboard side, fwd., below deck
12	Sea-bay air vent valve	Gate, 2"	Engine room, port side , fwd., on sea-bay
13	Sea-bay air vent valve	Gate, 2"	Engine room, port side, fwd., deck level
14	Sea-bay air vent valve	Gate, 2"	Engine room, starboard side, fwd., on sea-bay
15	G/S pump overboard discharge valve	SDNR, 4"	Engine room, port side, fwd.
16	Bilge pump overboard discharge valve	SDNR, 3"	Engine room, port side, fwd. of bilge pump
17	Weed clearing air valve	GLOBE ¾"	Engine room, port side, high suction, sea chest
18	Weed clearing air valve	GLOBE ¾"	Engine room, port side, low suction, sea chest
19	Weed clearing air valve	GLOBE ¾"	Engine room, starboard side, low suction, sea chest
20	Suction valve	GLOBE 2"	Engine room, starboard side low suction, sea chest
21	O/b discharge valve	GLOBE 1½"	Port propulsion room
22	O/b discharge valve	GLOBE 1½"	Port propulsion room

11.6.3.1 MANUALS

11.6.3.1.1 Refer to Section 11.2 for Manuals.

11.6.3.2 REPORTS

11.6.3.2.1 Refer to Section 11.2 for Reports.

11.6.3.3 DRAWINGS

11.6.3.3.1 Refer to Section 11.2 for Drawings.

11.6.3.4 REGULATIONS AND STANDARDS

11.6.3.4.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

11.6.4 Statement of Work

11.6.4.1 The Contractor must remove any interference items necessary to access the valves noted in this specification item. These include but are not limited to grids, floor plating, sections of piping, insulation, and operating gear. Upon completion of work, all removed interference items must be returned to "as found" condition.

11.6.4.2 Where ship-side valves are removed and hull blasting is underway the Contractor must blank all openings and pipework to ensure that no blasting media or coating system overspray enters the system from which the ship-side valves have been removed. The Contractor must ensure that no blasting media or overspray enters the ship. All blanking plates and plugs used must be labelled with a unique serial number and their position logged to ensure they are accounted as "removed" prior to vessel undocking.

11.6.4.3 The Contractor must locate, identify and tag all referenced valves and valve components to ensure proper reassembly.

11.6.4.4 The Contractor must remove, disassemble and clean all referenced valves and valve components.

11.6.4.5 The Contractor must clean thoroughly the internals of the valve bodies and sealing surfaces, and must lay all components out for inspection. The Contractor must allow the TA and the RO the opportunity to examine all valves in their disassembled state.

11.6.4.6 The Contractor must lap the metal to metal seated valves to provide a watertight seal.

11.6.4.7 The Contractor must machine valve discs, valve seats, and valve stems where required.

11.6.4.8 The Contractor must grind in, with the use of TA approved lapping compound, valve discs and seats.

11.6.4.9 After inspection, the Contractor must close the valves using new packing on the valve packing gland and between the valve bonnet and the valve body.

11.6.4.10 The Contractor must clean and check for wastage all valve stems. Any deficiencies must be noted and corrected

- 11.6.4.11** The Contractor must check all studs for wastage. Any deficiencies must be noted and corrected.
- 11.6.4.12** The Contractor must coat all moving parts and fasteners with CFM anti-seizing compound.
- 11.6.4.13** Where the whole valve assembly is removed from the piping and flanges are broken to access valves, the Contractor must renew all flange face gaskets (CFM).
- 11.6.4.14** The Contractor must provide an hourly rate for machining. The Contractor must bid on 60 hours of machining, to be adjusted up/down by PWGSC 1379 process.
- 11.6.4.15** The Contractor must re-assemble all valves with new CFM gaskets and packing and all valves must be re-installed in original locations. The Contractor must demonstrate to the TA that all valves are operating as designed prior to connecting the valves to the systems they serve and again after the valves are connected to the systems piping.
- 11.6.4.16** The Contractor must demonstrate to the TA and Chief Engineer that all ship-side valves are fully closed, prior to removal from drydock.
- 11.6.4.17** The Contractor must inspect, with the TA and RO, all ship-side valves to confirm that the ship-side valves and hull plate mating areas are watertight once sufficiently submerged, and before the vessel is released from the drydock. All rectifications, repairs, re-docking and re-inspections will be at the Contractor's expense.

11.6.5 Inspections

- 11.6.5.1** The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional work that is required, due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor's expense:
 - a) Hold Point #1 - The Contractor has demonstrated to the TA that all valves are correctly tagged, prior to and after removal;
 - b) Hold Point #2 - The Contractor has disassembled, cleaned and laid out all valves, has inspected them with the TA and RO and approved all valve maintenance and repairs to be performed;
 - c) Hold Point #3 – The Contractor has performed maintenance and repairs, laid out all disassembled valves and demonstrated to the TA's and RO's satisfaction that all required maintenance and repairs to components have been performed;
 - d) Hold Point #4 - The Contractor has laid out all assembled valves and demonstrated to the TA that all operate as designed;
 - e) Hold Point #5 – The Contractor has fitted all valves to the hull (but not yet to their systems' piping) and has demonstrated to the TA and RO that all operate as designed; and
 - f) Hold Point #6 – The Contractor has demonstrated to the TA that all valves are connected to their system's piping, operate as designed and are all shut.

11.6.6 Testing & Trials

11.6.6.1 The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the following tests are conducted at the appropriate stages, as described in the specification:

- a) All re-assembled and re-installed ship-side valves operate as designed (tests performed by Contractor, witnessed and approved by TA and RO); and
- b) All re-assembled ship-side valves are watertight subsequent to submersion (tests performed by Contractor, witnessed and approved by TA and RO).

11.6.7 Documentation and Deliverables

11.6.7.1 CERTIFICATES

11.6.7.1.1 The Contractor must provide survey credit documentation as per the Canada Shipping Act and associated regulations inspection requirements for the work within this section of the specification.

11.6.7.2 REPORTS

11.6.7.2.1 The Contractor must provide a “Ship-side Valves” report of the findings, work and final condition all of valves covered in this section of the specification.

11.6.7.2.2 The above Report will be reviewed by the TA. Based on the review, edits or additions may be required by the TA. The Contractor must perform any such edits or additions, to become the final version.

11.6.7.2.3 The Contractor must include the final versions of all above documentation in the Data Book at the end of the contract.

11.6.7.3 GENERAL

11.6.7.3.1 The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book at the end of the contract.

11.6.7.3.2 The Contractor must provide all documentation according to the Documentation section of the General Notes.

11.6.7.4 MEASUREMENTS, CALIBRATIONS AND READINGS

11.6.7.4.1 The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

11.6.7.5 REDLINED DRAWINGS

11.6.7.5.1 The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

11.6.7.6 SPARES [NOT USED]

11.6.7.7 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

11.6.8 Training [Not used]

11.7 SEA BAYS (SURVEY ITEM)

11.7.1 Identification

11.7.1.1 The CCG requires the sea chest grids to be removed, the sea bays cleaned and the renewal of all threaded studs used to attach the sea bay grids. The sea bay grids' removal will have to coincide with the blasting and coatings process to ensure they are fully prepared and recoated prior to their re-installation to the fully recoated and inspected sea bays. All sea bays and associated fittings will have to be confirmed as watertight subsequent to submersion.

11.7.1.2 References

11.7.1.3 EQUIPMENT DATA

11.7.2 The following equipment data is provided for guidance.

Name	Location
High Sea Inlet	Port Side, Frames 15-16
Low Sea Inlet, Port	Port side, Frames 16-17
Low Sea Inlet, Starboard	Starboard side, Frames 16-17
In hull pump inlet	Starboard side, Frames 60-61 (Grid but no sea chest)
Submersible Pump	Starboard side, Frames 61-64 (Sewage Compartment)

11.7.2.1 MANUALS

11.7.2.1.1 Refer to Section 11.2 for Manuals.

11.7.2.2 DRAWINGS

11.7.2.2.1 Refer to Section 11.2 for Drawings.

11.7.2.3 REPORTS

11.7.2.3.1 Refer to Section 11.2 for Reports.

11.7.2.4 REGULATIONS AND STANDARDS

11.7.2.4.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

11.7.3 Statement of Work

11.7.3.1 The Contractor must remove all five (5) sea chest grids prior to the underwater blast cleaning.

11.7.3.2 The Contractor must thoroughly clean all sea bays of all marine growth, dirt and debris. All dirt and debris must be removed from the vessel and disposed of ashore in accordance with Federal, Provincial and Municipal regulations in effect.

11.7.3.3 The Contractor must provide a rate per litre of removal and disposal of debris and bid on the removal and disposal of 250 litres of solid debris from the sea bays. Final pricing to be adjusted up/down according to actual debris removed, via PSGWC form 1379 process.

11.7.3.4 The Contractor must inspect the threaded mounting tabs, used for mounting the sea bay grids, for corrosion and damage.

11.7.3.5 The Contractor must identify all defects and propose repairs to sea bays and sea bay grids, including the supply and replacement of hardware, to the TA for approval prior to commencing work. All repairs must be by PSGWC form 1379 process, after consultation with the Chief Engineer and TA.

11.7.3.6 The Contractor must blast and renew the paint on all sea bay grids to hull paint standards. Reference must be made to CCGS Limnos M&R Report 2010 (International) and Dry Dock Coating Report Limnos 2019 (International).

11.7.3.7 The Contractor must reinstall the sea bay grids with new CFM bolts, after the underwater hull recoating work is completed. Bolt specification must match existing fasteners. There are four (4) bolts per grid, twenty (20) in total.

11.7.3.8 The Contractor must arrange for a final inspection of sea bays by the TA and RO, prior to the installation of sea bay bilge access covers..

11.7.3.9 The Contractor must re-install sea bay bilge access covers after final inspection. The Contractor must supply and fit new 1/8" thick fiber reinforced neoprene rubber gaskets to the sea bay access covers.

11.7.3.10 The Contractor must inspect, with the TA and RO, all sea bays, access plates and connected valves to confirm that all are watertight. This work must be performed once sea-bays are sufficiently submerged and before the vessel is released from the drydock. All rectifications, repairs, re-docking and re-inspections will be at the Contractor's expense.

11.7.4 Inspections

11.7.4.1 The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional work that is required, due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor's expense:

- a) Hold Point #1 – The Contractor has demonstrated to the TA's satisfaction that all sea bays have been cleaned;

- b) Hold Point #2 – The Contractor has consulted with the TA after inspection of all sea bay grid mounting tabs and agreed with the TA on repairs and replacements to be undertaken , if any;
- c) Hold Point #3 – The Contractor has demonstrated to the TA's and NACE inspector' satisfaction that all sea bay grids have been recoated;
- d) Hold Point #4 – The Contractor has demonstrated to the TA's satisfaction that all sea bays have been reinstalled with new fasteners; and
- e) Hold Point #5 – The Contractor has demonstrated to the TA and RO's satisfaction that all sea bays work has been completed, prior to installation of bilge access covers.

11.7.5 Testing & Trials

11.7.5.1 The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the following tests are conducted at the appropriate stages, as described in the specification:

- a) Sea bay grids surface cleanliness after grit blasting (test performed by Contractor, witnessed and approved by NACE Inspector and TA);
- b) Sea bay grids profile measurements of grit blasted areas (test performed and approved by NACE inspector, witnessed by Contractor and TA);
- c) Sea bay grids WFT and DFT measurements of each coating (test performed and approved by NACE inspector, witnessed by Contractor and TA); and
- d) All re-assembled sea bays are watertight subsequent to submersion (tests performed by Contractor, witnessed and approved by TA and RO).

11.7.6 Documentation and Deliverables

11.7.6.1 GENERAL

11.7.6.1.1 The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book at the end of the contract.

11.7.6.1.2 The Contractor must provide all documentation according to the Documentation section of the General Notes.

11.7.6.2 CERTIFICATES

11.7.6.2.1 The Contractor must provide to the TA:

- a) Waste disposal certificates; and
- b) Survey credit documentation as per the Canada Shipping Act and associated regulations inspection requirements for the work in this Section.

11.7.6.3 REPORTS

11.7.6.3.1 The Contractor must provide a “Sea Bays” report of the findings, work completed and final condition of the work performed under this specification.

11.7.6.4 MEASUREMENTS, CALIBRATIONS AND READINGS

11.7.6.4.1 The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

11.7.6.5 REDLINED DRAWINGS

11.7.6.5.1 The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

11.7.6.6 SPARES [NOT USED]

11.7.6.7 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

11.7.7 Training [Not used]

11.8 KEEL COOLERS (SURVEY ITEM)

11.8.1 Identification

11.8.1.1 The CCG requires the removal, inspection, cleaning and re-installation of the Fenstrum keel coolers for the main propulsion engines and ship service generators. All keel cooler installations will have to be confirmed as watertight subsequent to submersion.

11.8.2 Equipment Data

11.8.2.1 The following equipment data is provided for guidance.

Name	Keel Cooler Model	Location
Port M/E Keel Cooler #1	BN1645B-E1	Port side outboard well, aft position, Frames 8-14,
Port M/E Keel Cooler #2	CN1245C-E1	Port side outboard well, fwd position, Frames 8-14
Starboard M/E Keel Cooler #1	BN1645B-E1	Starboard side outboard well, aft position, Frames 8-14
Starboard M/E Keel Cooler #2	CN1245C-E1	Starboard side outboard well, fwd position, Frames 8-14
Port SSG Keel Cooler #1	D1651W-E1S1	Port side inboard well, aft position, Frames 8-14
Port SSG Keel Cooler #2	D1657W-E1S1	Port side inboard well, fwd position, Frames 8-14
Starboard SSG Keel Cooler #1	D1651W-E1S1	Starboard side inboard well, aft position, Frames 8-14
Starboard SSG Keel Cooler #2	D1657W-E1S1	Starboard side inboard well, fwd position, Frames 8-14

11.8.3 Manuals

11.8.3.1 Refer to Section 11.2 for Manuals.

11.8.4 Reports

11.8.4.1 Refer to Section 11.2 for Reports.

11.8.5 Drawings

11.8.5.1 Refer to Section 11.2 for Drawings.

11.8.6 Regulations and Standards

11.8.6.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

11.8.7 Statement of Work

11.8.7.1 The Contractor must remove the four (4) keel cooler grids. The eight (8) keel coolers must then be removed and cleaned of marine growth by pressure washing at 2500-3000 PSI and hand tooling. See the General Provisions of the "Underwater Hull Area" section of this specification for more details of keel cooler removal.

11.8.7.2 The Contractor must chemically clean the interior surfaces of the keel coolers as follows;

- a) Perform for each keel cooler an initial flush of clean water with drains open to clear debris. Close drains;
- b) Each keel cooler to be connected to a flushing system comprising a circulating loop mimicking the in-service circulation;
- c) When fitted to the flushing system, the keel cooler must be filled with a mixture of clean water and Caterpillar Fast Acting Cooling System Cleaner in a 15:1 mix ratio and circulated for at least 30 minutes at between 82°C to 95°C;
- d) Perform a post flush cleaning of each keel cooler with clean water until water runs clear;
- e) Perform a pressure test of each keel cooler at 0.1 bar (1.5 lbs.) for a one-hour period.

11.8.7.3 The Contractor must identify all defects and propose repairs to the Chief Engineer and TA for approval prior to commencing work. All repairs will be arranged via PWGSC 1379 process.

11.8.7.4 To ensure optimum heat exchange, the keel cooler surfacers must not be subjected to any protective coatings. The Contractor must protect and/or locate the keel coolers to prevent any coatings work overspray adhering to the coolers. Any coatings overspray found on the keel coolers must be removed prior to installation at the Contractor's expense.

11.8.7.5 The Contractor must reinstall the keel coolers with new CFM gaskets, galvanic isolation and fasteners, as per manufacturer's instructions (Fenstrum Gridcooler - Installation &

Maintenance - Form 170) after the keel cooler recesses have received all their new coatings and been inspected and approved by the NACE inspector and TA.

- 11.8.7.6** The Contractor must pressure test all keel coolers after installation is completed in the presence of the RO and TA. Pressure must be between 1.7-2.4 Bar or as required by the RO.
- 11.8.7.7** Each keel cooler grid is fastened onto the hull with twelve (12) threaded studs. The Contractor must replace all of these threaded studs with CFM threaded rod of the same material, thread type and length as the existing studs.
- 11.8.7.8** The Contractor must replace all nuts used to fix the keel cooler grids with new CFM nuts with nylon self-locking inserts.
- 11.8.7.9** The Contractor must inspect, with the TA and RO, all keel cooler connections and hull plate mating areas to confirm watertightness. This work must be performed once keel coolers are sufficiently submerged and before the vessel is released from the drydock. All rectifications, repairs, re-docking and re-inspections will be at the Contractor's expense.

11.8.8 Inspections

- 11.8.8.1** The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional work that is required, due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor's expense:
 - a) Hold Point #1 – The Contractor has demonstrated to the TA's satisfaction that all keel coolers have been cleaned and all marine growth removed;
 - b) Hold Point #2 – The Contractor has demonstrated to the TA's satisfaction that all keel coolers have passed their pressure test and, any cooler(s) that failed a pressure test has been subsequently repaired and passed a subsequent pressure test;
 - c) Hold Point #3 – The Contractor has demonstrated to the TA that all keel coolers are free of coatings and have been re-installed as per manufacturer's instructions;
 - d) Hold Point #4 – The Contractor has demonstrated to the TA's satisfaction that all keel cooler grids have been re-installed with new fasteners on new threaded studs.

11.8.9 Testing & Trials

- 11.8.9.1** The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the following tests are conducted at the appropriate stages, as described in the specification:
 - a) Pressure test of each keel cooler (tests performed by Contractor or designated Sub-contractor, witnessed by TA)
 - b) All keel coolers and through-hulls are watertight subsequent to submersion (tests performed by Contractor, witnessed and approved by TA and RO)

11.8.10 Documentation and Deliverables

11.8.10.1 GENERAL

11.8.10.1.1 The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book at the end of the contract.

11.8.10.1.2 The Contractor must provide all documentation according to the Documentation section of the General Notes.

11.8.10.2 CERTIFICATES

11.8.10.2.1 The Contractor must provide to the TA:

- c) The keel cooler pressure test results; and
- d) Survey credit documentation as per Canada Shipping Act and associated regulations inspection requirements for the work of this section.

11.8.10.3 REPORTS

11.8.10.3.1 The Contractor must provide a “Keel Coolers” report of the findings, work completed and final condition of the work performed under this specification.

11.8.10.4 MEASUREMENTS, CALIBRATIONS AND READINGS

11.8.10.4.1 The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

11.8.10.5 REDLINED DRAWINGS

11.8.10.5.1 The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

11.8.10.6 SPARES [NOT USED]

11.8.10.7 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

11.8.11 Training [Not used]

12 PROPULSION AND MANEUVERING

12.1 STARBOARD AZIPOD

12.1.1 Identification

12.1.1.1 The CCG requires the regulatory maintenance on the starboard side azipod to be completed. This includes the 8-year regulatory overhaul of the starboard Thrustmaster thru-hull azimuthal thruster, as well as a replacement of the GSM Rexroth hydraulic Power Unit (HPU).

12.1.2 References

12.1.2.1 EQUIPMENT DATA

12.1.2.1.1 The following equipment data is provided for guidance.

Equipment	Manufacture/Equipment Details
Azimuthal Thruster	Thrustmaster Model TH-400N
Azimuthal Thruster Hydraulic Power Unit	Rexroth Variable Pump A4CSG

12.1.2.2 MANUALS

12.1.2.2.1 The following equipment manuals are provided as Guidance Documents.

Manual Title	Electronic File Name
Thrustmaster - Operator's Manual Thru-Hull Azimuthal Thruster Model TH-400N	Thrustmaster - OPS Manual.pdf
Rexroth - Variable Pump A4CSG...EPG/30 Repair Instructions	Rexroth – Bosch – Pump Manual 9-14-10.pdf
Thrustmaster Work Instruction No. FS-W-495: TH400N – TH1000N Scheduled Maintenance (2016-04-03)	FS-W-495 TH400N-TH1000N Scheduled Maintenance.pdf
Thrustmaster Work Instruction No. PA-W-311 Rev L: Standard Coating Systems (08-22-2018)	PA-W-311 Standard 2-coat 3-coat coating systems.pdf

12.1.2.3 REPORTS

12.1.2.3.1 The following reports are provided as Guidance Documents.

Report Title	Electronic File Name
CCGS Limnos Bid 2022-192TM (2022-12-06)	CCGS Limnos- Thrustmaster-8y survey list dec 6 2022.pdf

12.1.2.4 DRAWINGS

12.1.2.4.1 The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File Name
B113100	AY, ROTATING GROUP	B113100_REV_00.pdf
B113101	AY, LODH	B113101_REV_00.pdf
B113103	AY, SWIVEL	B113103_REV_00.PDF
B113104	AY,UODH	B113103_REV_00.PDF
B113105	AY UODH, STEM, LODH	B113105_REV_00.pdf
E113249	AY, TH-400N	E113249_REV_00.pdf

12.2 STARBOARD AZIMUTHAL THRUSTER (SURVEY ITEM)

12.2.1 Identification

12.2.1.1 The CCG requires the 8-year regulatory overhaul of the starboard Thrustmaster thru-hull azimuthal thruster. A Thrustmaster Field Service Representative (FSR) will oversee the azimuthal thruster overhaul work. A NACE inspector will oversee the preparation and recoating work on the lower outdrive housing.

12.2.1.2 THRUSTMASTER FIELD SERVICE REPRESENTATIVE (FSR)

12.2.1.2.1 The Contractor must obtain the services of a Thrustmaster FSR Canadian Representative to complete the work outlined in this section of the specification:

Pierre Boisclair, President

M.I.E. Solutions & Equipment Inc.

170 Rosaire-Levesque, Entrelacs, QC, Canada J0T 2E0

Email: pboisclair@mie-solutions.ca

Tel: 514-821-1716

Cell: 514-821-1716

<http://mie-solutions.ca>

12.2.1.2.2 The Manufacturer's contact information is provided below for reference:

Thrustmaster of Texas Inc.

6900 Thrustmaster Drive, Houston, TX 77041, USA

Tel: 713-937-6295

www.thrustmastertexas.net

12.2.1.3 CCG CONTRACTED NACE INSPECTOR

12.2.1.3.1 To be confirmed

12.2.2 References

12.2.2.1 Relevant equipment data, drawings and reports/manuals are referenced at the beginning of this Propulsion and Maneuvering specification.

12.2.2.2 REGULATIONS AND STANDARDS

12.2.2.2.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

12.2.3 Statement of Work

12.2.3.1 The Contractor must perform the eight-year maintenance/survey as per OEM recommendation of the starboard azimuth thruster under the supervision of the Thrustmaster FSR. The Contractor must include an allowance of \$10,000 to cover the cost of services to be provided by Thrustmaster. Reasonable cost of travel, living expenses must be billed at cost without added overhead or profit. The allowance must form part of the overall bid and must be adjusted up or down by means of PWGSC 1379 process upon receipt of the final FSR invoice supported by copies of all related documentation and invoices to verify actual expenses.

12.2.3.2 The Contractor must provide unlimited access to the RO and TA on any and all starboard azimuth thruster work under this specification.

12.2.3.3 The Contractor must supply crane services, rigging equipment, floating platforms, staging, utilities, and personnel to remove and replace the starboard azimuth thruster.

12.2.3.4 Pad eyes are fitted to the vessel's hull to permit the safe and controlled lowering, lifting and adjusting for fit/alignment of the thruster components. The Contractor must test and certify all pad eyes and lugs to be used, prior to use.

12.2.3.5 The Contractor must certify all lifting appliances, and associated rigging for use under regional OHS Acts.

12.2.3.6 The strongback tool to remove propeller from taper will be CCG supplied.

12.2.3.7 All parts recommended by Thrustmaster to be replaced under the 8-year maintenance/survey, as well as those listed to be replaced in this specification that are found to be needing replacement, will be GSM. A list of these spares are provided in "CCGS Limnos Bid 2022-192TM (2022-12-06)".

12.2.3.8 The Contractor must, immediately subsequent to inspection of the disassembled thruster components, compare required new parts against the GSM supplied spares. The Contractor must identify any required spare parts that are missing from the spares inventory and must provide a list of additional spares required to the TA within 24 hours of thruster disassembly. The Contractor, with permission of the TA, must order any additional spares, which will be managed through PWGSC 1379 process.

12.2.3.9 The Contractor must perform the maintenance as follows, as per the OEM manual and under the supervision of the FSR:

- a) Remove thruster from vessel following the manufacturer's applicable removal procedure to remove thruster from the vessel;
- b) Complete 8-year overhaul consisting of;
 - i) Complete tear-down of thruster;
 - ii) Clean and inspect rotating group, replace bearings and seals;
 - iii) Clean, inspect and re-condition propeller and perform NDT;
 - iv) Replace all bearings;
 - v) Replace elastomers;
 - vi) Replace all internal and external hydraulic hoses with new hoses;
 - vii) Replace outdrive stem bolts;
 - viii) Sandblast and paint lower outdrive housing. See "Lower Outdrive Housing Recoating" section, below;
 - ix) Clean and inspect swivels, replace bearings, seals; and
 - x) Assemble thruster and perform testing.
- c) Drain, flush, renew fluids – HPU hydraulic system;
 - i) Completely drain 600 liters of Mobil DTE 25 oil from the system;
 - ii) Open, clean and inspect the Starboard hydraulic tank;
 - iii) Perform hydrostatic flush of the system as per the Thrustmaster Model TH-400N Operators Manual section 5 ; and
 - iv) Renew fluids, as per the Thrustmaster Model TH-400N Operators Manual section 5.
- d) Reinstall thruster to vessel, following manufacturer's applicable installation procedure to install thruster onto vessel; and
- e) Follow re-commissioning and sea trials by performing testing in accordance with Harbor Commissioning and Sea Trial protocols.

12.2.3.10 The starboard azimuthal thruster acquired a slight hydraulic leak in the hull/pod seal in mid-2022. The Contractor must determine the source of the leak and conduct repairs as part of this specification. Additional work related to this specification item will be by PWGSC 1379 process.

12.2.3.11 All fluids and other known consumables must be new CFM and must be included in the bid price.

12.2.3.12 Any unanticipated consumables or other work arising will be managed under PWGSC 1379 process.

12.2.3.13 All hydraulic hoses with special angled ferrules will be GSM. All other hoses must be CFM. All hydraulic hoses must be flushed as per the Thrustmaster Model TH-400N Operators Manual section 5, prior to installation.

12.2.3.14 The Contractor must keep the hydraulic system clean and free of debris by:

- a) Maintaining a clean work area at all times and eliminating sources of dust and other contamination;
- b) keeping seals and caps on hoses and hydraulic fittings in place until just before use;
- c) Using only new hydraulic fluid from a sealed container;
- d) Employing a 3 micron filter when filling the hydraulic reservoir with hydraulic fluid; and
- e) Performing sampling and analysis of the hydraulic fluid, post filling, according to ISO standard 4406.

12.2.3.15 LOWER OUTDRIVE HOUSING RECOATING

12.2.3.15.1 The Contractor must shot blast, prepare and recoat the starboard Lower Outdrive Housing as per Thrustmaster Work Instruction – Standard Coating Systems - No. PA-W-311 Rev L.

12.2.3.15.2 The Contractor must consult with the NACE inspector and Thrustmaster FSR to determine the preferred coating process to be used in this specification. The coatings products must be CFM and the Contractor must ensure that coatings products are ordered and delivered prior to commencement of this work.

12.2.3.15.3 The Contractor must schedule the NACE inspector to supervise all coatings-related work performed within this section.

12.2.4 Inspections

12.2.4.1 The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional work that is required, due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor's expense:

- a) Hold Point #1 – The Contractor has demonstrated to the TA's satisfaction that all pad-eyes and lifting appliances have been tested and approved for use.
- b) Hold Point #2 – The Contractor has determined to the TA's satisfaction the source(s) and cause(s) of the leak in the starboard azimuthal thruster and has agreed with the TA on rectification work outside of the regular 8-year overhaul scope of work, if any;
- c) Hold Point #3 – The Contractor has laid out all thruster components, subsequent to tear-down and before cleaning and repairs, for inspection by the TA, FSR and RO;
- d) Hold Point #4 – The Contractor has inspected the rotating group and propeller, performed NDT and has agreed with TA and RO on any work or replacements to be performed;
- e) Hold Point #5 - The Contractor has compared GSM spares against required spares and obtained permission from the TA to order additional spares, if any;
- f) Hold Point #6 - The Contractor has provided a coating schedule to the TA and NACE Inspector for approval prior to application of any Lower Outdrive Housing coatings;

- g) Hold Point #7 - The Contractor has arranged for and confirmed that the NACE Inspector certified the Lower Outdrive Housing paint product and preparation before application;
- h) Hold Point #8 – The Contractor has arranged for and confirmed that the NACE inspector and TA inspected and approved the preparation of the Lower Outdrive Housing surfaces, prior to first paint application;
- i) Hold Point #9 - The Contractor has arranged for and confirmed that the NACE inspector and TA verified and approved each coat after application;
- j) Hold Point #10 – The contractor has demonstrated to the TA and FSR that the re-assembled thruster has been tested and conforms to the manufacturer’s specifications;
- k) Hold Point #11 – The Contractor has demonstrated to the TA and FSR that the reinstalled thruster has been tested according to the manufacturer’s specifications, is hydraulically leak-free and hydraulic oil sample test meets or exceeds the manufacturer’s requirements for cleanliness;
- l) Hold Point #12 – The Contractor has demonstrated to the TA and RO, subsequent to submersion, that the thruster and hull sealing surfaces are watertight;

12.2.5 Testing & Trials

12.2.5.1 The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the following tests are conducted at the appropriate stages, as described in the specification:

- a) NDT test results of the propeller (performed by Contractor, witnessed by TA);
- b) Test results of hydraulic fluid sampled from the reservoir, after recommissioning tests completed (performed by Contractor, witnessed by TA and FSR);
- c) Profile measurements of grit-blasted areas of lower drive unit, WFT and DFT test results of coatings (performed by NACE inspector, witnessed by Contractor and TA).

12.2.6 Documentation and Deliverables

12.2.6.1 GENERAL

12.2.6.1.1 The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book.

12.2.6.1.2 The Contractor must provide all documentation according to the Documentation section of the General Notes.

12.2.6.2 CERTIFICATES

12.2.6.2.1 The Contractor must provide the TA:

- a) All disposal certificates for used oil;

- b) survey credit documentation as per Canada Shipping Act and associated regulations inspection requirements for the work of this section.

12.2.6.3 REPORTS

- 12.2.6.3.1** The FSR will provide to the Contractor a field service report outlining all the work performed by the FSR in this section. The Contractor will incorporate the FSR's report into a "Starboard Azimuthal Thruster" report, adding all other work performed in this specification section.

12.2.6.4 MEASUREMENTS, CALIBRATIONS AND READINGS

- 12.2.6.4.1** The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

12.2.6.5 REDLINED DRAWINGS

- 12.2.6.5.1** The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

12.2.6.6 SPARES [NOT USED]

12.2.6.7 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

12.2.7 Training [Not used]

12.3 STARBOARD AZIMUTHAL THRUSTER HYDRAULIC POWER UNIT (SURVEY ITEM)

12.3.1 Identification

- 12.3.1.1** The CCG requires the removal and replacement of the starboard Rexroth HPU with a GSM refurbished HPU. Under the guidance of a Rexroth FSR (hydraulic) and Techsol FSR (electronic propulsion system), sea trials will be undertaken to configure the starboard HPU to the same settings as the port HPU.

12.3.1.2 REXROTH FIELD SERVICE REPRESENTATIVE (FSR)

- 12.3.1.2.1** The Contractor must obtain the services of a Rexroth FSR to complete the work outlined in this section, including during sea trials.

Bosch Rexroth Canada
490 Prince Charles Drive South
Welland, ON L3B 5X7
Tel. 905-735-0510
Fax 905-735-5664
www.boschrexroth.ca

12.3.1.3 TECHSOL FIELD SERVICE REPRESENTATIVE

12.3.1.3.1 The Contractor must engage the services of a Techsol FSR to be present during sea trials.

Techsol Marine

4800 Rideau

Quebec, QC

Phone: (418) 688-2230

www.techsolmarine.com

12.3.2 References

12.3.2.1 Relevant equipment data, drawings, manuals and reports are referenced at the beginning of this Propulsion and Maneuvering specification.

12.3.2.2 REGULATIONS AND STANDARDS

12.3.2.2.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

12.3.3 Statement of Work

12.3.3.1 The Contractor, under the supervision of the Rexroth FSR, must remove the starboard HPU and ship to Rexroth at the address given in 12.3.1.2.1 using OEM approved shipping method, packing, container and labelling. Shipping cost must be covered by Contractor.

12.3.3.2 The Contractor must provide the shipment tracking number to the TA and Rexroth Canada, Attention Brad Dick, Service Group Leader.

12.3.3.3 The Contractor must inspect the vessel's HPU mountings and mating surfaces and must identify with the TA and RO any repairs to be performed. Said work to be managed under PWGSC 1379 process.

12.3.3.4 The Contractor must install the GSM refurbished HPU under the supervision of the Rexroth FSR.

12.3.3.5 The Contractor must replace all internal and external hydraulic hoses under the supervision of the Rexroth FSR. System specific hoses with angled ferrules will be GSM. See "CCGS Limnos Bid 2022-192TM (2022-12-06)" for a listing of GSM hoses and fittings. All other hoses and fittings must be CFM.

12.3.3.6 The Contractor must flush the starboard HPU with OEM approved hydraulic fluid, until the particle count reading indicates an ISO cleanliness of 17/15/12 or better as verified by the Rexroth FSR.

12.3.3.7 The Contractor, under the supervision of the Rexroth FSR, must configure the GSM refurbished HPU to react the same as the port HPU, given the same inputs.

12.3.3.8 The Contractor must schedule the Techsol FSR to be present at sea trials to adjust and confirm input settings to both the starboard and port HPUs. The Contractor must include an

allowance of \$10,000 to cover the cost of services to be provided by Techsol. Reasonable cost of travel, living expenses must be billed at cost without added overhead or profit. The allowance must form part of the overall bid and must be adjusted up or down by means of PWGSC 1379 process upon receipt of the final FSR invoice supported by copies of all related documentation and invoices to verify actual expenses.

- 12.3.3.9** If the Contractor cannot obtain identical settings and responses between the port and starboard HPUs during the sea trial, any subsequent work by the Contractor and the Rexroth and Techsol FSRs must be at the expense of the Contractor.

12.3.4 Inspections

- 12.3.4.1** The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional work that is required, due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor's expense:
- a) Hold Point #1 – The Contractor has removed the existing HPU, inspected vessel's HPU mounting/mating surfaces and determined repairs, if any, with the TA and Rexroth FSR;
 - b) Hold Point # 2 – The Contractor has completed installation of the GSM HPU, replaced all hydraulic hoses and flushed the hydraulic system to the satisfaction of the Rexroth FSR and TA.
 - c) Hold Point # 3 – The Contractor has completed packing of the removed HPU to the satisfaction of the Rexroth FSR and TA
 - d) Hold Point # 4 – The Contractor has confirmed with the TA shipment of the removed HPU to an approved Rexroth facility.
 - e) Hold Point # 5 – The Contractor has demonstrated to the Rexroth FSR and TA that the HPU functions as per manufacturer's specifications and is hydraulically leak-free.
 - f) Hold Point #6 - The Contractor has demonstrated to the TA, FSR and RO, in sea trials that the Starboard and Port azimuthal thruster settings are identical and respond in the correct manner.

12.3.5 Testing & Trials

- 12.3.5.1** The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the following tests are conducted at the appropriate stages, as described in the specification:
- a) Record hydraulic particle count results through the sequence of hydraulic system flushes (performed by Contractor, witnessed and approved by Rexroth FSR and TA; and
 - b) During sea trials, record starboard and port HPU settings through the entire load range (tests performed by Rexroth FSR, assisted by Techsol FSR, witnessed by TA and RO).

12.3.6 Documentation and Deliverables

12.3.6.1 GENERAL

- 12.3.6.1.1** The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book.
- 12.3.6.1.2** The Contractor must provide all documentation according to the Documentation section of the General Notes.

12.3.6.2 CERTIFICATES

- 12.3.6.2.1** The Contractor must provide the TA:
- a) All disposal certificates for used oil;
 - b) survey credit documentation as per Canada Shipping Act and associated regulations inspection requirements for the work of this section.

12.3.6.3 REPORTS

- 12.3.6.3.1** The Rexroth and Techsol FSRs will each provide to the Contractor a field service report outlining all the work performed by the respective FSRs in this section. The Contractor will incorporate the FSRs' reports into a "Starboard Azimuthal Thruster HPU" report, adding all other work performed in this specification section.

12.3.6.4 MEASUREMENTS, CALIBRATIONS AND READINGS

- 12.3.6.4.1** The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

12.3.6.5 REDLINED DRAWINGS

- 12.3.6.5.1** The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

12.3.6.6 SPARES [NOT USED]

12.3.6.7 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

12.3.7 Training [Not used]

13 POWER GENERATION SYSTEMS [NOT USED]

14 POWER DISTRIBUTION SYSTEMS [NOT USED]

15 AUXILIARY SYSTEMS

15.1 TANKS, COFFERDAMS AND VOID SPACES (SURVEY ITEM)

15.1.1 Identification

- 15.1.1.1** The CCG requires regulatory five-year inspections of all double bottom tanks, cofferdams, echo-sounder space and void spaces, followed by general and spot removal of failed coatings and coatings, where required, on the vessel's ballast and potable water tanks, cofferdams, and void spaces.
- 15.1.1.2** A Naval Engineering Test Establishment (NETE) vessel condition survey was conducted on the vessel, using Pulsed Eddy Current (PEC) technology, in October 2022. This specification identifies portions that have survey results associated with it. The relevant portions of the survey results will be made available to the Contractor, on request by the Contractor.
- 15.1.1.3** The CCG will provide an independent NACE inspector to oversee and verify the surface preparation, environmental conditions, application procedures, and curing conditions/times.
- 15.1.1.4 CCG CONTRACTED NACE INSPECTOR**

To be confirmed

15.1.2 References

15.1.2.1 EQUIPMENT DATA

- 15.1.2.1.1** Equipment data is referenced in the individual work sections

15.1.2.2 MANUALS

- 15.1.2.2.1** Relevant manuals are referenced in the individual work sections.

15.1.2.3 REPORTS

- 15.1.2.3.1** Relevant reports are referenced in the individual work sections.

15.1.2.4 DRAWINGS

- 15.1.2.4.1** Relevant drawings are referenced in the individual work sections.

15.2 SLUDGE/RECOVERED OIL/DIRTY OIL TANKS (SURVEY ITEM)

15.2.1 Identification

- 15.2.1.1** The CCG requires the opening, cleaning and preparation of the identified sludge/recovered/dirty oil tanks for inspection, survey and hydrostatic testing. The specification includes pressure testing of all tanks. Upon completion of the work, the tanks are to be returned to a state of operational readiness.

15.2.2 References

15.2.2.1 EQUIPMENT DATA

15.2.2.1.1 The following equipment data is provided for guidance.

Equipment	Location (Frames)	Capacity (litres)
Sludge Tank (Port side engine room)	8-9	100
Recovered oil tank (port side engine room)	10-11	100
Dirty Lube Oil Tank (STARBOARD Side engine room)	10-11	100

15.2.2.2 MANUALS

15.2.2.2.1 Not used

15.2.2.3 REPORTS

15.2.2.3.1 Not used

15.2.2.4 DRAWINGS

Drawing Number	Drawing Title	Electronic File Name
47-H-504	Capacity Plan & Deadweight Scale	47-H-504.dwg

15.2.3 Regulations and Standards

15.2.3.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

15.2.4 Statement of Work

15.2.4.1 The Contractor must have the tanks opened, ventilated and certified gas free as being “safe to enter” and “safe for hot work”.

15.2.4.2 The Contractor must clean all tank surfaces of all sludge and debris and wiped dry.

15.2.4.3 The Contractor must remove all debris and sludge from the vessel and dispose of it in accordance with federal, provincial and municipal regulations in effect.

15.2.4.4 The Contractor must provide a per litre unit price and must bid on disposing 50 liters of sludge and debris from these tanks. Adjustments up/down to actual amounts removed will be by PWGSC 1379 process.

15.2.4.5 The Contractor must inspect all sounding pipes and ensure that they are clear of any foreign materials.

15.2.4.6 The Contractor must inspect all tank vents, including fire screens, check valve balls and isolation caps where fitted.

15.2.4.7 The Contractor must identify all mechanical and structural defects (including weld defects) and propose repairs to the C/E and TA. The Contractor must not undertake any repair work until approval by the TA and managed by PWGSC 1379 process.

15.2.4.8 Prior to the closing up the tanks the Contractor must give the RO and TA the opportunity to inspect the tanks.

15.2.4.9 The Contractor must re-install all man-hole covers using CFM new fibre reinforced oil-resistant cover gaskets. The TA must be given the opportunity to witness the re-installation.

15.2.4.10 The Contractor must perform either of pneumatic or hydrostatic pressure test on each tank. Any additional work required due to a failure of the pressure test, including the costs of retesting, must be at the Contractor's expense.

- a) If Hydrostatically tested, the test pressure must be a minimum of 2.4 meter of head (3.4 PSI) for a one-hour period.
- b) If pneumatically tested, the test pressure must be between 1.5-2.0 PSI for a one-hour period. The Contractor must use a flexible, clear U-tube open water manometer and leak identification by soap/water mixture.
- c) If pneumatically tested, the manometer must be set up to overflow when pressure exceeds 2.0 PSI, allowing venting of tank pressure. For this purpose the inner diameter of the tube must be 2x the diameter of the air inlet hose. The Contractor must also fit a calibrated gauge (range of 0-10 PSI or less) after the inlet air regulator of air supply.

15.2.4.11 The Contractor must give the RO and TA the opportunity to witness the pressure test.

15.2.4.12 The Contractor must return the tanks to a state of operational readiness.

15.2.5 Inspections

15.2.5.1 The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional required work (including but not limited to repairs/replacements of components damaged by Contractor, additional cleaning, new grinding, gouging and welding, re-inspections and re-testing) due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor's expense:

- a) Hold Point #1 – The Contractor has determined that all tanks are safe to enter and safe for hot work;
- b) Hold Point #2 – The Contractor has inspected the tanks after cleaning and agreed with the TA on repair work to be performed, if any;
- c) Hold Point # 3 – The Contractor has completed all repairs, scheduled inspection and received approval of the work from the TA and RO;
- d) Hold Point #4 – The Contractor has successfully performed the pressure tests of all tanks, witnessed by the TA and RO; and

- e) Hold Point #5 – The Contractor has returned all tanks to a state of operational readiness, witnessed by TA and RO.

15.2.6 Testing & Trials

- 15.2.6.1** The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the pressure test of all tanks (performed by Contractor, witnessed and approved by TA and RO).

15.2.7 Documentation and Deliverables

15.2.7.1 GENERAL

- 15.2.7.1.1** The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book.

- 15.2.7.1.2** The Contractor must provide all documentation according to the Documentation section of the General Notes.

15.2.7.2 CERTIFICATES

- 15.2.7.2.1** The Contractor must provide the TA:
- a) Waste disposal certificate(s) for all sludge and debris removed under this specification;
 - b) Copies of all tank entry certificates; and
 - c) Survey credit documentation as per the Canada Shipping Act and associated regulations inspection requirements for Sludge/Recovered Oil/Dirty Oil Tanks.

15.2.7.3 REPORTS

- 15.2.7.3.1** The Contractor must provide the TA a “Sludge/Recovered/Dirty Oil Tanks” report, detailing work performed under this specification, including deficiencies, repairs and volumes of liquids removed/returned/disposed of

15.2.7.4 MEASUREMENTS, CALIBRATIONS AND READINGS

- 15.2.7.4.1** The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

15.2.7.5 REDLINED DRAWINGS

- 15.2.7.5.1** The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

15.2.7.6 SPARES [NOT USED]

15.2.7.7 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

15.2.8 Training [Not used]

15.3 BALLAST WATER TANKS (SURVEY ITEM)

15.3.1 Identification

15.3.1.1 The CCG requires the opening, cleaning and preparation of the identified ballast water tanks for inspection and survey. Coatings inspection will identify areas for spot re-coating which will also be performed within this specification. The specification includes pressure testing of all tanks. Upon completion of the work, the tanks are to be returned to a state of operational readiness.

15.3.1.2 The CCG will provide an independent NACE inspector to oversee and verify the surface preparation, environmental conditions, application procedures, and curing conditions/times.

15.3.2 References

15.3.2.1 EQUIPMENT DATA

15.3.2.1.1 The following equipment data is provided for guidance.

Equipment	Location (Frames)	Capacity (litres)	Surface Area (sq. m.)
Forepeak	69-STEM	11838	121
Port DB Ballast Tank	29-32	4714	17
Starboard DB Ballast Tank	29-32	4714	17

15.3.2.2 MANUALS

15.3.2.2.1 Not used

15.3.2.3 REPORTS

15.3.2.3.1 The following reports are provided for guidance.

Report Name	Electronic File No.
2019-07-22 – International Ship Hull Coating Report – L014	2019-07-22 - International Ship Hull Coating Report - L014.pdf
CCGS Limnos M&R Report 2010 (International)	CCGS Limnos M&R Report 2010 (International).pdf

15.3.2.4 DRAWINGS

Drawing Number	Drawing Title	Electronic File Name
47-H-504	Capacity Plan & Deadweight Scale	47-H-504.dwg

15.3.3 Regulations and Standards

- 15.3.3.1** All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

15.3.4 Statement of Work

15.3.4.1 ENTRY AND CLEANING

- 15.3.4.1.1** The Contractor must give the TA 24 hours advance notice prior to working in any accommodation areas or office spaces. This will allow CCG adequate time to secure the areas.

- 15.3.4.1.2** The Contractor must have the tanks opened, ventilated and certified gas free as being “safe to enter” and “safe for hot work”, following MOHS regulation and FSM procedures 7.B.3 and 7.B.4.

- 15.3.4.1.3** The Contractor must clean all tank surfaces of all sludge and debris and wiped dry.

- 15.3.4.1.4** The Contractor must remove all debris and sludge from the vessel and dispose of it in accordance with federal, provincial and municipal regulations in effect.

- 15.3.4.1.5** The Contractor must provide a per litre unit price and must bid on disposing 50 liters of sludge and debris from these tanks. Adjustments up/down to actual amounts removed will be by PWGSC 1379 process.

15.3.4.2 INSPECTIONS

- 15.3.4.2.1** Upon completion of the cleaning, the Contractor must provide the RO and TA the opportunity to inspect the tanks.

- 15.3.4.2.2** The Contractor must inspect all tank vents, including screens, check valve balls and isolation caps where fitted.

- 15.3.4.2.3** The Contractor must identify all mechanical and structural defects (including weld defects) and propose repairs to the C/E and TA. The Contractor must not undertake any repair work until approval by the TA and managed by PWGSC 1379 process.

- 15.3.4.2.4** The Contractor must survey the ballast water tanks coatings and identify to the C/E and TA all areas that need to be prepared and recoated. The contractor must provide a per square meter unit price and bid on a total of five (5) square meters of removal, preparation and recoating. Adjustments up/down to actual area recoated will be by PWGSC 1379 process.

15.3.4.3 COATINGS PREPARATION

- 15.3.4.3.1** The Contractor must reference ISO 8501-1:2007 for all coatings related work under this specification.

- 15.3.4.3.2** The Contractor must ensure the ballast tank coatings are compatible with the current International/Akzo-Nobel coatings. Reference must be made to the Limnos coatings reports from 2010 and 2019.
- 15.3.4.3.3** The Contractor must consult with and provide access to the NACE inspector in the coatings products care, handling and preparation, surface preparation and coating application for the products. The NACE inspector must be present during the entire process to verify conformity to the manufacturer's and CCG's required procedures for the application of the coating product.
- 15.3.4.3.4** Upon completion of all repairs and inspections, the Contractor must prepare for the application of spot re-coating, as per ISO 8501-1:2007. The Contractor must verify all surfaces to be painted are thoroughly clean, dry and free of grease or oil. All repaired weld seams and butts and all deficient areas of the existing coatings must be grit blasted to Brush-off Blast Cleaned (Sa1.0 / SSPC/SP7).
- 15.3.4.3.5** During grit blasting, the Contractor must feather all transitions between the bare metal and painted areas.
- 15.3.4.3.6** The Contractor must ensure that all traces of grit are removed with compressed air and vacuuming. The Contractor must demonstrate to the TA and NACE inspector that the surface cleanliness for contaminants, after cleaning, is between 10-15 µg/cm² (SSPC-SC2).
- 15.3.4.3.7** The NACE inspector will inspect the tanks subsequent to the Contractor's preparatory work.
- 15.3.4.4 NEW COATINGS**
- 15.3.4.4.1** The Contractor must inform the NACE inspector and TA and provide a notice of at least 24 hours of any scheduled activities related to the work described within this specification item.
- 15.3.4.4.2** The Contractor must allow the NACE inspector to verify the Contractor's conformity to the manufacturer's required procedures for the application of the coating product.
- 15.3.4.4.3** The Contractor must present the NACE inspector and TA with a coating schedule. The contractor must update the NACE inspector and the TA of any changes to this schedule.
- 15.3.4.4.4** Prior to coating application, the Contractor is informed that the NACE inspector will inspect the tanks for insufficiently adhered materials, insufficiently profiled areas and other cleaning/profiling deficiencies.
- 15.3.4.4.5** The NACE inspector will inspect all coatings products/materials immediately prior to their application. The Contractor must not use any products/materials that are rejected by the NACE inspector.
- 15.3.4.4.6** The Contractor must record the dates, start/stop times and environmental conditions (dry and wet bulb temperatures, relative humidity, dew point, temperature of the product at

application time and wet and dry film thickness gauge readings) prior to and during all coatings applications and must verify these with the NACE inspector.

- 15.3.4.4.7** The Contractor must spot recoat the prepared areas of the ballast tanks with Intershield ENA300/A (Bronze) to 6.0 mils DFT and as per the recommendations of the NACE inspector.
- 15.3.4.4.8** The Contractor must recoat the same areas with Intershield ENA301/A (Aluminum) to 6.0 mils. Recoat interval must follow the coatings manufacturer guidelines and as per the further recommendations of the NACE inspector.
- 15.3.4.4.9** The Contractor must recoat the same areas with Intershield 300 ENA300/A (Bronze) to 6.0 mils. Recoat interval must follow the coatings manufacturer guidelines and as per the further recommendations of the NACE inspector.
- 15.3.4.4.10** The Contractor must recoat the same areas with Intershield ENA301/A (Aluminum) to 6.0 mils. Recoat interval must follow the coatings manufacturer guidelines and as per the further recommendations of the NACE inspector.
- 15.3.4.4.11** The Contractor must not allow ballast water tanks to be sealed and filled with any liquid until the final coating has fully cured, as determined by the NACE inspector.

15.3.4.5 RETURN TO SERVICE

- 15.3.4.5.1** The Contractor must provide the RO and TA the opportunity to inspect the tanks after the cure period of the coatings has been reached.
- 15.3.4.5.2** The Contractor must allow the TA the opportunity to witness the reinstallation of all man-hole covers using CFM new oil-resistant fiber reinforced cover gaskets.
- 15.3.4.5.3** The Contractor must hydrostatically pressure test the tanks with a pressure of 0.1 bar (1.5 lbs.) for a 1-hour period. The RO and TA must be given the opportunity to witness this test.
- 15.3.4.5.4** The Contractor must return the tanks to a state of operational readiness.

15.3.5 Inspections

- 15.3.5.1** The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional required work (including but not limited to repairs/replacements of components damaged by Contractor, additional cleaning, new grinding, gouging and welding, re-coating, re-inspections and re-testing) due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor's expense:
 - a) Hold Point #1 – The Contractor has determined that all tanks are safe to enter and safe for hot work;
 - b) Hold Point #2 – The Contractor has inspected the tanks after cleaning and agreed with the TA on repair work to be performed, if any;

- c) Hold Point # 3 – The Contractor has completed all repairs, scheduled inspection and received approval of the work performed from the TA and RO;
- d) Hold Point #4 – The Contractor has provided a coating schedule to the TA and NACE inspector for approval prior to application of any coatings;
- e) Hold Point #5 - The Contractor has arranged for and confirmed that the NACE inspector certified the paint product and preparation before application;
- f) Hold Point #6 – The Contractor has arranged for and confirmed that the NACE inspector and TA inspected and approved the preparation of the ballast tank area, prior to first paint application;
- g) Hold Point #7 - The Contractor has arranged for and confirmed that the NACE inspector and TA verified and approved each coat after application.
- h) Hold Point #8 – The Contractor has successfully performed the pressure tests of all tanks, witnessed by the TA and RO;
- i) Hold Point #9 – The Contractor has verified with the NACE inspector and TA that the tanks' re-coatings have sufficiently cured to allow the tanks to be returned to operational readiness; and
- j) Hold Point #10 – The Contractor has returned all tanks to a state of operational readiness, witnessed by TA and RO.

15.3.6 Testing & Trials

- 15.3.6.1** The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the pressure test of all tanks (performed by Contractor, witnessed and approved by TA and RO).

15.3.7 Documentation and Deliverables

15.3.7.1 GENERAL

- 15.3.7.1.1** The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book.

- 15.3.7.1.2** The Contractor must provide all documentation according to the Documentation section of the General Notes.

15.3.7.2 CERTIFICATES

- 15.3.7.2.1** The Contractor must provide the TA:
- a) Waste disposal certificate(s) for all sludge and debris removed under this specification;
 - b) Copies of all tank entry certificates; and
 - c) Survey credit documentation as per the Canada Shipping Act and associated regulations inspection requirements for Ballast Water Tanks.

15.3.7.3 REPORTS

15.3.7.3.1 The Contractor must obtain a ballast tanks coatings report from the NACE inspector. The Contractor must ensure the report details preparatory work, coatings products used and all relevant environmental conditions at the time any tank coatings were applied, as required in this specification and further determined by the NACE inspector. The Contractor must include the NACE inspector's report in a "Ballast Water Tanks" report, detailing additional work performed under this specification, including deficiencies, repairs and volumes of liquids removed/returned/disposed of.

15.3.7.4 MEASUREMENTS, CALIBRATIONS AND READINGS

15.3.7.4.1 The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

15.3.7.5 REDLINED DRAWINGS

15.3.7.5.1 The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

15.3.7.6 SPARES [NOT USED]

15.3.7.7 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

15.3.8 Training [Not used]

15.4 INSPECTION OF POTABLE WATER TANK TRANSFER PIPING

15.4.1 Identification

15.4.1.1 The CCG requires the removal and inspection of the transfer piping between the outboard PW tanks to assess for possible repairs. Any required repairs will be addressed as Work Arising.

15.4.2 References

15.4.2.1 EQUIPMENT DATA

15.4.2.1.1 The following equipment data is provided for guidance.

Tank Description	Location (Frames)	Capacity (litres)	Surface Area (sq. m.)
No. 1 Port OB DB PW Tank.	34-45	15320	93
No. 4 Starboard OB DB PW Tank.	34-45	15975	93

Piping description	Material	Pipe Diameter	Approximate Length (m)
Emergency Transfer Piping , Outboard PW Tanks	Steel	4 inch	5.0

15.4.2.2 MANUALS

15.4.2.2.1 Not used

15.4.2.3 REPORTS

15.4.2.3.1 Not used.

15.4.2.4 DRAWINGS

The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File Name
47-H-504	Capacity Plan & Deadweight Scale	47-H-504.dwg
47-H-200-1	General Assembly Profile and Double Bottom Space	47-H-200-1.tif

15.4.3 Regulations and Standards

15.4.3.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

15.4.4 Statement of Work

15.4.4.1 GENERAL

15.4.4.1.1 The Contractor must perform work in this specification section after making tanks and #1 cofferdam safe for entry and hot work as per specification items 15.6 “Potable Water Tanks” and 15.9 “Cofferdams, Echosounder Compartments and Aft Void Spaces”. All work in the specification item must be completed before any re-coating work in sections 15.6 and 15.9 are commenced.

15.4.4.1.2 During work performed under this specification item, the Contractor must follow FSM 7.A.12 “Potable Water Quality” for any cleaning and disinfection work required on the PW system.

15.4.4.1.3 The Contractor must conform to CCG/8023-015 “Potable Water Tank Epoxy Coating Standard” for all coatings work within PW tanks required under this specification item.

15.4.4.1.4 During work performed under this specification item, the Contractor must conform to NSF/ANSI/CAN 61-2021 “Drinking Water System Components - Health Effects” for all cleaning products, solvents, gaskets, fasteners and other materials used within the PW system.

15.4.4.1.5 See Figures 15.4.A and 15.4.B below for orientation in the #1Cofferdam DB space.

15.4.4.2 INSPECTION

15.4.4.2.1 The Contractor must remove all flanged piping related to the transfer line between #1 and #4 PW Tanks for inspection.

15.4.4.2.2 The Contractor must inspect, with the RO and TA, the transfer piping for #1 and #4 PW Tanks, including all flanged piping, isolation valve and welded piping integral to the tanks. The Contractor must identify all mechanical and structural defects (including weld defects) and propose repairs to the RO and TA. The Contractor must not undertake any repair work until approval by the TA, which will be managed by PWGSC 1379 process.

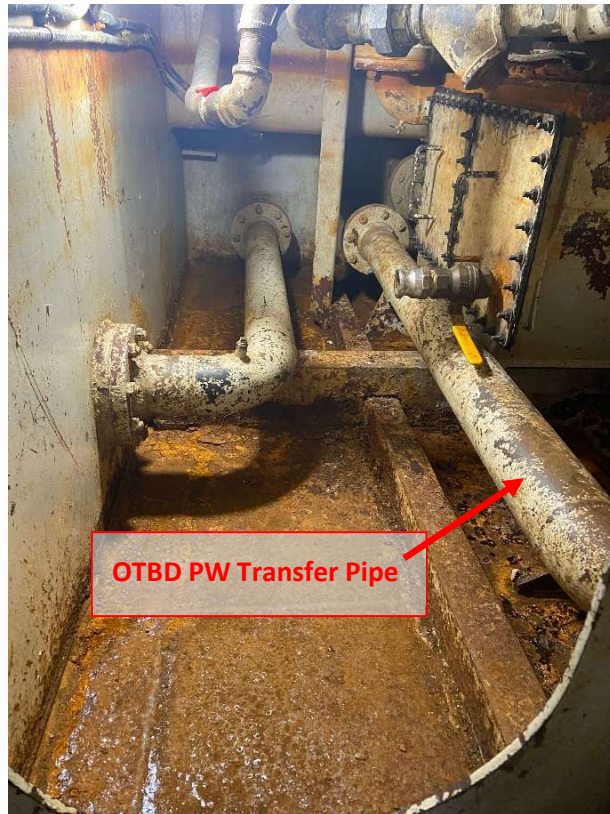


Figure 15.4.A - Cofferdam #1, port side, view to vessel C/L

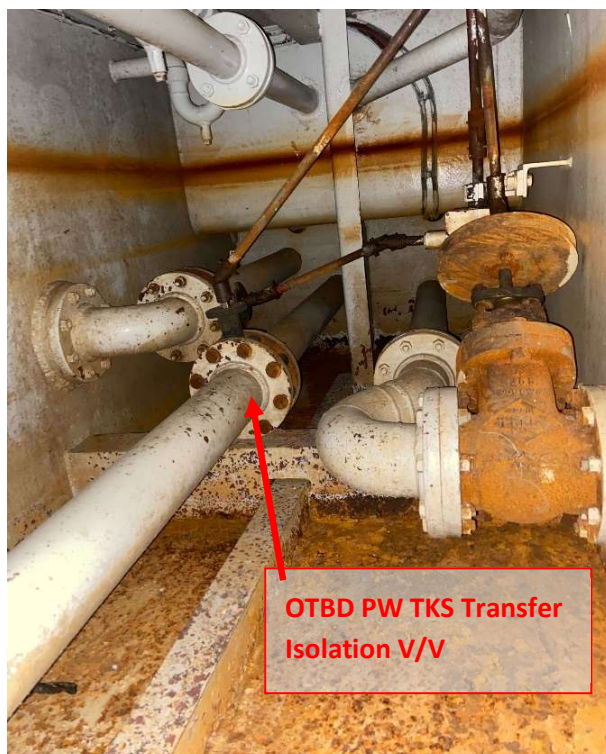


Figure 15.4.B - Cofferdam #1, starboard side, view to vessel C/L

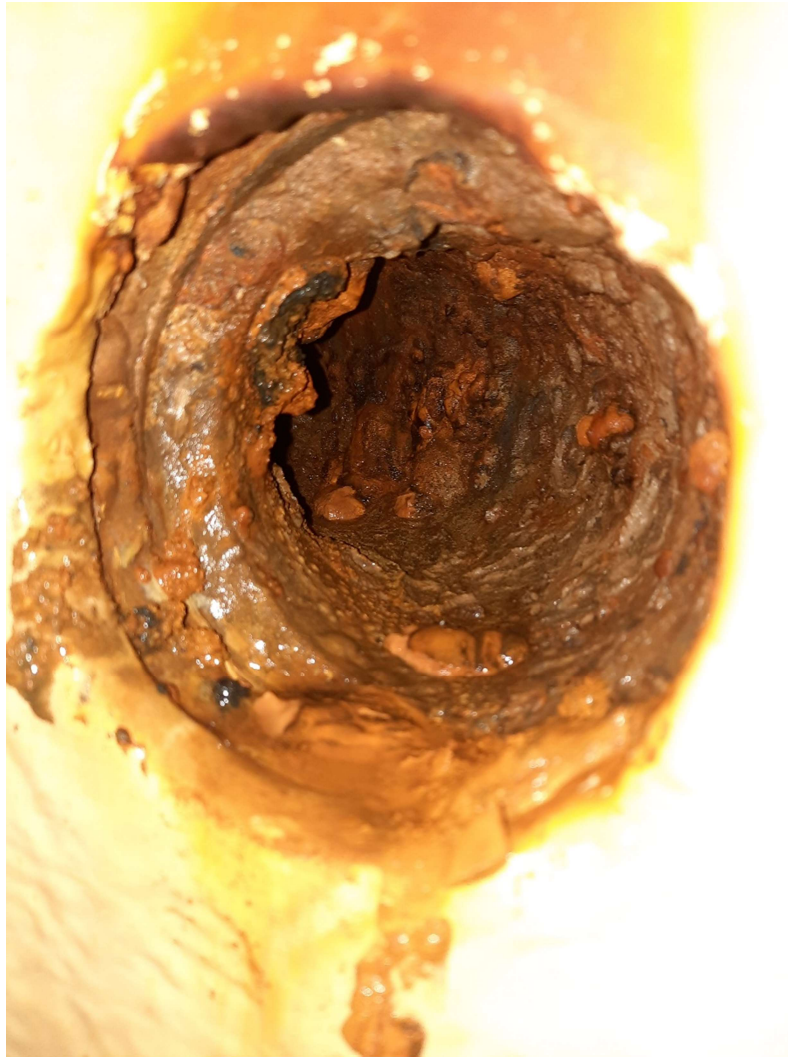


Figure 15.4.C – Transfer pipe elbow into #1 PW TK

15.4.4.3 RETURN TO SERVICE

- 15.4.4.3.1** The Contractor must re-assemble the transfer valve and flanged piping with new fasteners and gaskets conforming to NSF/ANSI/CAN 61-2021
- 15.4.4.3.2** The Contractor must include these work items in the pressure test undertaken in section 15.6 “Potable Water Tanks”.

15.4.5 Inspections

- 15.4.5.1** The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional required work (including but not limited to repairs/replacements of components damaged by Contractor, additional cleaning, new grinding, gouging and welding, re-coating, re-inspections and re-testing) due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor’s expense:

- a) Hold Point #1 – The Contractor has determined that all tanks and void spaces are safe to enter and safe for hot work;
- b) Hold Point #2 – The Contractor has inspected the Outboard PW tanks' transfer piping and fittings after removal and agreed with the TA and RO on repair work to be performed, if any;
- c) Hold Point # 3 – The Contractor has Completed repairs/replacements of pipe sections, if any; and
- d) Hold Point # 4 - The Contractor has returned the Outboard PW tank transfer piping to operational readiness, witnessed by TA and RO. The contractor has provided documentation to the TA and RO of the use of gaskets and lubricants approved for potable water systems as per NSF/ANSI/CAN Standard 61;

15.4.6 Testing and Trials

- 15.4.6.1** The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the pressure test of transfer piping, as per section 15.6 (performed by Contractor, witnessed and approved by TA and RO).

15.4.7 Documentation and Deliverables

15.4.7.1 GENERAL

- 15.4.7.1.1** The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book.

- 15.4.7.1.2** The Contractor must provide all documentation according to the Documentation section of the General Notes.

15.4.7.2 CERTIFICATES & REPORT

- 15.4.7.2.1** The Contractor must provide the TA a "Potable Water Outboard Tanks Transfer Piping " report, detailing work performed under this specification, including inspection results and any repairs, drawings, inspections and test results. The report must also include the following certificates:

- a) Copies of all DB entry certificates;
- b) Waste disposal certificate(s) for all materials and debris removed under this specification;
- c) Proof of gasket material compliance to NSF/ANSI/CAN Standard 61.

15.4.7.3 MEASUREMENTS, CALIBRATIONS AND READINGS

- 15.4.7.3.1** The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

15.4.7.4 REDLINED DRAWINGS

15.4.7.4.1 The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the report and Data Book in electronic format.

15.4.7.5 SPARES [NOT USED]

15.4.7.6 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

15.4.8 Training [Not used]

15.5 REPLACEMENT OF PW TANK PIPING

15.5.1 Identification

15.5.1.1 The CCG requires the removal and replacement of the fill/supply piping between #1 PW tank and the PW Manifold.

15.5.2 References

15.5.2.1 EQUIPMENT DATA

15.5.2.1.1 The following equipment data is provided for guidance.

- a) PW Manifold:
 - i) 1" galvanized steel pipe welded assembly flanged with spindle valves;
 - ii) Located in ER starboard side between frames 17-18.
- b) No. 1 Port OB DB PW Tank:
 - i) Steel, DB with stitch welded bulkheads;
 - ii) Located in DB, port side outboard, between frames 34-45;
 - iii) 15320 litres capacity;
 - iv) 93 sq. meters surface area.
- c) Fill/suction line piping, no. 1 PW Tank
 - i) 1" galvanized steel welded piping with flange connections;
 - ii) Located between PW manifold and No. 1 PW Tk, within #2 cofferdam and starboard aft void DB spaces;
 - iii) Overall length approximately 17 meters.

15.5.2.2 MANUALS

15.5.2.2.1 Not used

15.5.2.3 REPORTS

15.5.2.3.1 Not used

15.5.2.4 DRAWINGS

The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File Name
47-H-504	Capacity Plan & Deadweight Scale	47-H-504.dwg
47-2030-01	Hull 47 Diagrammatic Arrangement of Fresh Water, Sanitary & Raw Water Circulating	47-2030-01.pdf
47-2030-02	Piping Arrangement of Fresh & Raw Water Circulating Systems	47-2030-2_01.tif
47-H-200-1	General Assembly Profile and Double Bottom Space	47-H-200-1.tif

15.5.3 Regulations and Standards

15.5.3.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

15.5.4 Statement of Work

15.5.4.1 GENERAL

15.5.4.1.1 The Contractor must perform work in this specification section after making tanks, #2 Cofferdam and Starboard Aft Void Spaces safe for entry and hot work as per specification items 15.6 “Potable Water Tanks” and 15.9 “Cofferdams, Echosounder Compartments and Aft Void Spaces”. All work in the specification item must be completed before any re-coating work in sections 15.6 and 15.9 are commenced.

15.5.4.1.2 All Contractor welding must conform to CSA Standards W47.1:19 - Annex M and W59-18 and acceptable to the RO.

15.5.4.1.3 The Contractor or Sub-contractors performing the welding fabrication work must be certified by the CWB in accordance with CSA Standards W47.1:19-Annex M, Division 1 or 2 “Certification of Companies for Fusion Welding of Steel” and Qualification of welding personnel and welding procedures for marine applications”. Current copies of the following must be supplied to the TA prior to commencement of work:

- a) Company certification validation certificates;
- b) Welding Procedures Specifications (WPS) and data sheets (WPDS) with supporting Procedure Qualification Records (PQRs);
- c) Welding supervisor and welder qualification certificates and cards; and
- d) Visual Inspector qualification card.

15.5.4.1.4 The Contractor must arrange all completed welds to be examined by third-party welding inspectors that are certified by the Canadian Welding Bureau (CWB) to CSA W178.2, Level 2 or 3 having code endorsements for CSA Standards W47.1:19 and W59. Current copies of certification must be provided to the TA in advance of performing the inspections and formal inspection reports must be supplied to the TA upon request.

- 15.5.4.1.5** During work performed under this specification item, the Contractor must follow FSM 7.A.12 “Potable Water Quality” for any cleaning and disinfection work required on the PW system.
- 15.5.4.1.6** The Contractor must conform to CCG/8023-015 “Potable Water Tank Epoxy Coating Standard” for all coatings work within PW tanks required as a result of work performed in this specification item.
- 15.5.4.1.7** The Contractor must conform to NSF/ANSI/CAN 61-2021 “Drinking Water System Components - Health Effects” for all cleaning products, solvents, gaskets, fasteners and other materials used within the PW system.
- 15.5.4.1.8** The PW system operating pressure is 75 PSI.
- 15.5.4.1.9** See Figures 15.5.A through 15.5.H below for orientation in the #2 Cofferdam and Starboard Aft Void DB spaces.
- 15.5.4.2 SYSTEM DESCRIPTION**
- 15.5.4.2.1** The PW system is a two-way flow arrangement, serving four (4) PW tanks. Each PW tank is connected by a single line to the PW Manifold. The PW Manifold is comprised of a lower “Fill” portion that distributes water from a deck fitting into each PW tank, via four (4) Fill spindle valves. The PW manifold’s upper “Supply” portion comprises four (4) suction spindle valves that allows the PW supply pump to draw water from any of their respective PW tanks. The manifold uses 1” NPT galvanized piping throughout.
- 15.5.4.2.2** The PW lines from the PW manifold to the PW tanks use 1” NPT galvanized piping throughout. The piping is divided up into flanged sections to facilitate DB entry/removal.



Figure 15.5.A – PW Manifold in ER

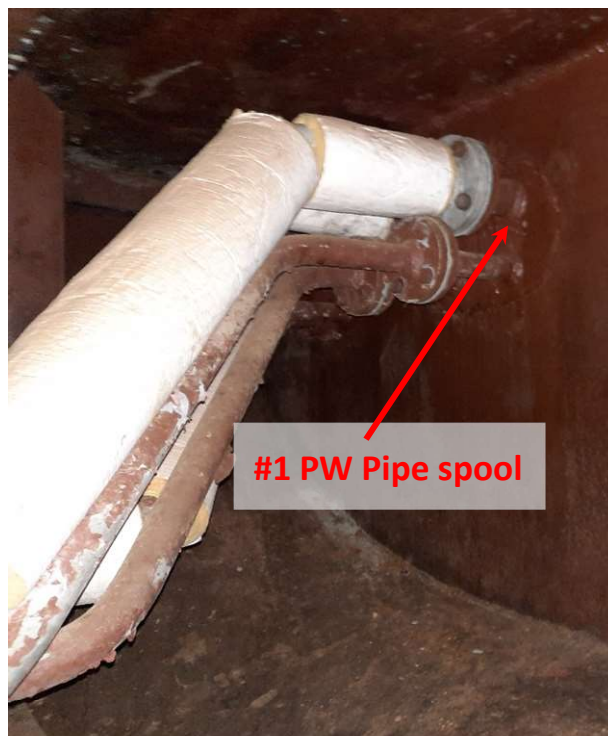


Figure 15.5.B – PW pipe penetrations at ER bulkhead



Figure 15.5.C – PW lines, view aft to ER bulkhead



Figure 15.5.D – PW lines, transits thru bulkhead at frame 32



Figure 15.5.E – PW lines, starboard side of #2 Cofferdam, looking to ship's C/L



Figure 15.5.F – PW lines, port side of #2 Cofferdam, looking to ship's C/L

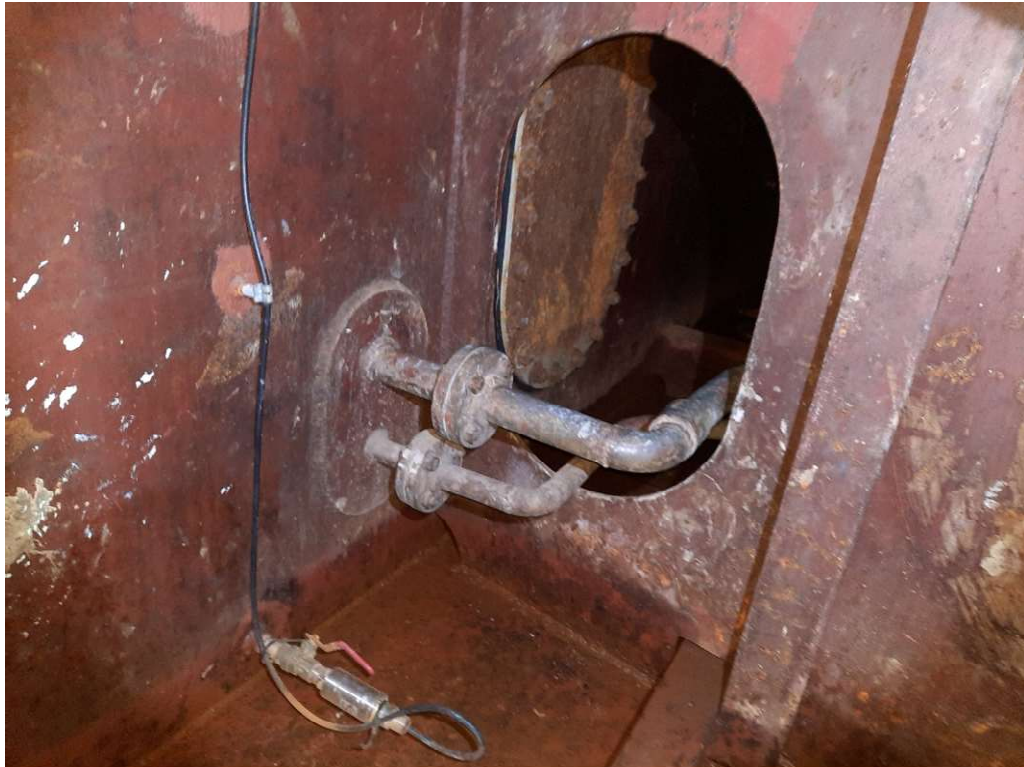


Figure 15.5.G – #1 PW line transit to #1PW TK. Fill/supply pipe in top position.



Figure 15.5.H – #1 PW line section and intake bell.

15.5.4.3 EXTENT OF REPLACEMENT

15.5.4.3.1 The Contractor must replace the upper "Supply" portion of the PW manifold with a new manifold. See figure 15.5.A.

15.5.4.3.2 The Contractor must replace the entire fill/supply line between the PW manifold and the #1 PW tank, including the portion of line inside the tank and three (3) welded spools transiting watertight bulkheads. See Figures 15.5.B to 15.5.H.

15.5.4.4 REMOVAL

15.5.4.4.1 The Contractor must remove the existing supply side of the PW manifold and dispose of it according to federal, provincial and municipal regulations in affect.

15.5.4.4.2 The Contractor must identify/tag all #1 PW Tank fill/supply pipe sections to be removed as to orientation and location. If pipe sections need to cut in order to remove from the DB and vessel, the Contractor must mark the pipe sections before cutting to preserve the geometry of the pipe.

15.5.4.5 FITTING OF MANIFOLD JIG

15.5.4.5.1 The Contractor must be aware that the existing manifold piping is not aligned and existing flange faces are not on planes perpendicular to the longitudinal centerline of the pipes to which they are attached. Where possible the Contractor must align all piping and make flanges perpendicular, as per good piping practice. Where necessary to achieve fit with mating flanges, however, the Contractor must orient the flanges to align with these.

15.5.4.5.2 The Contractor must fabricate a jig, on site, in plain carbon steel. This jig must capture the geometry of the mating flanges and support bracket(s).

15.5.4.5.3 The Contractor must discuss and get agreement from the TA on any welding that must be performed on the vessel, including measures to protect the vessel and adjacent systems from heat and weld splatter.

15.5.4.5.4 All materials used to fabricate the jig must be CFM.

15.5.4.5.5 The Contractor must remove the jig and temporarily cover the openings in the PW system piping to prevent contamination of the PW lines.

15.5.4.6 FABRICATION OF NEW MANIFOLD

15.5.4.6.1 The Contractor must fabricate the manifold by welding entirely in 316 stainless steel, using schedule 40 1-1/4" NPT pipe and weld fittings, with the exception of the 316 stainless steel ball valves which must attach to the welded manifold assembly with threaded NPT connections. All materials used to fabricate the manifold must be CFM.

15.5.4.6.2 The Contractor must ensure valves used in fulfilling this specification are potable water/food service rated as per NSF Standard 61.

- 15.5.4.6.3** The Contractor must use the prepared jig to ensure the fit and alignment of the Contractor's fabricated manifold to the mating flanges.
- 15.5.4.6.4** The Contractor must hydrostatically pressure test the completed manifold (with valves installed) at the Contractor's facility to 120 PSI for 15 minutes. The TA or TA assigned designate must be allowed to witness this test. Any additional work required as a result of a failed test will be at the expense of the Contractor.
- 15.5.4.6.5** The Contractor must disinfect the completed manifold as per FSM 7.A.12 and seal ends prior to installation in the vessel.

15.5.4.7 FABRICATION OF FILL/SUPPLY PIPING

- 15.5.4.7.1** The Contractor must fabricate replacement piping to same geometries of the removed piping, except where noted by the TA, for reasons of easier entry to DB, etc.. New piping must be 1-1/4" schedule 40 316 stainless steel and be of all welded construction.
- 15.5.4.7.2** The Contractor must dispose of removed piping according to federal, provincial and municipal regulation in effect, once the piping is no longer needed for reference purposes.
- 15.5.4.7.3** The Contractor must hydrostatically pressure test the completed pipe sections at the Contractor's facility to 1.5 times the PW system pressure for 15 minutes. The TA or TA assigned designate must be allowed to witness this test. Any additional work required as a result of a failed test will be at the expense of the Contractor.
- 15.5.4.7.4** The Contractor must disinfect the completed pipe sections as per FSM 7.A.12 and seal ends prior to transport to the vessel.
- 15.5.4.7.5** The Contractor must fabricate and weld three (3) new 316SS weld spools to the watertight and tank bulkheads.

15.5.4.8 FITTING OF NEW MANIFOLD AND PIPING

- 15.5.4.8.1** The Contractor must assemble the completed manifold and #1 PW tank piping on the vessel. All materials used in the construction of the manifold and any additional materials used for gasketing, clamping, hanging etc., must be CFM.
- 15.5.4.8.2** The Contractor must position bottom of intake bell not less than 12mm and not greater than 18mm from tank bottom plating.
- 15.5.4.8.3** Fasteners used for all flange connections must be 316 SS of the same sizes as current fasteners and must be CFM.
- 15.5.4.8.4** The Contractor must use new flange gaskets approved for potable water service, as per NSF/ANSI/CAN Standard 61 "Drinking Water System Components – Health Effects".
- 15.5.4.8.5** The Contractor must permit the TA or TA designate to verify that the new manifold and pipe flanges are positioned, aligned and parallel to the existing mating flanges, prior to installation. Any work arising from a failed verification will be at the Contractor's expense.

- 15.5.4.8.6** The Contractor must remove any temporary coverings and re-store/re-assemble any equipment that was disabled/removed in order to fulfill this specification.

15.5.5 Inspections, Testing and Trials

- 15.5.5.1.1** The Contractor must hydrostatically test the manifold and new piping to the PW system operating pressure for 30 minutes, in the presence of the TA and RO. Any additional work arising from a failed hydrostatic test will be at the Contractor's expense.

- 15.5.5.1.2** The Contractor must schedule, coordinate, allow for and confirm the following hold points, inspections and tests are conducted at the appropriate stages, as described in the specification. Any additional work (including but not limited to repairs/replacements of components damaged by Contractor, additional fabrication, testing, disinfection, re-inspections and re-testing) due to deficiencies found as a result of verifications, tests or inspections undertaken during these Hold Points, will be at the Contractor's expense:

- a) Hold Point #1 – The Contractor has completed the manifold jig. Witnessed by TA or TA designate;
- b) Hold Point #2 – The Contractor has tagged all fill/supply piping sections and noted where sections must be cut to permit DB exit/entry. Witnessed by TA or TA designate.
- c) Hold Point #3 – Prior to commencing any hot-work in ER, the Contractor has prepared the work area with protective coverings and obtained hot-work permits. Inspection/approval by TA or TA designate;
- d) Hold Point #4 - Prior to commencing fabrication, the Contractor has received acceptance of Welder certificates, PQR and WPS. Acceptance by RO and TA;
- e) Hold Point #5 – The Contractor has obtained a satisfactory hydrostatic pressure test of the completed manifold and fill/supply pipe sections at the Contractor's facility. Witnessed by TA or TA designate;
- f) Hold Point #6 - The Contractor has confirmed the dry-fit of manifold to existing mating flanges. Witnessed by TA or TA designate;
- g) Hold Point #7 – The Contractor has obtained a satisfactory hydrostatic test of the installed manifold and fill/supply piping. Witnessed by RO and TA; and
- h) Hold Point #8 – The Contractor has received final approval of the work. Acceptance by RO.

15.5.6 Documentation and Deliverables

15.5.6.1 GENERAL

- 15.5.6.1.1** The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. Additional work to address any such deficiencies will be at the Contractor's expense.

15.5.6.2 CERTIFICATES & REPORT

15.5.6.2.1 The Contractor must provide the TA a “Potable Water Fill/Supply Piping ” report, detailing work performed under this specification, including inspection results and any repairs, drawings, inspections and test results. The report must also include the following certificates and proofs:

- a) Copies of all DB entry certificates;
- b) Waste disposal certificate(s) for all materials and debris removed under this specification;
- c) Proof of valves material compliance to NSF/ANSI/CAN Standard 61;
- d) Proof of gasket material compliance to NSF/ANSI/CAN Standard 61; and
- e) Welder and weld inspector certificates;

15.5.6.3 MEASUREMENTS, CALIBRATIONS AND READINGS

15.5.6.3.1 The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

15.5.6.4 REDLINED DRAWINGS

15.5.6.4.1 The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

15.5.6.5 SPARES

15.5.6.5.1 The Contractor must provide one spare valve identical to the valves used in the fabrication of the manifold.

15.5.6.6 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

15.5.7 Training [Not used]

15.6 POTABLE WATER TANKS (SURVEY ITEM)

15.6.1 Identification

15.6.1.1 The CCG requires the opening, cleaning and preparation of the identified potable water tanks for inspection and survey. Coatings inspection will identify areas for spot re-coating, which will also be performed within this specification. The specification includes pressure testing of all tanks. The work also includes Chloride Ion testing prior to painting, under the recently released CCG for Potable Water Tank Epoxy Coating Standard. Upon completion of the work, the tanks are to be returned to a state of operational readiness.

15.6.1.2 Work in this specification must be performed in conjunction with work detailed in Sections 15.4 “Inspection of Potable Water Tanks Transfer Piping” and 15.5 “Replacement of Potable Water Piping”.

15.6.1.3 The CCG will provide an independent NACE inspector to oversee and verify the surface preparation, environmental conditions, application procedures, and curing conditions/times.

15.6.2 References

15.6.2.1 EQUIPMENT DATA

Equipment	Location (Frames)	Capacity (litres)	Surface Area (sq. m.)
#1 Port OB DB Potable Water Tk.	34-45	15320	93
#2 Port IB DB Potable Water Tk.	34-44	14502	91
#3 Starboard IB DB Potable Water Tk.	34-45	15320	93
#4 Starboard OB DB Potable Water Tk.	34-45	15975	93

15.6.2.2 MANUALS

15.6.2.2.1 Not used

15.6.2.3 REPORTS

15.6.2.3.1 The following reports are provided for guidance.

Report Name	Electronic File No.
2019-07-22 – International Ship Hull Coating Report – L014	2019-07-22 - International Ship Hull Coating Report - L014.pdf
CCGS Limnos M&R Report 2010 (International)	CCGS Limnos M&R Report 2010 (International).pdf
2019-06-24 - CCGS Limnos - Potable Water Tank Coating Repair (The Coating Inspector)	2019-06-26 PW TK Coating Change - Rev 1- Approved.pdf

15.6.2.4 DRAWINGS

Drawing Number	Drawing Title	Electronic File Name
47-H-504	Capacity Plan & Deadweight Scale	47-H-504.dwg

15.6.3 Regulations and Standards

15.6.3.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

15.6.4 Statement of Work

15.6.4.1 GENERAL & PUMP-OUT

- 15.6.4.1.1** The Contractor must give the TA 24 hours advance notice prior to working in any accommodation areas or office spaces. This will allow CCG adequate time to secure the areas.
- 15.6.4.1.2** The Contractor must follow CCG/8023-015 "Potable Water Tank Epoxy Coating Standard" for all work within this specification.
- 15.6.4.1.3** The Contractor must isolate all filling and transfer piping.
- 15.6.4.1.4** The Contractor must provide a per litre unit price and must bid on removal and disposal of 800 litres of potable water from each of the four (4) tanks. Any variance to that amount will be managed through PWGSC 1379 process.
- 15.6.4.2 ENTRY & CLEANING**
- 15.6.4.2.1** The Contractor must remove the tank drain plugs to aid in the draining of the potable water tanks.
- 15.6.4.2.2** The Contractor must have the tanks opened, ventilated and certified gas free as being "safe to enter" and "safe for hot work", following MOHS regulation and FSM procedures 7.B.3 and 7.B.4.
- 15.6.4.2.3** The Contractor must ensure that all tanks remaining open for inspection are certified for entry for the duration they are open for access.
- 15.6.4.2.4** The Contractor must remove all debris and sludge from the potable water tanks and dispose of it in accordance with federal, provincial and municipal regulations in effect.
- 15.6.4.2.5** The Contractor must provide a unit price per litre and a bid on removal of 800 litres of debris, sludge and foreign matter from the tanks. This price must include removal transportation and disposal of the material. Actual volume of material removed to be adjusted up/down by PWGSC 1379 process.
- 15.6.4.2.6** The Contractor must clean and wipe dry all tank surfaces of all sludge and debris. Subsequent to this initial clean, personnel entering the tanks must don work wear, boots and PPE that is contaminant free. Single use booties, gloves and coveralls are required to be used at all times.
- 15.6.4.2.7** The Contractor must protect level transducers from overspray and damage, for the duration of the work.
- 15.6.4.2.8** The Contractor must maintain a clean area at the entry point to the potable water tanks for personnel to don their protective gear and not contaminate said gear prior to tank entry. This clean area must be maintained over the duration of work on the tanks.
- 15.6.4.3 INSPECTIONS**
- 15.6.4.3.1** The Contractor must inspect all sounding pipes and striker plates and ensure that any foreign materials from or around the sounding pipes has been removed.

- 15.6.4.3.2** The Contractor must inspect the potable water tanks' two (2) crossover valves.
- 15.6.4.3.3** The Contractor must inspect all tank suction and discharge lines including the foot valves, vents, including screens, check valve balls and isolation caps where fitted.
- 15.6.4.3.4** The Contractor must identify all mechanical and structural defects (including weld defects) and propose repairs to the C/E and TA. The Contractor must not undertake any repair work until approval by the TA, which will be managed by PWGSC 1379 process.
- 15.6.4.4 COATINGS PREPARATION**
- 15.6.4.4.1** The Contractor must reference ISO 8501-1:2007 for all coatings related work under this specification.
- 15.6.4.4.2** The Contractor must provide the RO and TA the opportunity to inspect the tanks prior to application of coatings.
- 15.6.4.4.3** The Potable Water tank frames are stitch-welded and therefore require special coatings that can be guaranteed to perform under such conditions.
- 15.6.4.4.4** The International/Akzo-Nobel coatings applied in 2010 were discovered to be incompatible with stitch welding and were therefore completely removed in 2015 by blasting to bare metal. The tanks were then recoated using the following products by Specialty Polymer Coatings of Langley BC:
- a) Astek Marine Coat Acrylic Mortar
 - b) Two-component polyurethane SP-1386 DW
- 15.6.4.4.5** In 2019, approximately 50 square feet of the Specialty Polymer Coatings were found in need of treatment and recoating. At that time Royal Coatings of Belle Chasse LA was chosen and their following products were used:
- a) EasyPrep alkaline cleaner prior to coatings application;
 - b) EasyPrime epoxy primer to 4mls; followed by
 - c) EasyFlex epoxy paint to 9 mls.
- 15.6.4.4.6** The Contractor must survey the potable water tanks coatings and identify to the C/E and TA all areas that need to be prepared and recoated. The contractor must provide a per square meter unit price and bid on a total of three (3) square meters of removal, preparation and recoating per tank. Adjustments up/down to actual area recoated will be by PWGSC 1379 process
- 15.6.4.4.7** The Contractor must consult with the NACE inspector to determine the coatings products that will be used for the Potable Water tanks spot recoating. The Contractor must demonstrate to the TA and RO that the chosen coating products are approved for potable water and which may be guaranteed for stitch welded seams.
- 15.6.4.4.8** Upon completion of all repairs and inspections, the Contractor must prepare for the application of the new coating system, as per ISO 8501-1:2007. The Contractor must verify

all surfaces to be painted are thoroughly clean, dry and free of grease or oil before painting is commenced. All repaired weld seams and butts and all deficient areas of the existing coatings must be grit blasted to the state of cleanliness and profile recommended by the coatings manufacturer and further recommended by the NACE inspector.

- 15.6.4.4.9** During grit blasting, the Contractor must feather all transitions between the bare metal and painted areas.
- 15.6.4.4.10** When all coatings removal and profiling work has been completed, the Contractor must ensure that all visible traces of grit are removed with compressed air and vacuuming.
- 15.6.4.4.11** The Contractor must then clean all potable water tank interior surfaces with a solvent in accordance with SSPC-SP 1 Solvent Cleaning from the Steel Structures Painting Council (SSPC). The solvent used must be NSF/ANSI/CAN Standard 61 certified for use in potable water tanks. The tank must be allowed to dry out prior to re-entry, inspections and further work.
- 15.6.4.4.12** The Contractor must allow the NACE inspector to conduct Chloride Ion tests of each tank to determine the level of remaining chloride ions present on the tank surfaces. The contractor must follow Table 1 "Chloride ion testing guide" of CCG/8023-015 to determine the number of ion tests per tank that will be required.
- 15.6.4.4.13** The Contractor must provide a per unit price for each chloride ion test and bid on a total of four (4) tests. Adjustments up/down to actual number of tests will be by PWGSC 1379 process
- 15.6.4.4.14** The Contractor must record the Chloride Ion test results in a "Form 2: Chloride Ion Testing Log" from CCG/8023-015 and demonstrate to the TA and NACE inspector that the surface cleanliness for contaminants, after cleaning, is according to that recommended by the coatings manufacturer and further recommended by the NACE inspector.
- 15.6.4.4.15** If the Chloride Ion concentration is found to be greater than 5 µg/cm² in any tank(s), the tank(s) must be re-flushed with potable water, dried and re-tested, until the concentration is found to be 5 µg/cm² or less. All costs related to re-flushing and re-testing must be at the Contractor's expense.
- 15.6.4.4.16** The NACE inspector will inspect the tanks subsequent to the Contractor's preparatory work. Any additional preparatory work arising from any deficiencies identified in the inspection must be at the Contractor's expense.
- 15.6.4.5 NEW COATINGS**
- 15.6.4.5.1** The Contractor must inform the NACE inspector and TA and provide a notice of at least 24 hours of any scheduled activities related to the work described within this specification item.
- 15.6.4.5.2** The Contractor must not undertake any coatings work in PW tanks #1 or #4 until all work from section 15.4 is completed.

- 15.6.4.5.3** The Contractor must not undertake any coatings work in PW tank #1 until all work from sections 15.4 and 15.5 is completed.
- 15.6.4.5.4** The Contractor must allow the NACE inspector to verify the Contractor's conformity to the manufacturer's required procedures for the application of the coating product.
- 15.6.4.5.5** The Contractor must present the NACE inspector and TA with a coating schedule. The contractor must update the NACE inspector and the TA of any changes to this schedule.
- 15.6.4.5.6** Prior to coating application, the Contractor is informed that the NACE inspector will inspect the tanks for insufficiently adhered materials, insufficiently profiled areas and other cleaning/profiling deficiencies. Based on the NACE inspector's findings, the Contractor must correct, at the Contractor's expense, any areas deemed deficient.
- 15.6.4.5.7** The NACE inspector will inspect all materials immediately prior to their application. The Contractor must not use any materials that are rejected by the NACE inspector.
- 15.6.4.5.8** The Contractor must consult with and provide access to the NACE inspector in the coatings products care, handling and preparation, surface preparation and coating application for the products. The NACE inspector must be present during the entire process to verify conformity to the manufacturer's required procedures for the application of the coating product.
- 15.6.4.5.9** The Contractor must apply tank coatings only after all structural repairs have been carried out in the tank.
- 15.6.4.5.10** The Contractor must not allow the potable water tanks to be sealed and filled with any liquid until the coating has fully cured, as determined by the NACE inspector.
- 15.6.4.6 DISINFECTION & RETURN TO SERVICE**
- 15.6.4.6.1** The Contractor must provide the RO and TA the opportunity to inspect the tanks after the cure period of the coatings has been satisfied.
- 15.6.4.6.2** The Contractor must not disinfect or return to service the PW system until all work from sections 15.4 and 15.5 is completed.
- 15.6.4.6.3** The Contractor must remove any temporary piping blanks and return the potable water tanks and associated piping and equipment to service, including reinstallation of drain plugs, level transducers, sight glasses, vents, screens and any other equipment that was disabled or removed in order to fulfill this specification.
- 15.6.4.6.4** The Contractor must close all tank access covers after final inspection by the attending RO and the TA. Prior to reinstallation of a tank access cover, studs and bolts must be lubricated with grease/lubricant that is NSF/ANSI/CAN Standard 61 certified for use in drinking water applications.

- 15.6.4.6.5** The Contractor must supply and replace all tank access cover gaskets with new 1/8 gaskets approved for potable water service, as per NSF/ANSI/CAN Standard 61 “Drinking Water System Components – Health Effects”.
- 15.6.4.6.6** The Contractor must hydrostatically pressure test the tanks at a pressure of 0.15 bar (2.2 psi) for a 1-hour period. The Contractor must afford the attending RO and the TA to witness these pressure tests.
- 15.6.4.6.7** Once pressure tests are completed, the Contractor must disinfect the tanks as per FSM 7.A.12.
- 15.6.4.6.8** Following the disinfection period, the Contractor must drain and flush the potable water tanks as per FSM 7.A.12. Post-flush tank readings must be performed by an independent laboratory that is provincially licensed to perform these tests on potable water. Copies of all final test results must be presented to the TA.
- 15.6.4.6.9** The Contractor must dispose of all hyper-chlorinated water in accordance with Federal, Provincial, and Municipal Regulations in effect. All disposal certificates must be provided to the TA.
- 15.6.4.6.10** The Contractor must use a certified potable water source to re-fill the potable water tanks.
- 15.6.4.6.11** The Contractor must provide pricing for adding one (1) cubic meter of potable water to each of the four (4) tanks. Any variance to that amount will be managed through PWGSC 1379 process.

15.6.5 Inspections

- 15.6.5.1** The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional required work (including but not limited to repairs/replacements of components damaged by Contractor, additional cleaning, new grinding, gouging and welding, re-coating, re-inspections and re-testing) due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor’s expense:
- a) Hold Point #1 – The Contractor has determined that all tanks are safe to enter and safe for hot work;
 - b) Hold Point #2 – The Contractor has inspected the tanks after cleaning and agreed with the TA and NACE inspector on coatings removal and repair work to be performed, if any;
 - c) Hold Point # 3 – The Contractor has consulted with the TA and NACE inspector and agreed on the potable water tank compatible coating and cleaning products to be used for subsequent recoating work;
 - d) Hold Point # 4 – The Contractor has completed all structural repairs, scheduled inspection and received approval of the work performed from the TA and RO;

- e) Hold Point #5 – The Contractor has completed all coatings preparation work, scheduled inspections and received approval of work from the TA and NACE inspector;
- f) Hold Point #6 – The NACE inspector has performed the required number of Chloride Ion tests on all tanks as per CCG/8023-015, confirmed with the Contractor and TA that concentrations are below acceptable levels and provided the Chloride Ion Testing Log to the Contractor;
- g) Hold Point #7 – The Contractor has provided a coating schedule to the TA and NACE inspector for approval prior to application of any coatings;
- h) Hold Point #8 - The Contractor has arranged for and confirmed that the NACE inspector certified the paint product and preparation before application;
- i) Hold Point #9 – The Contractor has arranged for and confirmed that the NACE inspector and TA inspected and approved the preparation of the Potable Water tank areas, prior to first paint application;
- j) Hold Point #10 - The Contractor has arranged for and confirmed that the NACE inspector verified and approved each coat after application;
- k) Hold Point #11 – The Contractor has verified with the NACE inspector and TA that the tanks' re-coatings have sufficiently cured to allow the tanks to be filled with potable water;
- l) Hold Point #12 - The Contractor has returned the potable water tanks to operational readiness, witnessed by TA and RO. The contractor has provided documentation to the TA and RO of the use of gaskets and lubricants approved for potable water systems as per NSF/ANSI/CAN Standard 61;
- m) Hold Point #13 – The Contractor has successfully performed hydrostatic pressure tests of all tanks, witnessed by the TA and RO;
- n) Hold Point #14 – The Contractor has disinfected all tanks with hyper-chlorinated water for the required period, as per FSM 7.A.12, then drained and flushed the tanks, disposed of the hyper-chlorinated water, obtained disposal certificates and provided them to the Contractor; and
- o) Hold Point #15 – The Contractor has obtained independent provincially licensed laboratory potable water test results confirming tank chemical concentrations are within acceptable levels.

15.6.6 Testing and Trials

15.6.6.1 The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the following tests are conducted at the appropriate stages, as described in the specification:

- a) Chlorine Ion Tests of all tanks (performed by NACE inspector, witnessed by TA;
- b) Pressure test of all tanks (performed by Contractor, witnessed and approved by TA and RO); and
- c) Potable water tests (performed by provincial laboratory, witnessed by TA).

15.6.7 Documentation and Deliverables

15.6.7.1 GENERAL

15.6.7.1.1 The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book.

15.6.7.1.2 The Contractor must provide all documentation according to the Documentation section of the General Notes.

15.6.7.2 CERTIFICATES AND REPORT

15.6.7.2.1 The Contractor must obtain a potable water tanks coatings report from the NACE inspector. The Contractor must ensure the report details preparatory work, coatings products used and all relevant environmental conditions at the time any tank coatings were applied, as required in this specification and further determined by the NACE inspector. The Contractor must include the NACE inspector's report in a "Potable Water Tanks" report, detailing additional work performed under this specification, including deficiencies, repairs and volumes of liquids removed/returned/disposed of. The report must also include the following certificates and proofs:

- a) Copies of all tank entry certificates;
- b) Waste disposal certificate(s) for all sludge and debris removed under this specification;
- c) Survey credit documentation as per the Canada Shipping Act and associated regulations inspection requirements for Potable Water Tanks.
- d) Proof of access cover stud/bolt lubricant material compliance to NSF/ANSI/CAN Standard 61
- e) Proof of gasket material compliance to NSF/ANSI/CAN Standard 61
- f) Coating manufacturer's proof of coatings conformity to potable water use and for stitch welded seams;
- g) hyper-chlorinated water disposal certificates;
- h) Potable water laboratory report; and
- i) Completed Form 2: Chloride Ion Testing Log as per FSM 7.A.12

15.6.7.3 MEASUREMENTS, CALIBRATIONS AND READINGS

15.6.7.3.1 The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

15.6.7.4 REDLINED DRAWINGS

15.6.7.4.1 The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

15.6.7.5 SPARES [NOT USED]

15.6.7.6 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

15.6.8 Training [Not used]

15.7 FUEL TANKS (SURVEY ITEM)

15.7.1 Identification

15.7.1.1 The CCG requires the opening, cleaning and preparation of the identified fuel tanks for inspection and survey. The specification includes pressure testing of all tanks. Upon completion of the work, the tanks are to be returned to a state of operational readiness.

15.7.2 References

15.7.2.1 EQUIPMENT DATA

15.7.2.1.1 The following equipment data is provided for guidance.

Equipment	Location (Frames)	Capacity (litres)
Emergency Generator Fuel Oil Tank	42-44	468
#1 Port DB Fuel Tk.	60-69	8,665
#1 Starboard DB Fuel Tk.	60-69	8,665
#2 Port DB Fuel Tk.	47-60	20,702
#2 Starboard DB Fuel Tk.	47-60	19,684
#3 Port DB Fuel Tk.	18-26	11,951
#3 Starboard DB Fuel Tk.	18-26	11,951
Fuel Oil Day Tank	18 ½ - 21	1,137

15.7.2.2 MANUALS

15.7.2.2.1 Not used

15.7.2.3 REPORTS

15.7.2.3.1 Not used

15.7.2.4 DRAWINGS

Drawing Number	Drawing Title	Electronic File Name
47-H-504	Capacity Plan & Deadweight Scale	47-H-504.dwg

15.7.3 Regulations and Standards

15.7.3.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

15.7.4 Statement of Work

- 15.7.4.1** The Contractor must demonstrate in their bid that they can provide a dedicated on-site, clean storage capacity for marine distillate diesel fuels of up to 15,000 litres for the duration of the contract. The storage must not allow fuels from other sources to be mixed with the fuel removed from the vessel.
- 15.7.4.2** The Contractor must transfer the vessel's fuel supply from the Double Bottom tanks Tank into the aforementioned Contractor-supplied storage tank for the duration of the contract.
- 15.7.4.3** The Contractor must transfer the vessel's fuel supply from the fuel oil day tank and the emergency generator fuel oil tank into the aforementioned Contractor supplied storage tank for the duration of the contract. If fuel volume removed from the vessel exceeds the capacity of the on-site storage capacity of the yard, the yard must dispose of the excess fuel according to federal, provincial and municipal regulations in effect. The Contractor must provide a price per litre of fuel disposal. The final price for disposal will be adjusted via PWGSC 1379 process.
- 15.7.4.4** The Contractor must provide a per liter unit price and bid on removing and storing 12,000 liters of fuel from all tanks. Adjustments up/down to actual volume of fuel stored/disposed of will be by PWGSC 1379 process.
- 15.7.4.5** Upon completion of the work within this specification, the Contractor must return all the vessel's stored fuel to the vessel's double bottom fuel tanks via an approved diesel fuel/water separating filtration system. The system's filtration particle size must be 25 microns or less.
- 15.7.4.6** The Contractor must have the tanks opened, ventilated and certified gas free as being "safe to enter" and "safe for hot work", following MOHS regulation and FSM procedures 7.B.3 and 7.B.4.
- 15.7.4.7** The Contractor must clean all tank surfaces of all sludge and debris and wiped dry.
- 15.7.4.8** The Contractor must remove from the vessel all debris and sludge and dispose of it according to federal and provincial regulations. The Contractor must bid on disposing 1000 liters of waste fuel, sludge and debris. Adjustments up/down to actual volume of material removed will be by PWGSC 1379 process

- 15.7.4.9** The Contractor must inspect all sounding pipes and ensure that any foreign materials from or around the sounding pipes has been removed.
- 15.7.4.10** The Contractor must inspect all tank vents, including fire screens, check valve balls and isolation caps where fitted.
- 15.7.4.11** The Contractor must take UT readings from within the double bottom fuel tanks; The Contractor must bid on 100 shots total and provide a unit price per UT Shot. Adjustments up/down to actual number of UT Shots of performed will be by PWGSC 1379 process.
- 15.7.4.12** The Contractor must inspect the fuel tanks with the TA. On the basis of the inspection, the Contractor and TA will determine the distribution, locations and total number of UT shots to be taken.
- 15.7.4.13** The Contractor must provide the UT shot results and identify all mechanical, structural and weld defects and proposed repairs to the TA and C/E. The Contractor must not undertake any repair work until approval by TA, which will be managed by PWGSC 1379 process.
- 15.7.4.14** The Contractor must allow the TA the opportunity to inspect the tanks and witness the reinstallation of all man-hole covers using Contractor supplied new oil-resistant cover gaskets.
- 15.7.4.15** The Contractor must pressure test the tanks, using air at a pressure of 0.15 bar (2.2 psi) for a 1-hour period. The Contractor must afford the attending RO and the TA the opportunity to witness these pressure tests.
- 15.7.4.16** The Contractor must label, remove, clean, inspect and rebuild the following valves associated with the double bottom fuel tanks;
- a) Four (4) fuel tank valves (1 each on #1 Port & Starboard and #2 Port & Starboard);
 - b) Two (2) quick closing valves (1 each on #3 Port & Starboard); and
 - c) Two (2) crossover valves for #3.
- 15.7.4.17** Packing and flange gaskets for all fuel tank valves must be new and CFM.
- 15.7.4.18** The Contractor must label, remove, clean, assess and rebuild the Fuel Oil Day Tank's self-closing valve and both suction valves. Packing and flange gaskets must be CFM.
- 15.7.4.19** The Contractor must label, remove, clean, assess and rebuild the Emergency Generator Fuel Oil Tank's suction valve and self-closing valve. Packing and flange gaskets must be CFM.
- 15.7.4.20** The Contractor must lay out all rebuilt valves and give the TA the opportunity to inspect all rebuilt valves prior to installation.
- 15.7.4.21** The Contractor must pressure test all rebuilt valves and prove to the TA and RO that all rebuilt valves function properly after re-installation.
- 15.7.4.22** The Contractor must return the tanks to a state of operational readiness.

15.7.5 Inspections

15.7.5.1 The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional required work (including but not limited to repairs/replacements of components damaged by Contractor, additional cleaning, new grinding, gouging and welding, coatings, re-inspections and re-testing) due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor's expense:

- a) Hold Point #1 – The Contractor has determined that all tanks are safe to enter and safe for hot work;
- b) Hold Point #2 – The Contractor has inspected the tanks after cleaning and agreed with the TA on repair work to be performed, if any;
- c) Hold Point # 3 – The Contractor has completed all repairs, scheduled inspection and received approval of the work performed from the TA and RO;
- d) Hold Point #4 – The Contractor has rebuilt all identified valves, laid the labeled and re-assembled valves out and received approval of the work performed from the TA and RO;
- e) Hold Point #5 - The Contractor has confirmed function of all identified valves after re-installation, witnessed by TA and RO;
- f) Hold Point #6 – The Contractor has successfully performed the pressure tests of all tanks, witnessed by the TA and RO; and
- g) Hold Point #7 – The Contractor has returned all tanks to a state of operational readiness, witnessed by TA and RO.

15.7.6 Testing & Trials

15.7.6.1 The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the following tests are conducted at the appropriate stages, as described in the specification:

- a) Functionality of all rebuilt and re-assembled valves; and
- b) pressure test of all tanks (performed by Contractor, witnessed and approved by TA and RO).

15.7.7 Documentation and Deliverables

15.7.7.1 GENERAL

15.7.7.1.1 The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book.

15.7.7.1.2 The Contractor must provide all documentation according to the Documentation section of the General Notes.

15.7.7.2 CERTIFICATES

15.7.7.2.1 The Contractor must provide the TA:

- a) All tank entry certificates;
- b) Waste disposal certificate(s) for all sludge and debris removed under this specification; and
- c) Survey credit documentation as per the Canada Shipping Act and associated regulations inspection requirements for Fuel Tanks.

15.7.7.3 REPORTS

15.7.7.3.1 The Contractor must provide the TA a “Fuel Tanks” report, detailing work performed under this specification, including deficiencies, repairs and volumes of liquids removed/returned/disposed of.

15.7.7.4 MEASUREMENTS, CALIBRATIONS AND READINGS

15.7.7.4.1 The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

15.7.7.5 REDLINED DRAWINGS

15.7.7.5.1 The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

15.7.7.6 SPARES [NOT USED]

15.7.7.7 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

15.7.8 Training [Not used]

15.8 LUBE & HYDRAULIC OIL STORAGE TANKS (SURVEY ITEM)

15.8.1 Identification

15.8.1.1 The CCG requires the opening, cleaning and preparation of the identified lube and hydraulic oil tanks for inspection and survey. The specification includes pressure testing of both tanks. Upon completion of the work, the tanks are to be returned to a state of operational readiness.

15.8.2 References

15.8.2.1 EQUIPMENT DATA

15.8.2.1.1 The following equipment data is provided for guidance.

Equipment	Location (Frames)	Capacity (litres)
Port Lube Oil Storage Tank	18-19	696
Starboard Hydraulic Oil Storage Tank	18-19	696

15.8.2.2 MANUALS

15.8.2.2.1 Not used

15.8.2.3 REPORTS

15.8.2.3.1 Not used

15.8.2.4 DRAWINGS

Drawing Number	Drawing Title	Electronic File Name
47-H-504	Capacity Plan & Deadweight Scale	47-H-504.dwg

15.8.3 Regulations and Standards

15.8.3.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

15.8.4 Statement of Work

15.8.4.1 The Contractor must transfer the vessel's lube oil supply of no more than 200 liters from the Port lube oil storage tank into a clean Contractor supplied storage tank for the duration of the contract. The Contractor must provide a per liter unit price and bid on removing and storing 150 liters of lube oil to be adjusted up/down by PWGSC 1379 process. Upon completion of the Port lube oil tank's inspection the Contractor must return the vessel's stored lube oil to its original location with the use of a 20 micron particle filter.

15.8.4.2 The Contractor must transfer the vessel's Hydraulic oil supply of no more than 200 liters from the Starboard lube oil storage tank into a clean Contractor supplied storage tank for the duration of the contract. The Contractor must provide a per liter unit price and bid on removing and storing 150 liters of hydraulic oil to be adjusted up/down by PWGSC 1379 process. Upon completion of the Starboard hydraulic oil tank's inspection the Contractor must return the vessel's stored coolant to its original location.

15.8.4.3 The Contractor must have the tanks opened, ventilated and certified gas free as being "safe to enter" and "safe for hot work".

15.8.4.4 The Contractor must clean and wipe dry all tank surfaces of all sludge and debris.

15.8.4.5 The Contractor must bid on disposing 20 liters of waste oil, hydraulic oil, sludge and debris, in accordance with federal, provincial and municipal regulations. Adjustments up/down to actual volume of material removed will be by PWGSC 1379 process.

15.8.4.6 The Contractor must inspect all tank vents, including fire screens, check valve balls and isolation caps where fitted.

- 15.8.4.7** The Contractor must identify all mechanical and structural defects (including weld defects) and propose repairs to the C/E and TA. The Contractor must not undertake any repair work until approval by the TA and managed by PWGSC 1379 process.
- 15.8.4.8** The Contractor must allow the TA and RO the opportunity to inspect the tanks.
- 15.8.4.9** The Contractor must pressure test the tanks, using air at a pressure of 0.15 bar (2.2 psi) for a 1-hour period. The Contractor must afford the attending RO and the TA the opportunity to witness these pressure tests.
- 15.8.4.10** Prior to closing the tanks, the Contractor must ensure that tank interiors are free of all foreign objects. The Contractor must allow the TA the opportunity to inspect the tanks and witness the reinstallation of all access covers using Contractor supplied new oil-resistant cover gaskets.

15.8.5 Inspections

- 15.8.5.1** The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional required work (including but not limited to repairs/replacements of components damaged by Contractor, additional cleaning, new grinding, gouging and welding, coatings, re-inspections and re-testing) due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor's expense:
- a) Hold Point #1 – The Contractor has determined that all tanks are safe to enter and safe for hot work;
 - b) Hold Point #2 – The Contractor has inspected the tanks after cleaning and agreed with the TA on repair work to be performed, if any;
 - c) Hold Point # 3 – The Contractor has completed all repairs, scheduled inspection and received approval of the work from the TA and RO;
 - d) Hold Point #4 – The Contractor has successfully performed the pressure tests of all tanks, witnessed by the TA and RO; and
 - e) Hold Point #5 – The Contractor has returned all tanks to a state of operational readiness, witnessed by TA and RO.

15.8.6 Testing & Trials

- 15.8.6.1** The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the pressure test of all tanks (performed by Contractor, witnessed and approved by TA and RO).

15.8.7 Documentation and Deliverables

15.8.7.1 GENERAL

- 15.8.7.1.1** The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such

deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book.

15.8.7.1.2 The Contractor must provide all documentation according to the Documentation section of the General Notes.

15.8.7.2 CERTIFICATES

15.8.7.2.1 The Contractor must provide the TA:

- a) All tank entry certificates;
- b) Waste disposal certificate(s) for all oil, sludge and debris removed under this specification; and
- c) Survey credit documentation as per the Canada Shipping Act and associated regulations inspection requirements for Lube and Hydraulic Oil Storage Tanks.

15.8.7.3 REPORTS

15.8.7.3.1 The Contractor must provide the TA a “Lube and Hydraulic Oil Storage Tanks” report, detailing work performed under this specification, including deficiencies, repairs and volumes of liquids removed/returned/disposed of.

15.8.7.4 MEASUREMENTS, CALIBRATIONS AND READINGS

15.8.7.4.1 The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

15.8.7.5 REDLINED DRAWINGS

15.8.7.5.1 The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

15.8.7.6 SPARES [NOT USED]

15.8.7.7 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

15.8.8 Training [Not used]

15.9 COFFERDAMS, ECHO SOUNDER COMPARTMENTS AND AFT VOID SPACES (SURVEY ITEM)

15.9.1 Identification

15.9.1.1 Significant coating failure and corrosion is present in the identified double bottom (DB) spaces and are detailed in a referenced report. CCG requires Inspections to identify areas requiring coatings removal, steel work and epoxy repairs and re-coating, which will also be performed within this specification. Repair work will be performed coincidentally with any identified hull exterior repairs and be completed before hull exterior coatings are applied. At the end of the work, the DB spaces will be returned to operational readiness.

15.9.1.2 Subsequent to repair completion, the CCG requires the preparation of the DB spaces for regulatory inspection and survey.

15.9.1.3 A CCG contracted level 2 NACE inspector will oversee the substrate preparation, epoxy repairs, and coatings preparation and work.

15.9.1.4 AKZONOBEL/INTERNATIONAL TECHNICAL SERVICE REPRESENTATIVE (TSR)

Kevin Leigh, Senior Certified Coatings Inspector #13816

Cell: 519 328 6601

Email: kevin@jbicoatings.com

JBI Coatings

ON CANADA

www.international-marine.com

www.akzonobel.com

15.9.1.5 Akzo-Nobel/International Paints and Belzona Technical Service Representatives (TSR) will support the application of their respective epoxy repair and paint coatings.

15.9.1.6 BELZONA INC. TECHNICAL SERVICE REPRESENTATIVE (TSR)

Jon Ferrer, Technical Sales Manager

Cell: (416) 889-3134

Tel: (905) 737-1515

Email: jferrer@belzonagreatlakes.com

51-588 Edward Avenue, Richmond Hill, ON L4C 9Y6

15.9.1.7 CCG CONTRACTED NACE INSPECTOR

To be confirmed.

15.9.2 References

15.9.2.1 EQUIPMENT DATA

15.9.2.1.1 The following equipment data is provided for guidance.

Equipment	Location (Frames)	Surface Area (sq. Meters)
Echo Sounder Compt. Port	47-55	29
Echo Sounder Compt. Starboard	47-55	29
#1 Cofferdam	44-47	86
#2 Cofferdam	32-34	65

Aft Void Space Port side	18-32	121
Aft Void Space Starboard side	18-32	121

Equipment	Manufacture/Equipment Details
Hull plating	ASTM A131 Lloyds Grade "E" Shipbuilding Steel. Thicknesses as per shell expansion drawing 47-H-3
Structural ribs & stringers	Unknown. Assume ANSI A36 carbon steel
Steel repair epoxy	Belzona 111 Super Metal
AkzoNobel/International Hull Coatings – Void Spaces, undercoat	Intershield ENA300 – Bronze
AkzoNobel/International Hull Coatings – Void Spaces, overcoat	Intershield ENA301 – Aluminum
AkzoNobel/International Hull Coatings – Void Spaces, curing agent	ENA 303

15.9.2.2 MANUALS

MANUAL TITLE	ELECTRONIC FILE NAME
Belzona 1111 Product Specification Sheet FN10132	UK1111ps_10132.pdf
Belzona 1111 Product Instructions for Use FN10132	UK1111if_10132.pdf
Intershield 300 Epoxy	E-Program Files-AN-ConnectManager-SSIS-TDS-PDF- Intershield_300_eng_A4_20220329.pdf

15.9.2.3 REPORTS

Report Name	Electronic File No.
CCGS Limnos - HIMP Inspection of Void Spaces & Cofferdams	Limnos - HIMP Void Spaces Report - 2022-12-02.pdf

15.9.2.4 DRAWINGS

Drawing Number	Drawing Title	Electronic File Name
47-H-504	Capacity Plan & Deadweight Scale	47-H-504.dwg

15.9.3 Regulations and Standards

- 15.9.3.1** All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

15.9.4 General

- 15.9.4.1.1** The Contractor must obtain the most up-to-date product Technical Data Sheets of coatings used from International Paints and Belzona Inc.
- 15.9.4.1.2** Unless otherwise stated, all staging, screens, heaters, other environmental control equipment, water-proof lighting and any other support services, equipment and material necessary to perform the tasks set out in this specification, including inspections by the RO, TA and NACE inspector, must be supplied by the Contractor and removed by the Contractor on completion of the work.
- 15.9.4.1.3** Any additional requirements deemed necessary for void space access or blasting/coating/curing activities is the responsibility of the Contractor and must be included in their pricing. This includes inserts in hull plating for access, ventilation, sheltering or heating/curing activities.
- 15.9.4.1.4** The Contractor must allow the NACE inspector, RO and/or TA unhindered access to the echosounder, cofferdam and void spaces during working hours to witness any work performed within the specification.
- 15.9.4.1.5** A CCG contracted level 3 NACE inspector will record all relevant data and findings in a Coatings Preparation and Application Report which will be provided to the TA and the Contractor.
- 15.9.4.1.6** The Contractor must conform to CCG/8009-003 for all marked up drawings.
- 15.9.4.1.7** The Contractor must determine and obtain approval from the TA for necessary cut-outs required to be made to hull plating to permit entry/exit of equipment, drainage and ventilation during the course of work within this specification. Wherever possible the contractor must make use of cut-outs required for hull repairs and only perform additional cut-outs where the repair cut-outs are determined to be insufficient.

15.9.5 Entry and Cleaning

- 15.9.5.1.1** The Contractor must have the DB echosounder, cofferdam and void spaces opened, ventilated and certified gas free as being “safe to enter” and “safe for hot work”, following Transport Canada Marine Safety TP3177E and FSM procedures 7.B.3 and 7.B.4. The certificates must be given to the TA and copies posted by the tank manhole and gangway. Certifications must be renewed each day.
- 15.9.5.1.2** Within 48 hours after the vessel has been dry-docked, the Contractor must clean all sludge and debris from all DB echosounder, cofferdam and void space surfaces and wipe dry.

- 15.9.5.1.3** The Contractor must bid on disposing 60 liters of waste bilge water, sludge and debris, in accordance with federal, provincial and municipal regulations. Adjustments up/down to actual volume of material removed will be by PWGSC 1379 process.
- 15.9.5.1.4** The Contractor must inspect all sounding pipes and ensure that any foreign materials from or around the sounding pipes has been removed.
- 15.9.5.2 INSPECTION AND WORKPLAN**
- 15.9.5.2.1** The Contractor must determine, with the RO and TA, areas of plating corrosion to be UT tested. The Contractor must provide a copy of the shell expansion and mark-up the areas to be UT tested, in conjunction with the UT testing of hull exterior.
- 15.9.5.2.2** The Contractor must inspect all tank vents, including screens, check valve balls and isolation caps where fitted.
- 15.9.5.2.3** Within 72 hours after the vessel has been dry-docked, the Contractor must create a DB Void Spaces Workplan. Which will identify equipment access locations, water- and grit-blasting, steel repairs, new coatings and all inspections.
- 15.9.5.2.4** The Contractor must provide the following in the DB Void Spaces Workplan:
- d) Prepare a DB Void Space Surfaces drawing;
 - e) Conduct a visual inspection of the DB spaces with the NACE inspector, RO, TA and Belzona TSR and compare against the findings of the “CCGS Limnos - HIMP Inspection of Void Spaces & Cofferdams” report;
 - f) Determine with the RO and TA locations and dimensions of hull inserts for equipment access, ventilation and drainage, to be recorded on a marked-up copy of the DB Void Space Surfaces drawing.
 - g) Consult with the NACE inspector, RO, TA and Belzona TSR the results of the visual inspection of DB spaces to determine:
 - i) Areas requiring protection from blasting; and
 - ii) Types and locations of repairs that will be required. Findings to be recorded on a marked-up copy of the DB Void Space Surfaces drawing. The marking system must be based on the nomenclature and criteria given in the “Degrees/Extents of Corrosion and Repair Methods” table, below.

DB Degrees/Extents* of Corrosion and Repair Methods		
Condition	Corrosion Description	Type of Repair
Deep Grooves	>1/3 of original plate thickness and > 15% intensity	Gouge and reweld bead
Deep pits	>1/3 of original plate thickness and > 15% intensity	Insert plate welding

Deep but scattered pits/grooves	> 1/3 of original plate thickness but ≤ 15% intensity	Insert plate or overlay welding
Shallow but extensive pits/grooves	< 1/3 of original thickness but > 15% intensity	Overlay welding or insert plate welding or epoxy
Shallow, scattered Pits/grooves	< 1/3 of original thickness and ≤ 15% intensity	Repair epoxy
* Note: Percentages are based on panel areas between adjacent transverse frames and from longitudinal stiffener to longitudinal stiffener		

h) Epoxy Repair extents of coverage, to be recorded on a marked-up copy of the DB Void Space Surfaces drawing.

i) Coatings preparation and application procedure, including but not limited to area coverages, minimum/maximum overcoat and cure times and epoxy/coatings compatibility measures.

15.9.5.3 COATINGS REMOVAL AND PROFILING - ECHOSOUNDER COMPARTMENTS

15.9.5.3.1 Within 48 hours after the vessel has been dry-docked, the Contractor must clean all sludge and debris from the Echounder compartments and wipe dry.

15.9.5.3.2 The Contractor must remove failed coatings in all areas of visible rust, blistering, loss of adhesion and mechanical failure, as well as profile all bare steel within the echounder compartments. Grit-blasting must not be used. An industrial laser ablation or kinetic impact coatings removal and profiling tool i.e. "Bristle Blaster" must be used. Grinders and sanders may be used only where laser ablation or kinetic impact tools are unable to access the coatings, as these methods can imbed impurities into the steel substrate and provide a less uniform holding profile. The Contractor must submit a price per square meter cost for and must bid on 2 square meters of coatings removal and profiling work. Based on actual work required, pricing will be adjusted up/down by PWGSC 1379 process.

15.9.5.3.3 During removal and profiling work, manholes in the internal structures of the vessel must be held under negative pressure while blasting to prevent the ingress of dust into the vessel.

15.9.5.4 COATINGS REMOVAL AND PROFILING – OTHER VOID SPACES

15.9.5.4.1 Within 72 hours after the vessel has been dry-docked, The Contractor must prepare the remaining defined void spaces (#1 and #2 cofferdams and port and starboard aft void spaces) for water- and grit-blasting

15.9.5.4.2 The Contractor must plug all sounding vents.

15.9.5.4.3 The Contractor must clean all defined void space interior surfaces in preparation for the application of protective coatings. The Contractor must remove all chlorides, dirt and oil

from the surfaces by way of high-pressure water washing (3,000-5,000 PSI). Chlorides must be checked following washing. Chlorides must be at or below 5 mg/cm². If chloride ion level, as specified, is not attained, the Contractor must re-wash the affected area using a soluble salt remover, such as Chlor-Rid Liquid Salt Remover, at a dilution ratio of 1:100, sprayed on the affected area at a minimum of 3,000 psi.

- 15.9.5.4.4** The Contractor must remove all the resulting liquid and debris from the defined void spaces and wipe all surfaces dry.
- 15.9.5.4.5** The Contractor must ensure that equipment that could be damaged by grit blast is protected from direct blast or debris, as determined in the DB Void Spaces Workplan. This includes but is not limited to extended spindles, universals, valves, transducers and any electrical and mechanical equipment inside the void spaces or in close proximity to openings.
- 15.9.5.4.6** The Contractor must hold the Manholes in the internal structures of the vessel under negative pressure while grit-blasting to prevent the ingress of dust into the vessel.
- 15.9.5.4.7** The Contractor must get approval from the RO and TA on any inserts to be cut in the vessel for preparation or coating requirements.
- 15.9.5.4.8** Prior to grit-blasting, the Contractor must ground smooth all sharp edges found within the defined void spaces to form a rounded contour of minimum edge radius of two (2) mm. This two (2) mm rounding may be achieved by minimum two (2) strokes of a grinding disc or as recommended by NACE inspector.
- 15.9.5.4.9** The Contractor must grit-blast to bare metal to SSPC SP-10/NACE 2 (Near White) to achieve an angular surface profile of 50 to 75 microns (2-3 mils) for 100% of interior surfaces of the defined void spaces. The Contractor must submit a price per square meter cost and must bid on 393 square meters. Based on actual work required, pricing will be adjusted up/down by PWGSC 1379 process:
- 15.9.5.5 POST CLEANING INSPECTION – ALL DB VOID SPACES**
 - 15.9.5.5.1** Immediately upon completion of cleaning in each DB void space, the Contractor must force warm, dry air through each void space to prevent flash rusting.
 - 15.9.5.5.2** The Contractor must remove all abrasive residue by using compressed air and industrial vacuum with bristle attachment. The Contractor must provide copies of disposal certificates to the TA.
 - 15.9.5.5.3** The Contractor must arrange for an inspection of the void spaces with the NACE inspector and TA. Any work found to be defective by the NACE inspector must be corrected at the expense of the Contractor.
- 15.9.5.6 STEEL REPAIRS**
 - 15.9.5.6.1** The Contractor must arrange an inspection of the DB void spaces with the RO and TA and review the DB void spaces' exposed surfaces and UT survey results against the DB Void

Spaces Workplan. The Contractor must identify additional hull plating, structural members and weld areas of concern, if any, with the RO and TA and update the marked up copy of the DB Void Spaces drawing. Based on the revised marked up copy, the Contractor must perform repairs to hull plating, structural members and welds.

- 15.9.5.6.2** All Contractor welding must conform to CSA Standards W47.1:19 - Annex M and W59-18 and acceptable to the RO.
- 15.9.5.6.3** The Contractor or Sub-contractors performing the welding fabrication work must be certified by the CWB in accordance with CSA Standards W47.1:19-Annex M, Division 1 or 2 "Certification of Companies for Fusion Welding of Steel" and Qualification of welding personnel and welding procedures for marine applications". Current copies of the following must be supplied to the TA:
- a) Company certification validation certificates;
 - b) Welding Procedures Specifications (WPS) and data sheets (WPDS) with supporting Procedure Qualification Records (PQRs);
 - c) Welding supervisor and welder qualification certificates and cards; and,
 - d) Visual Inspector qualification card.
- 15.9.5.6.4** The Contractor must arrange all completed welds to be examined by third-party welding inspectors that are certified by the Canadian Welding Bureau (CWB) to CSA W178.2, Level 2 or 3 having code endorsements for CSA Standards W47.1:19 and W59. Current copies of certification must be provided to the TA in advance of performing the inspections and formal inspection reports must be supplied to the TA upon request.
- 15.9.5.6.5** The Contractor must supply the WPS, WPDS and PQRs to the TA and RO for the seam, overlay and butt welding at least 24 hours prior to commencement of welding.
- 15.9.5.6.6** The Contractor must ensure all DB void spaces weld repairs are approved by the RO and TA prior to the application of any hull exterior hull coatings.
- 15.9.5.6.7** All materials and consumables required to fulfill this specification must be CFM and new.
- 15.9.5.6.8** The Contractor must use plate inserts that are of the same thickness as the original plate and is International Association of Classification Societies (IACS) approved equivalent to Lloyds grade "E" shipbuilding steel. Steel must be accompanied by mill certificate.
- 15.9.5.6.9** The Contractor must use A36 hot rolled steel for structural members, of the same type and dimensions as the original member(s). Steel must be accompanied by mill certificate.
- 15.9.5.6.10** The Contractor must use Shielded Metal Arc Welding (SMAW) or Flux-Cored Arc Welding (FCAW). Electrodes must conform to approved WPS, WPDS and PQR.
- 15.9.5.6.11** The Contractor must conform to the following for all structural welds identified as deficient in the DB Void Spaces workplan:
- e) The Contractor must gouge deficient welds to a depth of 6 mm and re-weld the seam areas with multiple passes finishing the weld off with a cap pass. The TA must

be given the opportunity to inspect and approve the completed gouging/grinding work, before welding work has commenced;

- f) The Contractor must ensure the finished weld profile is between 2 mm to 3mm above the adjoining plate, but in no place more than 3 mm above;
- g) The Contractor must subject weld repairs to NDT 100% Visual Testing (VT), checked by a level 2 or 3 certified welding inspector; and
- h) Welds deemed deficient by NDT must be repaired as per CSA W59 for static structures. All additional work as a result of failed NDT, including the cost of re-inspection, must be at the expense of the Contractor.

15.9.5.6.12 The Contractor must conform to the following for all overlay welding in areas requiring this repair in the DB Void Spaces Workplan:

- a) Overlay welding must not exceed 200 mm x 200 mm in any one area affected by pitting;
- b) All overlay welds must conform to CSA W59 for static structures;
- c) The Contractor must subject weld repairs to NDT 100% VT and 10% Ultrasonic Testing (UT), checked by a CGSB 48.0712 level 2 certified welding inspector;
- d) The Contractor must grind out and re-weld all weld repairs that fail the welding inspector's NDT. Repaired welds must be inspected by a level 2 certified inspector. All additional work as a result of failed NDT, including the cost of re-inspection, must be at the expense of the Contractor.

15.9.5.6.13 The Contractor must conform to the following for all insert plate welding (including inserts required by Contractor to perform work) in areas requiring this work in the DB Void Spaces Workplan:

- a) Insert plate preparation, fitting and welding must conform to CSA W59-19;
- b) Plate insert welds must be NDT 100% Magnetic Particle (MT) and 25% UT, tested by an inspector certified to CGSB 48.9712 certified to at least level 2 or 3. Weld acceptance criteria as per CSA W59-19 for static structures; and
- c) The Contractor must grind out and re-weld all weld repairs that fail the welding inspector's NDT. Repaired welds must be inspected by a level CGSB 48.9712 level 2 or 3 inspector. All additional work as a result of failed NDT, including the cost of re-inspection, must be at the expense of the Contractor.

15.9.5.6.14 Any affected external hull coatings in way of hot work performed in the DB void spaces must be properly cleaned, prepared and coated as detailed in section 11.4 "Underwater Hull Area ", after inserts have been re-installed and welds tested.

15.9.5.6.15 The Contractor must submit a price per square meter cost for weld repairs and must bid on the following areas of each type of repair in each space. Any discrepancies between bid amounts and actual amounts of work performed will be adjusted up/down by PWGSC 1379 process:

- a) All DB spaces
 - i) Below top of turn of bilge - Repair of 10 linear meters of seams and butts welds;

- ii) Tank top to top of bilge - Repair of 5 linear meters of seams and butts welds;
- iii) Underside of Tank Top – Repair of 3 linear meters of seams and butt welds;
- b) #1 Cofferdam
 - i) Below top of turn of bilge – Overlay pad welding to 7% (2 m²) of surfaces;
 - ii) Below top of turn of bilge - Insert Plate Welding to 2% (0.5 m²) of surfaces;
- c) #2 Cofferdam, below top of turn of bilge – Overlay pad welding to 10% (2 m²) of surfaces;
- d) Void space, port side;
 - i) Below top of turn of bilge – Overlay pad welding to 4% (m²) of surfaces;
 - ii) Tank top to top of turn of bilge – Overlay pad welding to 5% (1 m²) of surfaces;
- e) Void space, starboard side
 - i) Below top of turn of bilge – Overlay pad welding to 4% (1 m²) of surfaces;
 - ii) Underside of tank top to top of turn of bilge – Overlay pad welding to 5% (1 m²) of surfaces;

15.9.5.6.16 The Contractor must pneumatically test each DB void space to the satisfaction of the RO and TA. The Contractor must be responsible for the installation and removal of blanks, vent head removals, and other measures to successfully perform the tests. Any additional work as a result of a failed pneumatic test must be at the expense of the Contractor.

15.9.5.7 EPOXY REPAIRS

15.9.5.7.1 The Contractor must not perform any epoxy repairs in a DB void space until all steel work in that void space has been completed and approved by the RO.

15.9.5.7.2 The Belzona FSR will record all relevant data and findings in a DB Epoxy Repairs Report which will be provided to the TA and the Contractor.

15.9.5.7.3 The Contractor's personnel performing epoxy repairs must have previous experience in application of Belzona or similar epoxy repair products in marine applications.

15.9.5.7.4 The Contractor must determine, with the RO, TA and Belzona TSR all aspects of epoxy repair coatings and conform to the Belzona application instructions and other guidance provided by the Belzona TSR.

15.9.5.7.5 The Contractor must determine, with the Akzo-Nobel/International TSR and Belzona TSR, on epoxy preparation, tie-coats, cure times and any other measures to ensure compatibility and adhesion between their respective products. The Contractor must review and receive approval of such measures from the TA.

15.9.5.7.6 The Contractor must conform to the following for all repair epoxy work in areas requiring this repair in the DB Void Spaces Workplan:

- a) All epoxy repair work must be performed under the supervision of the Belzona TSR;

- b) Belzona 1111 "Super Metal" two-part repair epoxy must be used;
- c) The Belzona TSR will inspect all materials immediately prior to their application. The Contractor must not use any materials that are rejected by the TSR;
- d) All surfaces receiving an application of this product must have a surface profile of minimum 1.5 mils (38 Microns) but preferably 3 mils (75 microns) and a surface cleanliness of SSPC-SP11;
- e) Surfaces to receive an application of this product must be thoroughly degreased with Belzona 9111 cleaner/degreaser or Methyl Ethyl Ketone prior to application of the epoxy;
- f) The Contractor must refer and adhere to all other epoxy manufacturer's application instructions as per "Belzona 1111 FN10132 (Super Metal) Instructions for use";
- g) Inspection of areas treated with repair epoxy must be inspected by the Belzona TSR, RO and TA. Any areas that are determined to be deficient by the RO or Belzona TSR must be corrected according to the instructions given by the Belzona TSR and must be at the expense of the Contractor; and
- h) If a second repair coat is required by the Belzona TSR or RO, the Contractor must note the short overcoat period (sections 4 and 6 of Belzona 1111 FN10132) and ensure that the 2nd coat is applied within the recommended period. Any abrading and related work of the first coat as a result of the Contractor missing the optimum overcoat period, and caused by the Contractor, will be the expense of the Contractor.

15.9.5.7.7 The Contractor must submit a price per square meter cost for epoxy repairs and must bid on the following areas in each space. Any discrepancies between bid amounts and actual amounts of work performed will be adjusted up/down by PWGSC 1379 process:

- a) #1 Cofferdam, below top of turn of bilge – Epoxy repair to 87% (23 m²) of surfaces;
- b) #2 Cofferdam, below top of turn of bilge – Epoxy repair to 90% (16 m²) of surfaces;
- c) Void space, port side;
 - i) Below top of turn of bilge – Epoxy repair to 95% (26 m²) of surfaces;
 - ii) Underside of tank top to top of turn of bilge - Epoxy repair to 5% (1 m²) of surfaces;
- d) Void space, starboard side
 - i) Below top of turn of bilge – Epoxy repair to 95% (26 m²) of surfaces;
 - ii) Underside of tank top to top of turn of bilge - Epoxy repair to 5% (1 m²) of surfaces;

15.9.5.8 PREPARATION FOR RECOATING

15.9.5.8.1 The Contractor must reference ISO 8501-1:2007 for all coatings related work under this specification.

- 15.9.5.8.2** In order to ensure adhesion between repair epoxy and paint coatings, the Contractor must conform to the surface preparation instructions of the repair epoxy application areas as agreed to by the Belzona TSR and Akzo-Nobel/International Paints TSR.
- 15.9.5.8.3** Immediately prior to coating work, the Contractor must clean all areas of the DB void spaces with industrial vacuum with brush attachment, to a surface cleanliness of SSPC-SP11.
- 15.9.5.8.4** The Contractor must mask off all gaskets, electrical cables, strain reliefs and glands, electrical components and non-painted or colour-coded piping, prior to any coatings application.
- 15.9.5.9 NEW COATINGS**
- 15.9.5.9.1** Within 24 hours of the completion of surface preparation, the Contractor must arrange for the TA and NACE inspector to inspect the DB void spaces for cleanliness, masking and water mitigation prior to painting. Any preparatory work that is not approved by the NACE inspector or TA must be made to the satisfaction of the NACE inspector or TA at the Contractor's expense.
- 15.9.5.9.2** The Contractor must review the DB Void Spaces Workplan with the TA and NACE inspector and confirm all coatings procedures and schedules and any changes required as a result of prior work and/or new information. The Contractor must provide the NACE Inspector and TA at least 24 hours' notice of any scheduled activities related to the work described within this specification item. The contractor must update the NACE Inspector and the TA of any changes to this schedule.
- 15.9.5.9.3** The Contractor must verify all surfaces to be painted are thoroughly clean, dry and free of grease or oil before painting is commenced.
- 15.9.5.9.4** The Contractor must apply all coatings products in multiple coats as per the manufacturer's recommended application guidelines and NACE inspector.
- 15.9.5.9.5** The Contractor must allow for and arrange inspections to be carried out by the NACE inspector and TA between each coat. Any defects found in these inspections will be repaired at the contractor's expense.
- 15.9.5.9.6** For all coating applications, the Contractor must follow the coatings manufacturer guidelines (min/max thickness, coating interval, preparation between coats, etc.) and as per the further recommendations of the NACE inspector.
- 15.9.5.9.7** The Contractor must verify with the NACE inspector that all environmental conditions during the application and curing of the coatings are within the coatings manufacturer's recommended ranges.
- 15.9.5.9.8** The Contractor must spot coat the exposed steel areas of the echosounder compartments with a first application of Intershield 300 Bronze and a second application of Intershield 300 Aluminum. The Contractor must bid on 2 square meters of spot coating. Any

differences between bid amounts and actual amounts of work performed will be adjusted up/down by PWGSC 1379 process:

- 15.9.5.9.9** For #1 and #2 Cofferdams and port and starboard aft void spaces, the Contractor must:
- a) apply two (2) stripe coats of Intershield 300 Bronze along all edges and areas hard to access with spray equipment, as per the NACE inspector.
 - b) 100% spray coat the interior surfaces with Intershield 300 Bronze, as per the recommendations of the NACE Inspector.
 - c) 100% spray coat the interior surfaces with Intershield 300 Aluminum, as per the recommendations of the NACE inspector.
 - d) The NACE inspector will WFT and DFT between applications to ensure minimum thicknesses are achieved. Any re-coatings work as a result of failed WFT/DFT must be at the expense of the Contractor.
- 15.9.5.9.10** The Contractor must record the environmental conditions each time any coatings are applied. This must include:
- a) Location(s) where the coating is applied;
 - b) Start and stop times of coating application;
 - c) Coating product temperature, after mixing but before application;
 - d) Temperature of the surface to be painted;
 - e) Dry and wet bulb temperatures just prior to coating application;
 - f) Relative humidity of ambient air just prior to coating application; and
 - g) Dew point, just prior to coating application.
- 15.9.5.9.11** The Contractor must complete all DB void space coatings within the manufacturer's recommended cure period, given the experienced ambient temperature and humidity variations, or four (4) calendar days prior to the undocking of the vessel, whichever comes first.
- 15.9.5.9.12** If the NACE inspector fails any part or all of the work, for any reason that is due to the Contractor's planning, preparation or execution of work, additional work required to pass the inspection (including, but not limited to, re-blasting, cleaning, re-coating and re-inspections) must be at the expense of the Contractor.
- 15.9.5.9.13** The Contractor must remove all temporary protections, tape and tape residue from the DB void spaces. All removed coverings and other waste must be removed ashore for disposal.
- 15.9.5.9.14** The Contractor must arrange for a final inspection of the DB void spaces by the TA prior to final close-up. All vent pipes including vent head screens and sounding pipes are to be proven clear and witnessed by the TA. The Contractor must re-install all manhole covers.
- 15.9.5.10 RETURN TO SERVICE**

15.9.5.10.1 The Contractor must pressure test the Cofferdams, echo sounder compartment and aft void spaces, using air at a pressure of 0.15 bar (2.2 psi) for a 1-hour period. The Contractor must afford the attending RO and the TA to witness these pressure tests.

15.9.5.10.2 Prior to closing up the spaces, the Contractor must ensure that the spaces are free of all foreign objects. The Contractor must allow the TA the opportunity to inspect the tanks and witness the reinstallation of all man-hole covers using CFM new oil-resistant cover gaskets.

15.9.6 Inspections

15.9.6.1 The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional required work (including but not limited to repairs/replacements of components damaged by Contractor, additional cleaning, new grinding, gouging and welding, re-inspections and re-testing) due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor's expense:

- a) Hold Point #1 – The Contractor has determined that all volumes are safe to enter and safe for hot work;
- b) Hold Point #2 – The Contractor has inspected the volumes after cleaning and agreed with the TA on repair work to be performed, if any;
- c) Hold Point # 3 – The Contractor has completed all repairs, scheduled inspection and received approval of the work from the TA and RO;
- d) Add hold points for coatings removal, surface prep and recoatings
- e) Hold Point #4 – The Contractor has successfully performed the pressure tests of cofferdams, echosounder and aft void space, witnessed by the TA and RO; and
- f) Hold Point #5 – The Contractor has returned all tanks to a state of operational readiness, witnessed by TA and RO.

15.9.7 Testing & Trials

15.9.7.1 The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the pressure test of all tanks (performed by Contractor, witnessed and approved by TA and RO).

15.9.8 Documentation and Deliverables

15.9.8.1 GENERAL

15.9.8.1.1 The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book.

15.9.8.1.2 The Contractor must provide all documentation according to the Documentation section of the General Notes.

15.9.8.2 CERTIFICATES

15.9.8.2.1 The Contractor must provide the TA:

- a) Waste disposal certificate(s) for all sludge and debris removed under this specification;
- b) All tank entry certificates; and
- c) Survey credit documentation as per the Canada Shipping Act and associated regulations inspection requirements for cofferdams, void spaces and echosounders.

15.9.8.3 REPORTS

15.9.8.3.1 The Contractor must provide the TA a “Cofferdams, Echo Sounder/Aft Void Spaces” report, detailing work performed under this specification, including deficiencies, repairs and volumes of liquids removed/returned/disposed of.

15.9.8.3.2 Add NACE inspector’s report

15.9.8.4 MEASUREMENTS, CALIBRATIONS AND READINGS

15.9.8.4.1 The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

15.9.8.5 REDLINED DRAWINGS

15.9.8.5.1 The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

15.9.8.6 SPARES [NOT USED]

15.9.8.7 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

15.9.9 Training [Not used]

16 DOMESTIC SYSTEMS

16.1 REPAIR OF GREY- AND BLACK-WATER TANKS

16.1.1 Identification

16.1.1.1 The CCG requires the cleaning, inspection and repair to the vessel's grey- and black-water tanks, which exhibit pitting and grooving corrosion, due to coating failure and chemical attack. Replacement of the tanks' flushing system piping is also required

16.1.1.2 A CCG contracted level 2 NACE inspector will oversee the substrate preparation, epoxy repairs, and coatings preparation and application work. A Belzona Technical Service Representative (TSR) will support the application of their epoxy repair coatings.

16.1.1.3 A visual survey of the tank interior coatings was taken in 2022. The steel plating was graded according to the ABS Hull Inspection & Maintenance Program (HIMP), which is the basis for the work included in the specification. Another photographic record was conducted in January 2023 and is included as reference.

16.1.1.4 Reference images of the tanks are provided in a referenced inspection report and in Appendix C .

16.1.1.5 BELZONA TECHNICAL SERVICE REPRESENTATIVE (TSR)

Jon Ferrer, Technical Sales Manager

Cell: (416) 889-3134

Tel: (905) 737-1515

Email: jferrer@belzonagreatlakes.com

51-588 Edward Avenue, Richmond Hill, ON L4C 9Y6

16.1.1.6 CCG CONTRACTED NACE INSPECTOR

To be confirmed.

16.1.2 References

16.1.2.1 EQUIPMENT DATA

16.1.2.1.1 The following equipment data is provided for guidance.

Tank Description	Location	Interior Dims. (m) L x W x H	Interior Surface Area (m2)	Capacity (litres)
Grey Water	Sewage Plant Compartment – Frames 60-69	1.107 x 1.714 x 1.226	10.7	2000
Black Water	Sewage Plant Compartment – Frames 60-69	1.799 x 1.206 x 1.704	14.6	3637

Equipment	Manufacture/Equipment Details
Tank bottom plates	5/16" thick W44 carbon steel
All other plating	1/4" thick W44 carbon steel
Steel Repair Epoxy (tank interior surfaces)	Belzona 1121 Super XL Metal
Protective Coating (tank interior surfaces)	Belzona 5811 Immersion Grade

16.1.2.2 MANUALS AND REPORTS

The following equipment manuals are provided as Guidance Documents.

Document Title	Electronic File Name
Sewage and Grey Water Collection, Storage and Discharge CCGS Limnos Jetvac Project # Q-1868	Grey+Water+and+Sewage+Manual.pdf
Grey & Black water Tanks Inspection 2023	Limnos - G & B WTR TKS Inspection - 2023-01.pdf
Belzona 1121 Product Specification Sheet FN10012	UK1121ps_10012.pdf
Belzona 1121 FN10012 (Super XL-Metal) Instructions for Use	UK1121if_10012.pdf
Belzona 5811 (Immersion grade) Product Specification Sheet FN10159	USA5811ps_10159.pdf
Belzona 5811 FN10159 (Immersion grade) Instructions for Use	USA5811if_10159.pdf

16.1.2.3 DRAWINGS

The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File Name
1862-L01	Vacuum Collection & Sewage Storage CCGS Limnos	1862-L01.pdf

16.1.2.4 REGULATIONS AND STANDARDS

All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

16.1.3 Statement of Work**16.1.3.1 GENERAL**

- 16.1.3.1.1** All Contractor welding must conform to CSA Standards W47.1:19 - Annex M and W59-18 and acceptable to the RO.
- 16.1.3.1.2** The Contractor or Sub-contractors performing the welding fabrication work must be certified by the CWB in accordance with CSA Standards W47.1:19-Annex M, Division 1 or 2 "Certification of Companies for Fusion Welding of Steel" and Qualification of welding personnel and welding procedures for marine applications". Current copies of the following must be supplied to the TA:
- a) company certification validation certificates;
 - b) welding procedures specifications (WPS) and data sheets (WPDS) with supporting procedure qualification records (PQRs);
 - c) welding supervisor and welder qualification certificates and cards; and,
 - d) visual Inspector qualification card.
- 16.1.3.1.3** The Contractor must arrange all completed welds to be examined by third-party welding inspectors that are certified by the Canadian Welding Bureau (CWB) to CSA W178.2, Level 2 or 3 having code endorsements for CSA Standards W47.1:19 and W59. Current copies of certification must be provided to the TA in advance of performing the inspections and formal inspection reports must be supplied to the TA upon request. The Contractor must include the cost of welding inspectors in their bid. The Contractor must retain the welding inspector(s) and schedule their inspections.
- 16.1.3.1.4** The Contractor must obtain the most up-to-date product Technical Data Sheets from the Belzona TSR.
- 16.1.3.1.5** Unless otherwise stated, all staging, screens, heaters, other environmental control equipment, lighting and any other support services, equipment and material necessary to perform the tasks set out in this specification, including inspections by the RO, TA and NACE inspector, must be supplied by the Contractor and removed by the Contractor on completion of the work.
- 16.1.3.1.6** The Contractor must allow the NACE inspector, RO and/or TA unhindered access to the Grey- and Black-water tanks during working hours to witness any work performed within the specification.
- 16.1.3.1.7** The NACE inspector will record all relevant data and findings in a Coatings Preparation and Application Report which will be provided to the TA and the Contractor.
- 16.1.3.1.8** The Contractor must conform to CCG/8009-003 for all marked up drawings.
- 16.1.3.2 PUMP-OUT**
- 16.1.3.2.1** The Contractor must isolate the tanks from all of the ship's black- and grey-water drains.
- 16.1.3.2.2** The Contractor must pump out, by vacuum truck, and dispose of the contents of the grey- and black-water tanks as per federal, provincial and municipal regulations.

16.1.3.2.3 The Contractor must provide a per litre unit price and must bid on removal and disposal of 2,500 litres of black/grey water and flushing water. Adjustment up/down to actual amounts will be addressed by PWGSC 1379 process.

16.1.3.3 ENTRY AND CLEANING

16.1.3.3.1 The Contractor must open, ventilate and certify the tanks gas free and as being “safe to enter” and “safe for hot work”, for the duration they are open for access, following MOHS regulation and FSM procedures 7.B.3 and 7.B.4.

16.1.3.3.2 The Contractor must install temporary ducting from the tank manholes to the exterior, with extraction fans. The Contractor must demonstrate to the TA that the arrangement mitigates the contamination of the sewage compartment with debris caused by work performed under this specification, but still allows communication between persons inside and outside of the tanks.

16.1.3.3.3 The Contractor must remove all debris and sludge, pressure wash clean all internal surfaces of the tanks and wipe dry.

16.1.3.3.4 The Contractor must plug all tank connections to prevent contamination of other parts of the grey- and black-water system that are not subject to repairs and new coatings.

16.1.3.3.5 The Contractor must clean all grey- and black-water tank interior surfaces in preparation for the application of protective coatings. The Contractor must remove all chlorides, dirt and oil from the surfaces by way of high-pressure water washing (3,000-5,000 PSI). Chlorides must be checked following washing. Chlorides must be at or below 5 mg/cm². If chloride ion level, as specified, is not attained, the Contractor must re-wash the affected area using a soluble salt remover, such as Chlor-Rid Liquid Salt Remover, at a dilution ratio of 1:100, sprayed on the affected area at a minimum of 3,000 psi.

16.1.3.3.6 The Contractor must remove all the resulting liquid and debris from the grey- and black-water tanks and wipe all surfaces dry.

16.1.3.4 TANK INTERIOR COATINGS REMOVAL

16.1.3.4.1 The Contractor must remove damaged tank interior coatings. Due to the location and size of tanks, grit blasting must not be used. An industrial laser ablation or kinetic impact coatings removal and profiling tool i.e. “Bristle Blaster” must be used. Severely corroded areas and areas of significantly detached coatings may first be removed with a needle gun. Grinders and sanders must not be used except where laser ablation or kinetic impact tools are unable to access the coatings, as these methods can imbed impurities into the steel substrate and provide a less uniform holding profile.

16.1.3.4.2 The Contractor must bid on a unit price per square meter of interior coatings removal and bid on a total of 10.5 sq meters of removal in the grey- and black-water tanks. Adjustment up/down to actual amount will be addressed by PWGSC 1379 process.

16.1.3.4.3 The Contractor must remove all dust and debris from the stripped tanks, using compressed air and an industrial vacuum with bristle attachment.

16.1.3.5 INSPECTION & WORKPLAN

16.1.3.5.1 The Contractor must refer to the table below, based on the ABS HIMP “Traffic Light” grading system, for bidding on the work to be performed for the remediation of the grey- and black-water tanks. This is based on a visual survey of emptied tanks taken in the Spring of 2022. The results are applicable to all tank interior surfaces.

Black & Grey Water Tanks HIMP Survey Results			
Inspection Criteria	Rating	Rated Condition	Rated Condition Description
Coating condition	6	Poor Condition (Very High)	Breakdown of coating or rust penetration is > 30% of the area; • Hard rust scale is > 20% of the area; • Rusting in the area is > 75% of edges or weld lines.
Presence of general corrosion	6	Poor Condition (Very High)	Extensive area of corrosion: corrosion of hard and/or loose scale, including pitting, over 70% or more of the plating surface in question accompanied by evidence of thinning.
Presence of pitting, grooving or other localized linear corrosion	4	Fair Condition	Pitting depth > 1/3 of original Thickness, covering > 15% of tank surface areas.
Presence of deformation	0	Good Condition	No deformation.
Presence of fractures	0	Good Condition	No fractures.
Compartment or space cleanliness	5	Poor Condition	Meaningful examination not possible without cleaning.

16.1.3.5.2 The table below gives the estimated areas of the tanks to be repaired, by the specified method.

Extents of Corrosion and Repair Methods			
Condition	Corrosion Description	Type of Repair	Extent of repair
Deep Grooves	>1/3 of original plate thickness and > 15% intensity	Gouge and reweld bead	1 meter total

Deep pits	>1/3 of original plate thickness and > 15% intensity	Insert Plate Welding	1% of tank surface area
Shallow but extensive pits/grooves	< 1/3 of original thickness but > 15% intensity	Overlay Welding	1% of tank surface area
Deep but scattered pits/grooves	> 1/3 of original plate thickness but ≤ 15% intensity	Overlay Welding	1% of tank surface area
Shallow, scattered Pits/grooves	< 1/3 of original thickness and ≤ 15% intensity	Repair Epoxy	70% of tank surface areas

16.1.3.5.3 The Contractor must provide a per linear meter unit price on gouging and bead re-welding and a per square meter unit price on the other types of repair, as per the values given in the “Extents of Corrosion and Repair Methods” table .

16.1.3.5.4 The Contractor must develop a Grey- and Black-water Tanks Remediation Plan for repairs. While developing the plan, the Contractor must consider all interior plating repairs using Belzona 1121.

16.1.3.5.5 The Contractor must include the following in the Grey- and Black-water Tanks Remediation Plan:

- a) Prepare a drawing of the tanks’ interior surfaces;
- b) Conduct a visual inspection of the tanks with the TA and compare against the findings of the “Black and Grey Water Tanks HIMP Survey Results” table and the “Extents of Corrosion and Repair Methods” table, above;
- c) Consult with the NACE inspector, RO, TA and Belzona TSR the results of the visual inspection of tank interiors and determine types and schedule of repairs that will be required; and
- d) In consultation with the NACE inspector, RO, TA and Belzona TSR, prepare a marked-up copy of the tanks’ interior surfaces indicating types and locations of repair to be undertaken. The marking system must be based on the nomenclature and criteria given in the “Extents of Corrosion and Repair Methods” table.

16.1.3.5.6 Any discrepancies in work to be performed between the above tables and the Grey- and Black-water Tanks Remediation Plan will be addressed by PWGSC 1379 process.

16.1.3.6 ACCESS COVER & FLUSH LINE PIPING REPLACEMENT

16.1.3.6.1 The Black and Grey Water tanks each have access covers with incorporated flush piping welded to the access covers. See Appendix B, image B1 and “Grey & Black water Tanks Inspection 2023”. The Contractor must repair the access covers by replacing the associated flush piping.

16.1.3.6.2 The Contractor must prepare a bilingual (French and English) drawing and weld procedure for this specification item.

- 16.1.3.6.3** The Contractor must obtain approval of drawings and weld procedures from RO and TA prior to fabrication work.
- 16.1.3.6.4** Based on the following information, the Contractor must bid on the following but must verify all dimensions and construction details once components are removed.
Adjustments up/down to actual amount will be addressed by PWGSC 1379 process:
- a) For the Grey Water tank, a new “T” configuration flush pipe assembly to be welded to existing access cover. Grey Water flush pipe assembly to be constructed from 1-1/4” schedule 40 black steel pipe, comprising a 8” long stem and 20” long distribution pipe. Distribution section to include holes of ¼” diameter arranged radially throughout length of pipe to permit flushing water to rinse all tank surfaces;
 - b) For the Grey Water Tank, a new “T” configuration flush pipe assembly to be welded to existing access cover. Grey Water flush pipe assembly to be constructed from 1-1/4” schedule 40 black steel pipe, comprising a 8” long stem and 18.5” long distribution pipe. Distribution section to include holes of ¼” diameter arranged radially throughout length of pipe to permit flushing water to rinse all tank surfaces;
- 16.1.3.6.5** The Contractor must remove the existing flush piping for both tanks from vessel and dispose of according to federal, provincial and municipal regulations
- 16.1.3.6.6** All Contractor welding must conform to CSA Standards W47.1:19 - Annex M and W59-18 and acceptable to the RO. All welds must be full penetration.
- 16.1.3.6.7** The Contractor or Sub-contractors performing the welding fabrication work must be certified by the CWB in accordance with CSA Standards W47.1:19-Annex M, Division 1 or 2 “Certification of Companies for Fusion Welding of Steel” and Qualification of welding personnel and welding procedures for marine applications”. Current copies of the following must be supplied to the TA:
- a) company certification validation certificates;
 - b) welding procedures specifications (WPS) and data sheets (WPDS) with supporting procedure qualification records (PQRs);
 - c) welding supervisor and welder qualification certificates and cards; and
 - d) visual Inspector qualification card.
- 16.1.3.6.8** The Contractor must arrange all completed welds to be 100% VT NDT, examined by third-party welding inspectors that are certified by the Canadian Welding Bureau (CWB) to CSA W178.2, Level 2 or 3 having code endorsements for CSA Standards W47.1:19 and W59. Current copies of certification must be provided to the TA in advance of performing the inspections and formal inspection reports must be supplied to the TA upon request.
- 16.1.3.6.9** The Contractor must repair all welds that fail the welding inspector’s NDT. Repaired welds must be inspected by a level CGSB 48.9712 level 2 or 3 inspector. All additional work as a result of failed NDT, including the cost of re-inspection, must be at the expense of the Contractor.

16.1.3.6.10 The Contractor must ground smooth all sharp edges to form a rounded contour of minimum edge radius of two (2) mm. This two (2) mm rounding may be achieved by minimum two (2) strokes of a grinding disc or as recommended by NACE inspector.

16.1.3.6.11 The Contractor must grit-blast all surfaces of the access covers and flush piping that will be exposed to the tank interior to SSPC SP-10/NACE 2 (Near White). All surfaces to achieve an angular surface profile of 50 to 75 microns (2-3 mils).

16.1.3.7 TANK REPAIR

16.1.3.7.1 The Contractor must perform repairs according to the following specifications and as included in the Grey- and Black-water Tanks Remediation Plan:

- a) Tank Exterior coatings spot removal;
 - i) Where hot work is expected to effect the coatings of the tank exteriors, the Contractor must first remove to bare metal the exterior coatings to 80mm beyond the anticipated affected areas, prior to the hot work. Bristle Blaster or equivalent kinetic impact coatings removal and profiling tool must be used, simultaneous with collection of dust and debris by industrial vacuum to mitigate contamination of the sewage compartment;
 - ii) Surface profile must be a minimum of 1.5 mils (38 microns), but preferably 3 mils (75 microns) and surface cleanliness of SSPC-SP11
 - iii) The Contractor must feather all areas of removed coatings on exterior tank surfaces to the satisfaction of the TA and NACE inspector;
 - iv) The Contractor must bid on a unit price per square meter of exterior coatings removal and bid on 1.5 sq meters of removal. Adjustment up/down to actual amount will be addressed by PWGSC 1379 process.
- b) New plate inserts and weld repairs:
 - i) Plate inserts must be new W44 carbon steel plate of the same thickness as the original plate;
 - ii) Approximately 100 cm of the Black Water Tank access penetration coaming is required to be replaced.
 - iii) For overlay welds, the steel must be welded to at least 1mm over the nominal wall thickness but not more than 3mm;
 - iv) Plate insert welds must be 100% Magnetic Particle (MP) and 25% Ultrasonic Testing (UT) tested by a certified Canadian General Standards Board (CGSB) Non-Destructive Testing (NDT) inspector.
 - v) All other welding must be subjected to NDT by visual means and checked 100% by a certified welding inspector certified to at least CWB level 2, according to CSA W178.2.

- vi) The Contractor must bid on a unit price per square meter of welded plate inserts and bid on 2 sq meters of inserts. Adjustment up/down to actual amount will be addressed by PWGSC 1379 process.
- c) Repair epoxy;
 - i) All epoxy repair work must be performed under the supervision of the Belzona TSR;
 - ii) Belzona 1121 "Super XL-Metal" two-part repair epoxy must be used.
 - iii) The Belzona TSR will inspect all materials immediately prior to their application. The Contractor must not use any materials that are rejected by the TSR.
 - iv) All surfaces receiving an application of this product must have a surface profile of minimum 1.5 mils (38 Microns) but preferably 3 mils (75 microns) and a surface cleanliness of SSPC-SP11.
 - v) Surfaces to receive an application of this product must be thoroughly degreased with Belzona 9111 cleaner/degreaser or Methyl Ethyl Ketone prior to application of the epoxy.
 - vi) The Contractor must refer and adhere to all other epoxy manufacturer's application instructions as per "Belzona 1121 FN10012 (Super XL-Metal) Instructions for use".

16.1.3.8 PREPARATION FOR RECOATING

- 16.1.3.8.1** After all hot work is completed, the Contractor must re-inspect the tanks' exterior surface coatings with the TA to identify any existing coatings found to be heat affected. The Contractor and TA will determine responsibility for repairs. Any new work determined to be the responsibility of the CCG will be addressed by 1379 work arising process.
- 16.1.3.8.2** The Contractor must reference ISO 8501-1:2007 for all coatings related work under this specification.
- 16.1.3.8.3** The Contractor must prepare all bare metal surfaces of the tanks' interiors to a surface profile of minimum 1.5 mils (38 Microns) but preferably 3 mils (75 microns) and a surface cleanliness of SSPC-SP11 as recommended by the Belzona TSR.
- 16.1.3.8.4** The Contractor must thoroughly degrease all tank interior surfaces and access covers and adhere to all other epoxy manufacturer's surface preparation instructions as per "Belzona 5811 FN10159 (Immersion Grade) Instructions for use".

16.1.3.9 RECOATING

- 16.1.3.9.1** Immediately prior to coating work, the Contractor must clean all surfaces with industrial vacuum with brush attachment, to a surface cleanliness of SSPC-SP11.

- 16.1.3.9.2** The Contractor must coat all interior tank surfaces, access covers and associated flush piping with a minimum of two (2) applications of Belzona 5811 Immersion grade coating product, producing a minimum total Dry Film Thickness (DFT) of 16 mils.
- 16.1.3.9.3** The Contractor must schedule and allow the NACE inspector to inspect the coatings products and supervise the mixing and application of the coating product.
- 16.1.3.9.4** The Contractor must apply by spray application the Belzona 5811 coating product over the Belzona 1121 within 36 hours of the application of the 1121. Otherwise the Contractor must abrade the 1121 to achieve a frosted appearance with minimum surface profile of 40 microns. Any required abrading of the 1211 repair epoxy will be at the Contractor's expense.
- 16.1.3.9.5** The Contractor must apply by spray application a second coat of Belzona 5811 within 72 hours as per the NACE inspector/Belzona TSR instructions. After 72 hours, the Contractor must abrade the first coat of 5811 to achieve a frosted appearance with minimum surface profile of 40 microns. Any required abrading of the first coat of 5811 will be at the Contractor's expense.
- 16.1.3.9.6** The Contractor must refer and adhere to all epoxy manufacturer's application instructions as per "Belzona 5811 FN10159 Immersion Grade Instructions for use".
- 16.1.3.9.7** The Contractor is advised that the NACE inspector will perform Wet Film Thickness (WFT) and DFT thickness measurements of each coating application to ensure the target coating thickness recommended by Belzona is achieved. If the NACE inspector determines that additional applications are necessary, all costs associated with the additional applications will be at the Contractor's expense.
- 16.1.3.9.8** The Contractor must allow for sufficient cure period, as per the 5811 Instructions for Use and as determined by the NACE inspector, before attaching the access covers to the tanks or introducing any liquids, grease or other contaminants into the tanks.

16.1.4 Inspections

- 16.1.4.1** The Contractor must ensure, when developing the ITP, scheduling and approving work, that the following Hold Points are respected. Any additional required work (including but not limited to repairs/replacements of components damaged by Contractor, additional cleaning, new grinding, gouging and welding, re-coating, re-inspections and re-testing) due to deficiencies found as a result of verifications or inspections undertaken during these Hold Points, will be at the Contractor's expense:
- a) Hold Point #1 – The Contractor has determined that tanks are safe to enter and safe for hot work;
 - b) Hold Point #2 – The Contractor has inspected the tanks after cleaning and agreed with the TA, RO and NACE inspector on coatings removal work to be performed;
 - c) Hold Point # 3 – The Contractor has completed to the TA's satisfaction all ventilation and dust mitigation measures;

- d) Hold point #4 – The Contractor has confirmed all features and dimensions of the flush piping to be replaced and have produced drawings and weld procedures approved by the TA and RO;
- e) Hold Point #5 – The Contractor has completed, to the NACE inspector's and TA's satisfaction, all coatings removal work on the tank interiors;
- f) Hold Point #6 – The Contractor has consulted with the TA, RO, TSR and NACE inspector, developed and agreed to a Grey- and Black-water Tanks Remediation Plan;
- g) Hold Point #7 - The Contractor has completed all welding repairs, if any, to the satisfaction of the TA, welding inspectors and RO;
- h) Hold Point #8 – The Contractor has completed all interior surface preparation to the satisfaction of the TA and NACE inspector;
- i) Hold Point #9 – The Contractor has completed all repair epoxy work to the satisfaction of the TA, TSR and NACE inspector;
- j) Hold Point #10 – The Contractor has provided a coating schedule to the TA and NACE inspector for approval prior to application of any coatings;
- k) Hold Point #11 - The Contractor has arranged for and confirmed that the NACE inspector inspect the coating product and supervise coating product preparation and application;
- l) Hold Point #12 – The Contractor has arranged for and confirmed that the NACE inspector and TA inspect and approve the preparation of the tank interiors areas, prior to first coating application;
- m) Hold Point #13 - The Contractor has arranged for and confirmed that the NACE inspector verify and approve the 2nd coating application;
- n) Hold Point #14 – The Contractor has verified with the NACE inspector and TA that the tanks' re-coatings have sufficiently cured to allow the tanks to be hydrostatically tested;
- o) Hold Point #15 - The Contractor has returned the Grey- and Black-water tanks to operational readiness, witnessed by TA and RO;
- p) Hold Point #16 – The Contractor has successfully performed hydrostatic pressure tests of all tanks, witnessed by the TA and RO;

16.1.5 Testing and Trials

16.1.5.1 The Contractor must include in the ITP, schedule, coordinate, allow for and confirm the following tests are conducted at the appropriate stages, as described in the specification:

- a) Chlorine Ion Tests of all tanks (performed by NACE inspector, witnessed by TA;
- b) Pressure test of all tanks (performed by Contractor, witnessed and approved by TA and RO); and
- c) Potable water tests (performed by provincial laboratory, witnessed by TA).

16.1.6 Documentation and Deliverables

16.1.6.1 GENERAL

16.1.6.1.1 The Contractor must provide the TA with electronic copies of all certificates and reports, within 24 hours of the completion of the work within this specification section. These documents will be reviewed by the TA. Based on the review, edits, missing items or clarifications may be required by the TA. The Contractor must address any such deficiencies to produce a final documentation. The Contractor must include the final documentation in the Data Book.

16.1.6.1.2 The Contractor must provide all documentation according to the Documentation section of the General Notes.

16.1.6.2 CERTIFICATES

16.1.6.2.1 The Contractor must provide the TA:

- a) Waste disposal certificate(s) for all sludge and debris removed under this specification;
- b) All tank entry certificates; and
- c) Survey credit documentation as per the Canada Shipping Act and associated regulations inspection requirements for Grey- and Black-water Tanks

16.1.6.3 REPORTS

16.1.6.3.1 The Contractor must obtain a Grey- and Black-water Tanks coatings report from the NACE inspector. The Contractor must ensure the NACE inspector's report details preparatory work, coatings products used and all relevant environmental conditions at the time any tank coatings were applied, as required in this specification and further determined by the NACE inspector. The Contractor must include the NACE inspector's report in a "Grey- and Black-water Tanks" report, detailing work performed under this specification, including approved drawings and weld procedures for access covers and flush piping, the Grey- and Black-water Tanks Remediation Plan, deficiencies, repairs and volumes of liquids removed/returned/disposed of. This report must be provided to the TA.

16.1.6.4 MEASUREMENTS, CALIBRATIONS AND READINGS

16.1.6.4.1 The Contractor must ensure that all measurements, calibrations and readings under this specification are dated and signed by the person doing the work.

16.1.6.5 REDLINED DRAWINGS

16.1.6.5.1 The Contractor must provide updated drawings to capture changes or deviations from the original scope. Mark ups/red lining may be done on site either electronically or manually but must be delivered in the reports and Data Book in electronic format.

16.1.6.6 SPARES [NOT USED]

16.1.6.7 EQUIPMENT OR SYSTEM MANUALS [NOT USED]

16.1.7 Training [Not used]

17 DECK EQUIPMENT AND SUPPORT SYSTEMS [NOT USED]

18 NAVIGATION AND CONTROL SYSTEMS

18.1 SPEED LOG INSTALLATION

18.1.1 IDENTIFICATION

18.1.1.1 CCG requires the installation of a new Sperry Marine Naviknot 450D speed log system (CFM). This speed log system includes but is not limited to the following; the Transducer, the Gate Valve, the Electronics Unit, the Display and Control Unit, the Preamplifier D, and the Power Supply.

18.1.1.2 The new Sperry Marine Naviknot 450D system will also connect to the existing X-Band Starboard radar, X-Band Port radar, the ECDIS, the Gyrocompass, and the Autopilot.

18.1.2 REFERENCES

18.1.2.1 EQUIPMENT DATA

18.1.2.1.1 The following is Government Supplied Material (GSM)

Quantity	Equipment	Manufacture/Equipment Details
N/A	N/A	N/A

18.1.2.1.2 All materials, equipment and parts, including but not limited to the list provided in the table below, as well as any other materials necessary to perform the specified work – unless clearly states otherwise - must be Contractor Furnished Material (CFM) .

Quantity	Equipment	Manufacture/Equipment Details
1	Control and Display unit	Sperry Marine P/N: 073507
1	Electronics unit	Sperry Marine P/N: 073522
1	Transducer with 18 meter cable	Sperry Marine P/N: 74893
1	Gate valve	Sperry Marine P/N: 073500
1	Preamplifier D	Sperry Marine P/N: 073523
1	Power Supply 24 VDC	LOGO P/N: 42700
Note*	14 AWG 3C Cable	Anixter BVA-1403C
Note*	14 AWG 2C Cable	Anixter BVA-1402C
Note*	18 AWG 6C Cable	Belden 6369
Note*	22 AWG 4C Cable	Belden 8723SB
1	Straightblade Plug, AC 125 V, 15 A	Model # HBL5965VY

Note *: It is the Contractor's responsibility to measure the required length of cabling.

18.1.2.2 MANUALS

18.1.2.2.1 The following equipment manuals are provided as Guidance Documents.

Manual Title	Electronic File Name
Doppler Transducers, Gate Valve and Tank Mount and Preamplifier D Type 5029 for Doppler Speed Log Systems NAVIKNOT 450 D / 600 SD	5029-0125-01.pdf
Operation, Installation and Service Manual (Naviknot 450D)	056394.pdf
Toroidal Core (Ferrite) Installation for Preamplifier D, type 5029 in Naviknot 450 D/DD. 600 SD and 600 SDD/SDT systems	5029-0125-02.pdf

18.1.2.2.1.1 Drawings

18.1.2.2.2 The following Drawings are to be considered as Guidance Drawings.

Drwg. No.	Drawing Title	Electronic File Name
N/A	LimnosSpeedLog_CCG_GuidanceDrawing	LimnosSpeedLog_CCG_GuidanceDrawing.dwg

18.1.2.3 REGULATIONS AND STANDARDS

18.1.2.3.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

18.1.3 STATEMENT OF WORK

18.1.3.1 GENERAL

18.1.3.1.1 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.

18.1.3.1.2 All Contractor welding must conform to CSA Standards W47.1:19 - Annex M and W59-18 and acceptable to the RO.

18.1.3.1.3 The Contractor or Sub-contractors performing the welding fabrication work must be certified by the CWB in accordance with CSA Standards W47.1:19-Annex M, Division 1 or 2 "Certification of Companies for Fusion Welding of Steel" and Qualification of welding personnel and welding procedures for marine applications". Current copies of the following must be supplied to the TA:

- d) company certification validation certificates;

- e) welding procedures specifications (WPS) and data sheets (WPDS) with supporting procedure qualification records (PQRs);
- f) welding supervisor and welder qualification certificates and cards; and
- g) visual Inspector qualification card.

18.1.3.1.4 The Contractor must arrange all completed welds to be examined by third-party welding inspectors that are certified by the Canadian Welding Bureau (CWB) to CSA W178.2, Level 2 or 3 having code endorsements for CSA Standards W47.1:19 and W59. Current copies of certification must be provided to the TA in advance of performing the inspections and formal inspection reports must be supplied to the TA upon request.

18.1.3.1.5 Prior to any hot work 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 are certified as gas free and suitable for hot work as per the Fleet Safety and Security Manual.

18.1.3.1.6 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.

18.1.3.2 GATE VALVE AND TRANSDUCER INSTALLATION

18.1.3.2.1 The Contractor must install a new Sperry Marine gate valve in the forward starboard confined space, in the location found in figure 18.1.A and figure 18.1.B. The Contractor must verify with the technical authority (TA) the exact location of the gate valve prior to installation.



Figure 18.1.A - Gate Valve and Transducer Installation Location

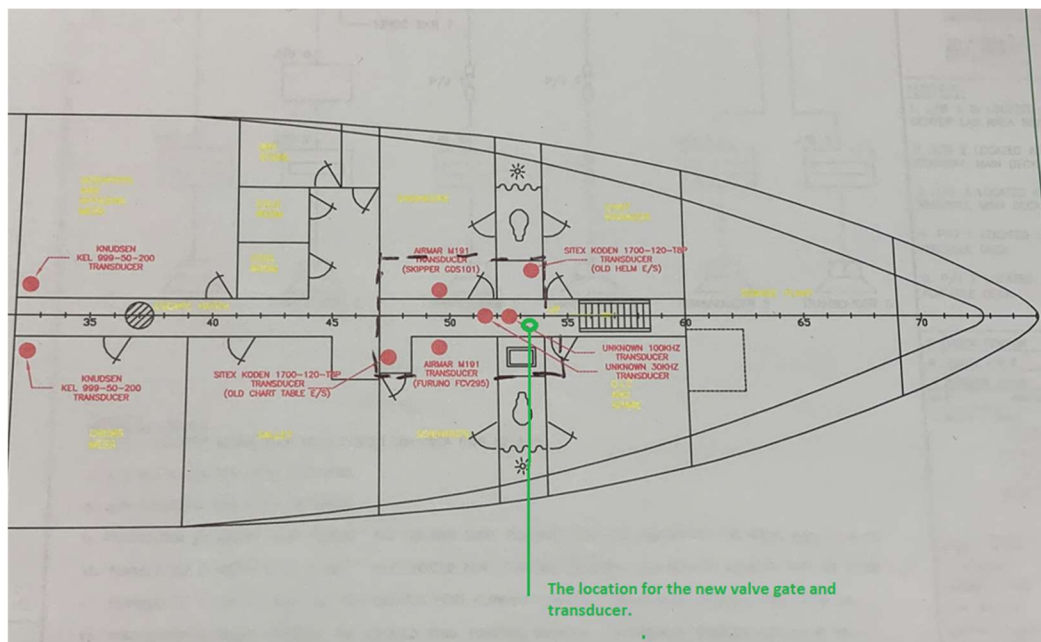


Figure 18.1.B - Gate Valve and Transducer Installation Drawing Location

- 18.1.3.2.2** The Contractor must install the gate valve as per section 3 of manual 5029-0125-01.pdf, referenced in section 18.1.2.2. of this specification.
- 18.1.3.2.3** A flange is supplied with the gate valve. Should the flange not be acceptable to Transport Canada, the contractor must manufacture an identical one using approved steel.
- 18.1.3.2.4** The Contractor must follow instructions as per section 3 of manual 5029-0125-01.pdf, referenced in section 2.2 of this specification.
- 18.1.3.2.5** The Contractor must provide a construction drawing of the gate valve installation modification to the RO (Recognized Organization) for approval prior to conducting the work.
- 18.1.3.2.6** The Contractor must complete welding and inspection of the speed log gate valve flange prior to coatings work within the echosounder compartment but prior to installation of the gate valve, taking into account the required cure time for coatings as per the NACE inspector.
- 18.1.3.2.7** The Contractor must apply two coats of paint, compatible with the ship's paint system, to the gate valve flange.
- 18.1.3.2.8** The Contractor must supply all gaskets, gland packing, liquid cleaners, buffers, and rust paint. New gaskets and gland packings must be of the same type as those removed unless the contractor offers a substitute product acceptable to TA.
- 18.1.3.2.9** The Contractor must visually inspect the overboard penetration for any form of defect and notify the TA.
- 18.1.3.2.10** Transducer shall be aligned as per figure 3.2 of manual 5029-0125-01.pdf, referenced in section 18.1.2.2. of this specification.
- 18.1.3.2.11** The transducer factory-made cable pigtail is 18 metres long; the length of the pigtail must not be reduced nor extended by the Contractor.
- 18.1.3.2.12** The Contractor must install the transducer such that it sits flush with the hull.
- 18.1.3.3 PREAMPLIFIER D INSTALLATION**
- 18.1.3.3.1** The Contractor must install the Preamplifier D in a above the Port Side Forward Confined space to the left optical network switch as shown in figure 18.3. The Contractor must not install the Preamplifier inside the metal framing of the optical network switch.
- 18.1.3.3.2** If necessary, the Contractor must reorganize the cables and move the grey panel on the wall in figure 18.3.
- 18.1.3.3.3** The Contractor must power the Preamplifier D using the newly installed back up ECDIS UPS.

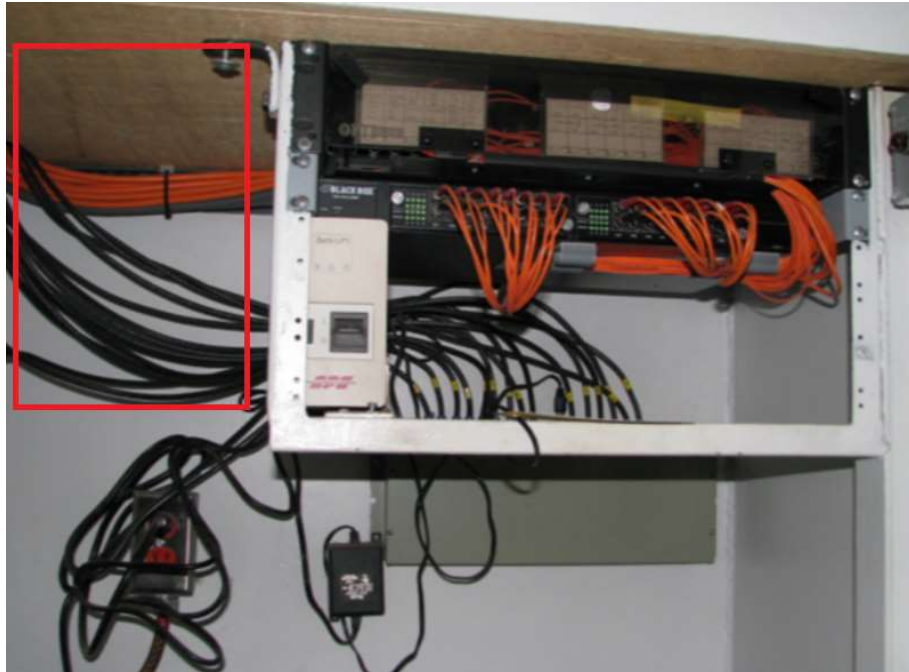


Figure 18.1.C – Preamplifier D Installation Location Above Port Side Forward Confined Space

- 18.1.3.3.4** The Contractor must cut out and install a waterproof transit for any cable installed from the Preamplifier D to and from the Transducer.
- 18.1.3.3.5** The transit cut out for the Preamplifier must be a Transport Canada and TA-approved and Recognized Organization (RO) type-approved waterproof transit.
- 18.1.3.3.6** The Contractor must ensure the Preamplifier D is grounded using a 10mm² grounding strap. Grounding surface must be thoroughly cleaned of any paint before grounding.
- 18.1.3.3.7** The Contractor must pick a suitable location of the Preamplifier D above the Port Side Forward Confined Space such that the Preamplifier D is close enough to the gate valve that the 18 meters transducer pigtail reaches the Preamplifier D.
- 18.1.3.3.8** The Contractor must supply or manufacture suitable foundation brackets for the Preamplifier D. New foundational brackets must be painted with a paint that is compatible with the ship's paint system.

18.1.3.4 24 VDC POWER SUPPLY

- 18.1.3.4.1** The Contractor must install a 24 VDC Power Supply (CFM) inside the cabinet shown in figure 18.1.D.

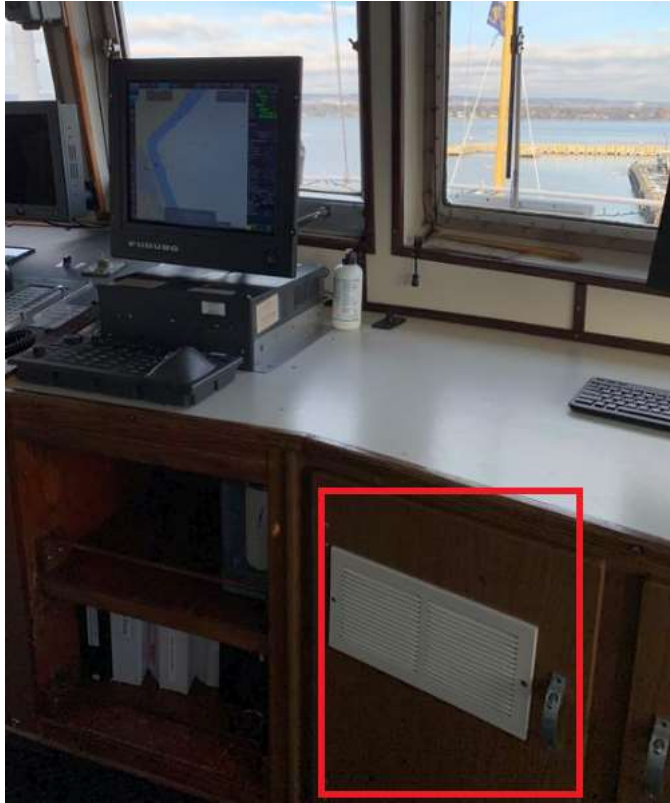


Figure 18.1.D – 24 VDC Power Supply Installation Location

- 18.1.3.4.2** The Contractor must power the 24 VDC Power Supply through the newly installed back-up ECDIS UPS.
- 18.1.3.4.3** The 24 VDC Power Supply will have two outputs of 24 VDC. The Contractor must use one output to supply power to the Electronics Unit IAW installation instructions found in 056394.pdf.
- 18.1.3.4.4** The Contractor must label the 24 VDC Power Supply with the name “24 VDC Speed log power supply”.

18.1.3.5 CONTROL AND DISPLAY UNIT INSTALLATION

- 18.1.3.5.1** The Contractor must install a Sperry Marine Control and Display unit (CFM) on the left hand side of the bridge console as shown in figure 18.1.E in red.



Figure 18.1.E – Control and Display Unit Installation Location

- 18.1.3.5.2** Contractor must properly wire and connect the Control and Display unit to the main electronics unit In Accordance With (IAW) drawing “LimnosSpeedLog_CCG_GuidanceDrawing”. The Contractor must install the Control and Display Unit using the installation instructions in 056394.pdf.

18.1.3.6 ELECTRONICS UNIT INSTALLATION

- 18.1.3.6.1** The Contractor must install the Electronics Unit under the bridge console, in a location to allow reasonable access for servicing and as approved by the TA or TA designate. Mounting options may include door mounting as shown in figure 18.1.F. The Contractor must include extra cabling such that, when the door is repeatedly opened and closed, no cable strain or extra cable tension occurs.
- 18.1.3.6.2** The Contractor must wrap all extra wire defined in 18.1.3.6.1 with protective wire sleeving.

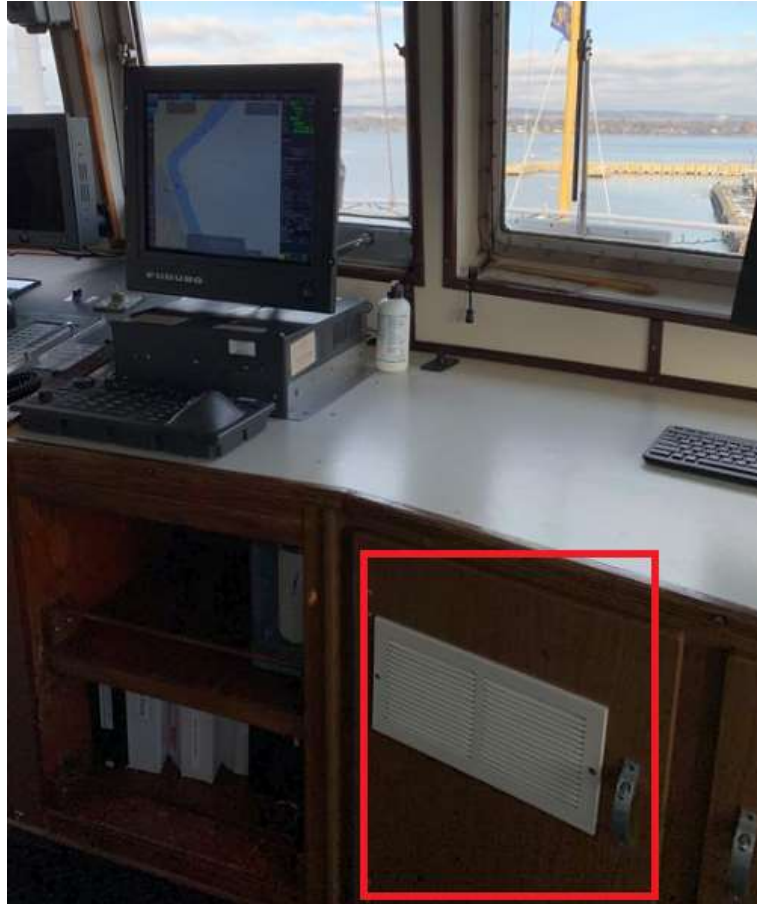


Figure 18.1.F – Electronic Unit Installation Location

- 18.1.3.6.3** The Contractor must connect and configure the Electronic Unit as per drawing 056394.pdf page 222 IAW the installation instructions found in 056394.pdf.
- 18.1.3.6.4** The Contractor must power the Electronics Unit using the 24 VDC Power Supply as per SOW item 18.1.3.4.
- 18.1.3.7 CONNECTIONS TO PRE EXISTING EQUIPMENT**
- 18.1.3.7.1** The Contractor must wire and connect the Electronics Unit to the X-Band Port Radar IAW drawing "LimnosSpeedLog_CCG_GuidanceDrawing".
- 18.1.3.7.2** The Contractor must wire and connect the Electronics Unit to the X-Band Starboard Radar IAW drawing "LimnosSpeedLog_CCG_GuidanceDrawing".
- 18.1.3.7.3** The Contractor must wire and connect the Electronics Unit to the ECIDS Processor IAW drawing "LimnosSpeedLog_CCG_GuidanceDrawing".
- 18.1.3.7.4** The Contractor must wire and connect the Electronics Unit to the Gyrocompass IAW drawing "LimnosSpeedLog_CCG_GuidanceDrawing".
- 18.1.3.7.5** The Contractor must wire and connect the Electronics Unit to the Autopilot IAW drawing "LimnosSpeedLog_CCG_GuidanceDrawing".

18.1.3.8 CABLE INSTALLATION

- 18.1.3.8.1** The Contractor must supply and install all the cables required to provide complete and functional systems that meet all of the requirements identified in this statement of work.
- 18.1.3.8.2** The Contractor must use OEM-supplied cabling included with equipment unless otherwise stated in this SOW Item.
- 18.1.3.8.3** Where cabling is not included with the equipment, the Contractor must supply cabling listed in 18.1.2.1.2.1, or an equivalent approved by the TA.
- 18.1.3.8.4** The Contractor must use cabling, connectors and connector installation tools from the same equipment manufacturer in order to provide a complete and functional cabling system.
- 18.1.3.8.5** The Contractor must ensure all installed cables are tagged with cable designations at each end and through any deck, deckhead and/or cable penetration. The same cable designation must be used to identify cables in the "As Fitted Drawings".
- h) The cable tags for outdoor locations must be of the embossed stainless steel metallic type and securely affixed to the cables.
 - i) The cable tags for indoor locations must be of the permanent printed plastic type.
 - j) Self-adhesive plastic wrap-around or heat shrink sleeves may be used in certain areas, at the discretion of the TA.
 - k) Individual conductors must be either colour-coded or identified using heat shrink sleeves.
- 18.1.3.8.6** The Contractor is responsible for unpacking/repacking all cable transits/glands. Repacking shall be made using a RO type approved Roxtec type of cable transits.
- 18.1.3.8.7** When a cable is removed by the Contractor, the Contractor must supply and install a new Roxtec module in all instances where the cable was going through a Roxtec cable transit. The Contractor must bid on replacement of seven (7) Roxtec modules. Actual number of Roxtec modules replaced will be adjusted up/down via PWGSC form 1379 process.
- 18.1.3.8.8** Any existing cable gland type of penetration that is not being reused must be sealed by the Contractor.
- 18.1.3.8.9** The Contractor must ground all equipment as per OEM documentation.
- 18.1.3.8.10** For cables other than the CAT6a cables, continuity testing is not required; however, all cables which have been installed by the Contractor that are found to be defective (fail continuity test) or damaged must be replaced by the Contractor at the Contractor's expense (material and labour) before commissioning.
- 18.1.3.9 WIRING TERMINATIONS**
- 18.1.3.9.1** The Contractor must complete the wiring terminations for all cables as per CCG provided drawings and documents or as per the CCG-approved Contractor's drawings.

18.1.3.9.2 Any wire terminating into a terminal block or terminal strip must be terminated using crimped ferrules.

18.1.3.10 INTERFERENCES

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

18.1.3.11 INSPECTION POINTS

- l) HOLD POINT 1: The Contractor must seek confirmation of the proposed gate valve installation location from the TA prior to performing any installation work.
- m) HOLD POINT 2: The Contractor must seek confirmation for installation locations of all proposed electronic equipment listed in 18.1.2.1.2.1 from the TA prior to performing any installation work.
- n) HOLD POINT 3: The RO class surveyor and the TA must be present at the inspection of the new gate valve.
- o) HOLD POINT 4: The Contractor must connect the Electronics Unit to the existing X-Band Starboard radar, X-Band Port radar, the ECDIS, the Gyrocompass, and the Autopilot, as well the FSR must configure and each device to properly accept the input of the Electronics Unit and Speed log system prior to sea trials.

18.1.3.12 TESTING AND TRIALS

18.1.3.12.1 The Contractor must obtain the services of an FSR, Sperry Marine, to conduct the final commissioning and set-to-work activities. The Contractor must include an allowance of \$10,000.00 to cover the cost of services to be provided by Sperry Marine. Reasonable cost of travel, living expenses must be billed at cost without added overhead or profit. The \$10,000.00 allowance must form part of the overall bid and must be adjusted up or down by means of PWGSC 1379 process upon receipt of the final FSR invoice supported by copies of all related documentation and invoices to verify actual expenses.

18.1.3.12.2 Watertightness of the new valve must be proven to the satisfaction of the RO class surveyor and the TA.

18.1.3.12.3 All Testing and Commissioning activities related to the affected system(s) must be conducted by the FSR.

18.1.3.12.4 The FSR must fill out the "Naviknot Setup Table / Preamp D, Type 5029" table on page 193 and page 194 of 056394.pdf and provide the report to the TA.

18.1.3.12.5 The FSR must fill out the "Naviknot 450 D Record of Calibration Trial Runs" on page 195 of 056394.pdf and provide the report to the TA.

18.1.4 DOCUMENTATION AND DELIVERABLES

18.1.4.1 The Contractor must provide the TA with original copies of the following:

18.1.4.2 REPORTS

18.1.4.2.1 N/A

18.1.4.3 CERTIFICATES

18.1.4.3.1 All components and/or equipment certifications or Type Approvals (where applicable) must be submitted to Canada.

18.1.4.4 DRAWINGS

18.1.4.4.1 The Contractor must provide an "As-Fitted" version of the RO approved CCG drawings which will reflect the installation including any deviation from the installation drawings (redlines) that occurred during the installation. The As-Fitted version must be submitted within fifteen (15) business days of the completion of the work, or 5 business days prior to completion of the vessel work period, whichever occurs first.

18.1.4.5 SPARES

18.1.4.5.1 N/A

18.1.4.6 EQUIPMENT OR SYSTEM MANUALS

18.1.4.6.1 N/A

18.1.5 TRAINING

18.1.5.1.1 N/A

18.2 UPS INSTALLATION FOR THE BACK-UP ECDIS

18.2.1 IDENTIFICATION

18.2.1.1 The intent of this SOW item is to install an RO approval marine grade UPS and battery bank for the back-up FURUNO ECDIS to be certified by RO for the navigation chart paperless. This UPS and battery pack installation will include but is not limited to the following; GES-102N 1KV/700W 120VAC UPS and BBU-102NA battery bank.

18.2.2 REFERENCES

18.2.2.1 EQUIPMENT DATA

18.2.2.1.1 The following is Government Supplied Material (GSM):

Quantity	Equipment	Manufacture/Equipment Details
1	1KV/700W 120VAC UPS	Always On GES-102N
1	Battery Bank	Always On BBU-102NA

18.2.2.2 CONTRACTOR FURNISHED MATERIAL (CFM)

18.2.2.2.1 All materials, equipment and parts, including but not limited to the list provided in the table below, as well as any other materials necessary to perform the specified work – unless clearly states otherwise - must be Contractor Furnished Material (CFM) .

Quantity	Equipment	Manufacture/Equipment Details
Note*	14 AWG 3C Cable	Anixer BVA-1403C
2	AC Power Connector	SCHURTER Inc. / Power Entry Connector Plug, Male Blades IEC 320-2-2/E Free Hanging (In-Line)
2	AC Power Connector	SCHURTER Inc. / Power Entry Connector Plug, Female Sockets IEC 320-C13 Free Hanging (In-Line)
2	AC Power Connector	HUBBELL / HBL5965VY / PLUG STRAIGHTBLADE 15A 125V YELLOW

Note *: It is the Contractor's responsibility to measure the required length of cabling.

18.2.2.3 MANUALS

18.2.2.3.1 The following equipment manuals are provided as Guidance Documents.

Manual Title	Electronic File Name
Always On M0305 N Series UPS - Operators Manual	Always On M0305 N Series UPS - Operators Manual.pdf
Always-On-UPS-Catalogue	Always-On-UPS-Catalogue-May-5-2022.pdf

18.2.2.4 DRAWINGS

18.2.2.4.1 The following Drawings are to be considered as Guidance Drawings.

Drwg. No.	Drawing Title	Electronic File Name
N/A	LimnosRadarECDIS_CCG_GuidanceDrawing_1	LIMNOS RADAR ECDIS IN1_NEW.dwg
N/A	LimnosRadarECDIS_CCG_GuidanceDrawing_2	LIMNOS RADAR ECDIS IN2_NEW.dwg

18.2.2.5 REGULATIONS AND STANDARDS

18.2.2.5.1 All Work must conform to the Acts, Regulations, Standards, Rules, Codes, and Guideline Requirements listed in Appendix A.

18.2.3 STATEMENT OF WORK

18.2.3.1 GENERAL

18.2.3.1.1 The Contractor must follow the Safety Instructions on the Always On M0305 N Series UPS - Operators Manual.

18.2.3.2 UPS AND BATTERY BANK INSTALLATION

- 18.2.3.2.1** UPS and battery bank must be installed on the FWD console in the wheel house and secured by aluminum brackets. Please see the mounting location in picture 18.2.A, and the binders will be removed by CCGS. If it is necessary, the wooden shelf will be lowered by 1 inch.

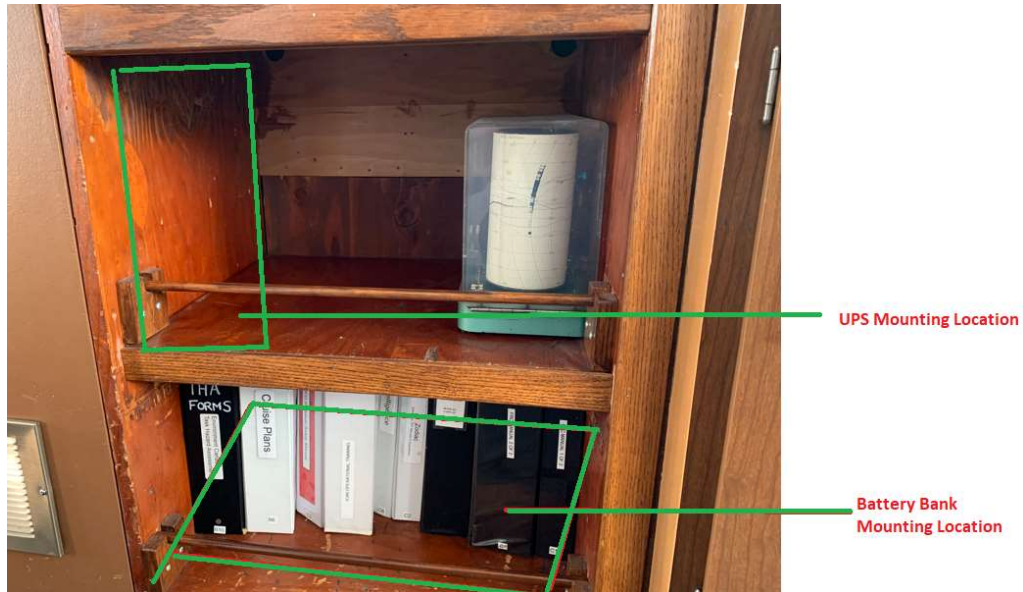
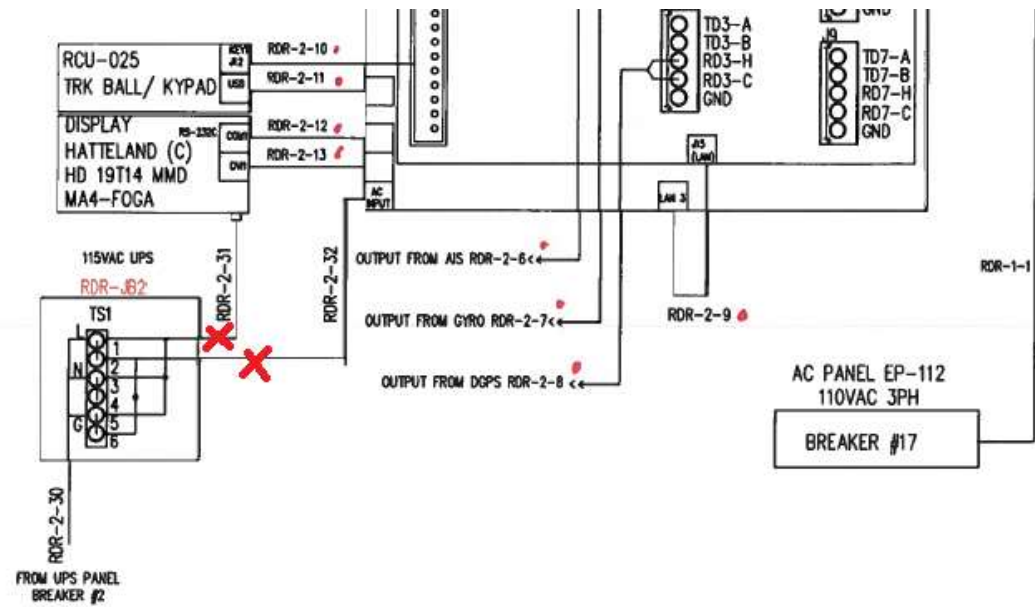


Figure 18.2.A – UPS & Battery Bank Mounting Location

18.2.3.3 CABLE INSTALLATION

- 18.2.3.3.1** The Contractor must disconnect the cable RDR-2-31 and RDR-2-32 from the junction box RDR-JB2, terminate into a proper AC power connector in the table 18.2.2.2.1 , and reconnect them to the new GES-102N UPS. If the existing power cable RDR-2-31 and RDR-2-32 are not long enough to reach the new UPS, the Contractor must run new power cables and terminate both ends.



**Figure 18.2.B – Existing Power Connection on the RDR -JB2
for PORT Radar Processor & Display**

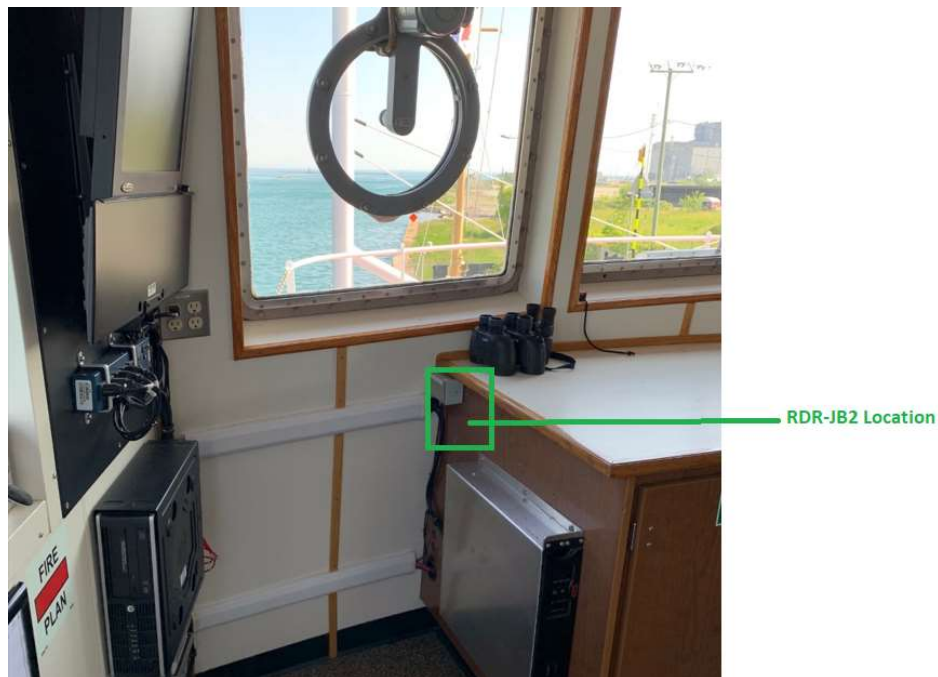
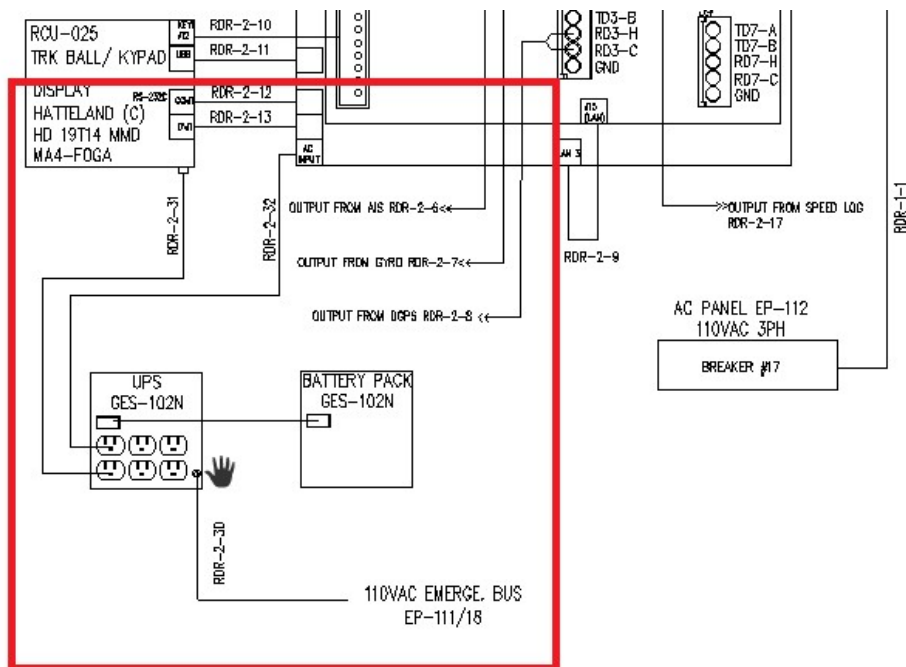


Figure 18.2.C – RDR -JB2 Location



Figure 18.2.D – PORT Radar Processor & Display Location



**Figure 18.2.E – Power Connection on the New UPS
for PORT Radar Processor & Display**

- 18.2.3.3.2** The Contractor must connect the UPS input to the ship emergency 110VAC outlet.
- 18.2.3.3.3** The Contractor must supply and install all the cables required to provide complete and functional systems that meet all of the requirements identified in this statement of work.
- 18.2.3.3.4** The Contractor must use OEM-supplied cabling included with equipment unless otherwise stated in this SOW Item.
- 18.2.3.3.5** Where cabling is not included with the equipment, the Contractor must supply cabling listed in 18.2.2.2.1, or an equivalent approved by the TA.
- 18.2.3.3.6** The Contractor must use cabling, connectors and connector installation tools from the same equipment manufacturer in order to provide a complete and functional cabling system.
- 18.2.3.3.7** The Contractor must ensure all installed cables are tagged with cable designations at each end and through any deck, deckhead and/or cable penetration. The Same cable designation must be used to identify cables in the "As Fitted Drawings":
- p) The cable tags for outdoor locations must be of the embossed stainless steel metallic type and securely affixed to the cables;
 - q) The cable tags for indoor locations must be of the permanent printed plastic type;
 - r) Self-adhesive plastic wrap-around or heat shrink sleeves may be used in certain areas, at the discretion of the TA; and
 - s) Individual conductors must be either colour-coded or identified using heat shrink sleeves.
- 18.2.3.3.8** The Contractor must ground all equipment as per OEM documentation.
- 18.2.3.3.9** For cables other than the CAT6a cables, continuity testing is not required; however, all cables which have been installed by the Contractor that are found to be defective (fail continuity test) or damaged must be replaced by the Contractor at the Contractor's expense (material and labour) before commissioning.
- 18.2.3.4 WIRING TERMINATIONS**
- 18.2.3.4.1** The Contractor must complete the wiring terminations for all cables as per CCG provided drawings and documents or as per the CCG approved Contractor's drawings.
- 18.2.3.4.2** Any wire terminating into a terminal block or terminal strip must be terminated using crimped ferrules.
- 18.2.3.5 INTERFERENCES**
- 18.2.3.5.1** The Contractor is responsible for the identification of interference items, their temporary removal, storage, and refitting to the vessel.
- 18.2.3.6 INSPECTION POINTS**
- t) **HOLD POINT 1:** The Contractor must seek confirmation of UPS and battery bank installation location from the TA prior to performing any installation work.

- u) HOLD POINT 2: The Contractor must seek confirmation of the quality of UPS and battery bank installation from the TA prior to powering on the equipment.

18.2.3.7 TESTING AND TRIALS

18.2.3.7.1 The Contractor must demonstrate the full functionality of the newly installed UPS and battery bank.

18.2.3.7.2 The Contractor must run a successful battery test.

18.2.3.7.3 The Contractor must have various measurement through the UPS meters display and multimeter. The Contractor must record the measurements on the table below.

Measurements	Reading from UPS Display	Reading from Multimeter
O/P VOLT		
O/P FREQ		N/A
I/P VOLT		
I/P FREQ		N/A
BAT VOLT		N/A
O/P LOAD		N/A
O/P W		N/A
O/P VA		N/A
O/P Current		N/A
BACKUP TIME		N/A
BAT CHARG		N/A
TEMPERATURE		N/A
BAT PACK NUM		N/A
RATING		N/A
CUP VERSION		N/A

18.2.4 DOCUMENTATION AND DELIVERABLES

18.2.4.1 The Contractor must provide the TA with original copies of the following:

18.2.4.2 REPORTS

18.2.4.2.1 N/A

18.2.4.3 CERTIFICATES

18.2.4.3.1 All components and/or equipment certifications or Type Approvals (where applicable) must be submitted to Canada.

18.2.4.4 MEASUREMENTS, CALIBRATIONS AND READINGS

18.2.4.4.1 UPS Measurements

18.2.4.5 DRAWINGS

18.2.4.5.1 The Contractor must provide an "As-Fitted" version of the drawings which will reflect the installation including any deviation from the installation drawings (redlines) that occurred during the installation. The As-Fitted version must be submitted within fifteen (15) business days of the completion of the work, or 5 business days prior to completion of the vessel work period, whichever occurs first.

18.2.4.6 SPARES

18.2.4.6.1 N/A

18.2.4.7 EQUIPMENT OR SYSTEM MANUALS

18.2.4.7.1 N/A

18.2.5 TRAINING

18.2.5.1.1 N/A

19 INTEGRATED CONTROL SYSTEMS [NOT USED]

20 SCIENCE EQUIPMENT [NOT USED]

A APPENDIX A: ACTS, REGULATIONS, STANDARDS, RULES, CODES AND GUIDELINE REQUIREMENTS

A.1.0 Acts, Regulations, Standards, Rules, Codes and Guideline Requirements

The *CCGS Limnos* was built in Canada in 1968. The ship was delegated in 2019 to the American Bureau of Shipping (ABS) and is “not In-Class” in accordance with Transport Canada Marine Safety and Security (TCMSS) Delegated Statutory Inspection Program (DSIP). ABS is henceforward described as the Recognized Organization (RO) under DSIP.

The vessel is certified for ‘Near Coastal Voyages Class 1’ of the Great Lakes Basin, in accordance with the Vessel Safety Certificate Regulations of the Canada Shipping Act 2001 as per the Regulations, Standards and Codes referenced therein.

Inspection of the vessel in accordance with the Canada Shipping Act 2001 must be carried out by the ABS as required for the purposes of the Contract.

A.2.0 Hierarchy and References: Acts, Regulations, Standards, Rules, Codes and Guidelines (ARSRC&G)

The vessel must meet the Act and Regulations in accordance with the Canada Shipping Act 2001 and comply with the Regulations, Standards, Guidelines and Codes referenced therein. The vessel must also comply with the Acts, Regulations, Standards, Rules, Codes and Guidelines referenced in section A.2.0 to A.6.0 of this Appendix including the Rules of ABS as per section A.6.5 and Transport Canada Marine Safety & Security approval requirements applicable to the vessel.

Any standards, rules, codes, or guideline referenced in the regulations (sections A.2.0. to A.6.0 of this Appendix) are mandatory regulatory requirements.

The Regulations under the Canada Shipping Act 2001 are to be applied for a ‘Government vessel on non-commercial service’, unless otherwise noted within this Appendix or the specification.

Individual specifications may draw attention to specific requirements prescribed in reference documents; however, this does not limit the application of the Acts, Regulations, Standards, Rules, Codes and Guidelines (ARSRC&G) referenced in this Appendix.

The latest edition, at the time of contract signing, of all ARSRC&G as well as CCG Fleet Safety Manual listed below are to be used as reference unless otherwise specifically noted. The Contractor must ensure all work completed in the specifications are carried out in accordance with all applicable federal, provincial and territorial regulations and standards. CCG procedures and standards must be used as specified, specifically where no other regulation takes precedence.

The term ‘Approved’ (including the expression ‘Class Approved’) for the purposes of this specification is defined as ‘approved’ as meeting all the requirements under the Acts, Regulations, Standards, Rules, Codes and Guidelines referenced in sections A.2.0 to A.6.0 of this Appendix including ABS Rules as per section A.6.5 and Transport Canada Marine Safety approval requirements applicable to the vessel.

A.3.0 Regulations pursuant to the Canada Shipping Act 2001

Ref	Regulation
1.	Marine Machinery Regulations (SOR/90-264) – These regulations were amended in June of 2021. Among other amendments Parts II to IV of Schedules I to XV of the Regulation were repealed. TP 15456 ‘Canadian Vessel Plan Approval and Inspection Standard’ contains the TCMSS plan approval and inspection requirements.
2.	Hull Construction Regulations (C.R.C., c. 1431) In particular Part VII and Part VIII remain in force as applicable. These regulations were amended in June 2021 to have the inspection requirements migrated to TP 15456 Canadian Vessel Plan Approval and Inspection Standard.
3.	Lifesaving Equipment Regulations (C.R.C., c. 1436) The <i>CCGS Limnos</i> is not considered a classed vessel in accordance with the LSE.
4.	Vessel Fire Safety Regulations (SOR-2017-14) Particular attention is drawn to the following: - Section 1(7) For the purposes of these Regulations, any guidelines, recommendations, requirements, and similar matters set out in a document referred to in a footnote to a document that is incorporated by reference into these Regulations are to be considered mandatory. Approvals required by the Minister of Transport as per sections 2 & 3. Reference; ‘TCMSS Notice to industry: Type Approval Certification to the Marine Equipment Directive (MED) on Canadian Vessels’. European EC and MED type approval certificates are not accepted by TCMSS.
5.	Vessel Pollution and Dangerous Chemicals Regulations (SOR/2012-69) Note, these regulations do not apply to government vessels (section 3(3)). However CCG opts to comply and have certificates issued accordingly unless otherwise indicated within the specification. Incorporate MARPOL, I to VI inclusive as well as the Antifouling Convention, For the purposes of this contract the <i>CCGS Limnos</i> will fully comply except where otherwise noted.
6.	Arctic Shipping Safety and Pollution Prevention Regulations (SOR/2017-286) Not applicable to the <i>CCGS Limnos</i> .
7.	Ballast Water Regulations (SOR/2021-120). The new Ballast Water Regulations were published in the Canada Gazette Part II on June 23, 2021. These regulations impose the Ballast Water Management convention as well as Canadian specific requirements on domestic vessels operating in Canadian waters only. In accordance with the applicable section 3(3)(b), the Regulations do not apply to vessels that are owned or operated by a state and used only in government non-commercial service;

	For the purposes of this contract the <i>CCGS Limnos</i> will fully comply except where otherwise noted.
8.	Cargo, Fumigation and Tackle Regulations (SOR/2007-128) Not applicable to the CCGS Limnos
9.	Collision Regulations (C.R.C., c. 1416)
10.	Crew Accommodation Regulations (C.R.C., c. 1418)
11.	Fire and Boat Drills Regulations (SOR/2010-83)
12.	Load Line Regulations (SOR/2007-99)
13.	Long-Range Identification and Tracking of Vessels Regulations (SOR/2010-277) Not applicable to the CCGS Limnos
14.	Marine Personnel Regulations (SOR/2007-115)
15.	Navigation Safety Regulations, 2020 (SOR/2020-216) Note: References to TP 127 within this Regulations are applicable to all ships
16.	Regulations Excluding Certain Government Ships from the Application of the Canada Shipping Act (SOR/2000-71) Includes exemptions from certain provisions of the Canada Shipping Act
17.	Safe Working Practices Regulations (C.R.C., c. 1467)
18.	Safety Management Regulations (SOR/98-348) Apply in accordance with Chapter IX of SOLAS, Reg. 2.2 This chapter does not apply to government-operated ships used for non-commercial purposes CCG vessels comply voluntarily and are issued a Safety Management certificate by the RO.
19.	Steering Appliances and Equipment Regulations (SOR/83-810)
20.	Vessel Safety Certificates Regulations (SOR/2021-135) (VSCR) The Vessel Safety Certificates Regulations were Published in the Canada Gazette Part II on June 23, 2021. This vessel will be certified for Near Coastal Class 1 voyages .
21.	Vessel Registration and Tonnage Regulations (SOR/2007-126) - Incorporates ITC 69 as applicable.

A.4.0 Marine Technical Review Board Decisions (MTRB) and Determination of Closest Possible Compliance (as applicable)

Transport Canada Marine Safety and Security have approved the following MTRB's for the CCGS Limnos in accordance with the CSA 2001.

MTRB Decision No.	Effective Date
M17193	2020-11-06

Any requests for exemptions to CSA 2001 Regulations/IMO Conventions/ IMO Codes (with the exception of Collision Regulation exemptions) are subject an MTRB decision by TCMSS. Any exemption or equivalency identified or being proposed by the Contractor must be brought to the attention of the owner who may, after consideration, make application for an MTRB to TCMSS through ABS.

A.5.0 Additional Acts and Regulations

Ref	Act and Regulation
a	Canada Labour Code, R.S.C., 1985, c. L-2 Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)
b	Marine Transportation Security Act, S.C. 1994, c. 40 Marine Transportation Security Regulations (SOR/2004-144) 201.2.a. Does not apply to government vessels on government non-commercial service.
c	Canadian Environmental Protection Act 1. Sulphur in Diesel Fuel Regulations (SOR/2002-254) 2. Federal Halocarbon Regulations, 2003 (SOR/2003-289) 3. Ozone-depleting Substances and Halocarbon Alternatives Regulations (SOR/2016-137)
d	Transportation of Dangerous Goods Act (S.C. 1992, c. 34) Transportation of Dangerous Goods Regulations (SOR/2001-286)
e	All work must be completed by contractors in accordance with the local workers' safety regulation of the province or territory where work is performed. For guidance information can be found at: http://www.ccohs.ca/oshanswers/information/wcb_canada.html

A.6.0 Standards, Rules, Codes and Guidelines:

The following Standards, Rules, Codes and Guidelines are to be met. Note that any standards, rules, code, or guideline referenced in the regulations (sections A.2.0 to A.5.0 of this Appendix) are to be considered as mandatory regulatory requirements.

A.6.1 IMO International Conventions

IMO International Conventions are applicable as referenced in the Regulations under the Canada Shipping Act 2001 and MTRB's which may include Canadian specific requirements. Listed below are some of the principle IMO International Conventions.

Ref	IMO International Conventions
a	AFS – International Convention on the Control of Harmful Anti-Fouling Systems on Ships, 2001 (as referenced in the Vessel Pollution and Dangerous Chemicals Regulations SOR/2012-69)
b	BWM – International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (As referenced in the Ballast Water Regulations SOR-2021-120)
c	COLREG – Convention on the International Regulations for Preventing Collisions at Sea (as referenced in the Collision Regulations C.R.C. c. 1416)
d	Load Lines, 1966/1988 – International Convention on Load Lines, 1966, as amended by the Protocol of 1988 (as referenced in the Load Line Regulations, SOR-2007-99)
e	MARPOL – International Convention for the Prevention of Pollution from Ships (as referenced in the Vessel Pollution and Dangerous Chemicals Regulations SOR/2012-69)
f	SOLAS International Convention for the Safety of Life at Sea, 1974 as amended. (as referenced in multiple regulations under the CSA 2001)
g	STCW – International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (as referenced in the Marine Personnel Regulations SOR-2007-115)
h	Tonnage – International Convention on Tonnage Measurement of Ships, 1969 (as referenced in the Vessel Registration and Tonnage Regulations SOR/2007-126)
i	MLC 2006 Maritime Labour Convention, 2006 (as referenced in the Marine Personnel Regulations SOR-2007-115 and the Maritime Occupational Health and Safety Regulations SOR/2010-120)

A.6.2 IMO Instruments

Any document such as Resolutions, Circulars, Guidelines, recommendations, or requirements adopted by IMO or set out in an IMO instrument referred to in a footnote to a document referenced in the Regulations in sections 1.2 to 1.5 of this specification are to be considered mandatory.

Principal IMO Codes, Resolutions, Circulars, Guidelines and Recommendations are listed below (other IMO instruments may also apply):

Ref	IMO Instruments
a	FSS – Fire Safety Systems Code (as referenced in Vessel Fire Safety Regulations (SOR-2017-14) and SOLAS)
b	FTP Code – International Code for Application of Fire Test Procedures (as referenced in Vessel Fire Safety Regulations (SOR-2017-14) and SOLAS)
c	LSA Code – International Life-Saving Appliance Code (as Referenced in Life Saving Equipment Regulations and SOLAS)
d	2008 IS Code – International Code on Intact Stability, 2008 (as Referenced in SOLAS)
e	Noise Levels – Code on Noise Levels on Board Ships (as referenced in SOLAS)

f	International Maritime Dangerous Goods (IMDG) Code, (as referenced in the Cargo Fumigation and Tackle Regulations SOR-2007-128)
g	NOx Technical Code (2008) – Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines (as referenced in the Vessel Pollution and Dangerous Chemicals Regulations SOR/2012-69)
h	Cargo Stowage and Securing (CSS) Code (as referenced in Cargo Fumigation and Tackle Regulations SOR-2007-128 and SOLAS)
i	IMO Resolution MSC.81(70), Revised Recommendation on Testing of Life-Saving Appliances. (as referenced in SOLAS, the LSA Code)
j	MSC/Circ.504 Guidance on design and construction of sea inlets under slush ice conditions ((as referenced in TP 15211)
k	MSC/Circ. 848 – Revised guidelines for the approval of equivalent fixed gas fire extinguishing systems, as referred to in SOLAS 74, for machinery spaces and cargo pump rooms (as referenced in the Vessel Fire Safety Regulations and SOLAS)
l	MSC/Circ.1082 Unified interpretations of the Guidelines for the approval of fixed water-based local application fire-fighting systems (MSC/Circ.913) (as per Vessel Fire Safety Regulations and SOLAS II-2)
m	MSC/Circ.1165, Revised Guidelines For The Approval Of Equivalent Water-Based Fire-Extinguishing Systems For Machinery Spaces And Cargo Pump-Rooms as amended by MSC.1/Circ.1237 (as per Vessel Fire Safety Regulations and SOLAS II-2)
n	MSC.1/Circ. 1267 Amendments To Revised Guidelines For The Approval Of Equivalent Fixed Gas Fire-Extinguishing Systems, As Referred To In SOLAS 74, For Machinery Spaces And Cargo Pump-Rooms (MSC/Circ.848) (as referenced in the Vessel Fire Safety Regulations and SOLAS)
o	MSC.1/Circ.1269 Amendments To The Revised Guidelines For The Approval Of Equivalent Water-Based Fire-Extinguishing Systems For Machinery Spaces And Cargo Pump-Rooms (MSC/Circ.1165) (as per Vessel Fire Safety Regulations and SOLAS II-2)
p	MSC/Circ.913 (As amended by MSC.1/Circ.1387) - Guidelines For The Approval Of Fixed Water-Based Local Application Fire-Fighting Systems For Use In Category A Machinery Spaces (as per Vessel Fire Safety Regulations and SOLAS II-2)
q	MSC.1/Circ.1387 Revised Guidelines For The Approval Of Fixed Water Based Local Application Fire-Fighting Systems For Use In Category A Machinery Spaces (MSC/Circ.913) (as per Vessel Fire Safety Regulations and SOLAS II-2)
r	MSC.1/Circ.1276 – Unified interpretations of SOLAS chapter II-2.
s	MSC.1/Circ. 1386 Amendments To The Revised Guidelines For The Approval Of Equivalent Water-Based Fire-Extinguishing Systems For Machinery Spaces And Cargo Pump-Rooms (MSC/Circ.1165) (as per Vessel Fire Safety Regulations and SOLAS II-2)
t	MSC. 1/Circ. 1580 Guidelines for vessels and units with dynamic positioning (DP) systems. (as applicable for DP System)

A.6.3 TCMSS Technical Publications (TP) (as amended)

Note: Technical Publications (TP's) referenced in part or their entirety within a Regulation are considered as a mandatory requirement under the Regulation.

Ref	TCMSS Technical Publications (TP)
a	TP 127, Ships Electrical Standards - Note for the purposes of the specification all electrical work is to be completed in accordance with TP 127 and referenced codes as well as where TP 127 is referenced in the Regulations noted in sections 1.2 to 1.5. Additionally the inspection requirements in accordance with TP 15456 that reference TP 127 must be carried out.
b	TP 7301 – Stability, Subdivision and Load Line Standards
c	TP 14612 – Procedures for Approval of Life-saving Appliances and Fire Safety Systems, Equipment and Products (as referenced in the Life Saving Equipment Regulations and The Vessel Fire Safety Regulations)
d	TP 13430 – Standard for the Tonnage Measurement of Vessels (2012)
e	TP 13617 – List of Canada's Alternate Ballast Water Exchange Areas and Fresh Waters (2021)
f	TP 3231 – Ship Safety Bulletins, Available at the following URL: https://tc.gc.ca/eng/marinesafety/bulletins-menu.htm In Particular Note the contents of Bulletin 06/1989 Grounding Safety in Dry-dock
g	TP 13585 – Marine Safety Management System
h	TP 14475 – Canadian Life Saving Appliance Standard (as referenced in the Life Saving Equipment Regulations)
i	TP 15211 – Canadian Supplement to the SOLAS Convention
j	TP 15456 – Canadian Vessel Plan Approval and Inspection Standard was adopted by TCMSS in conjunction with the Vessel Safety Certificates Regulations coming into force, June 2021. The standard incorporates many of the requirements formerly contained within the Hull Inspection Regulations and Parts II-IV of Schedules I to XV of the Marine Machinery Regulations as well as TP 127.

A.6.4 American Bureau of Shipping (ABS) Rules and Codes

ABS Rules for Building and Classing Marine Vessels (Marine Vessel Rules) Updated January 1, 2020 . All modifications to the ship and systems, including component supply, plan approval and onsite survey must be completed in accordance with ABS Rules and Codes. The ship is delegated to ABS in accordance with Transport Canada's Delegated Statutory Inspection program and is also not "In-Class".

A.6.5 The following specific ABS Rules and Codes are noted for guidance (as amended):

Ref	ABS Rules and Codes (update as required)
a	ABS Marine Vessel Rules (2021)
b	ABS Guide for Nondestructive Inspection (2020)

c	Generic Rules for Conditions of Classification, Materials and Welding, and Surveys After Construction (2021)
d	Guidance Notes on the Application and Inspection of Marine Coating Systems (2017)
e	Certification of Lifting Appliances (2020)
f	Inspection Grading Criteria for the ABS Hull Inspection and Maintenance Program (HIMP)

A.6.6 Electrical Codes and Standards

ABS or other RO Rules for Building and Classing Marine Vessels (Marine Vessel Rules) Updated January 1, 2020 apply as well as those standards referenced by ABS Rules. As noted TP 127 applies where referenced within an applicable Regulation or TP 15456 (or otherwise within a specification).

Ref	Electrical Codes and Standards are to be complied with as applicable
a	ABS may refer to other regulations and standards when deemed necessary. These include the International Electrotechnical Commission (IEC) publications, notably the IEC 60092 series.
b	Other IEC publications as referenced in ABS Rules are considered mandatory.
c	CSA Electrical Codes are applicable as listed in section A.6.7 below
d	TP 127 – Ships Electrical Standards

A.6.7 CSA Standards

The following CSA Standards apply:

Ref	CSA Standard
a	CSA W47.1 – Certification of Companies for fusion welding of steel, Division 1 or 2 and Annex M
b	CSA W47.2-11 – Certification of Companies for fusion welding of aluminum, Division 1 or 2
c	CSA W59 – Welded Steel Construction
d	CSA W 59.2 – Welded Aluminum Construction
e	CSA W178.2 – Welding Inspector Certification
f	CSA B52-99 – Mechanical refrigeration code
g	CSA Code B64.10.17 – Selection and installation of backflow preventers
h	Note also the CCG Welding Specification CT-043-EQ-EG-001-E (KME#3049715 latest version) applies in addition to CSA and RO standards
The following CSA Standards also apply as referenced below:	
i	CSA Standard CAN3-Z11-M81 (R2005), Portable Ladders (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)

j	CSA Standard CAN/CSA-B311-02, Safety Code for Manlifts; (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)
k	CSA Standard CAN/CSA-Z185-M87 (R2006), Safety Code for Personnel Hoists; (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)
l	CSA Standard Z259.3-99 (R2004), Descent Control Devices; (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)
m	CSA Standard CAN/CSA-Z259.2.1-98 (R2008), Fall Arresters, Vertical Lifelines and Rails (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)
n	CSA Standard CAN/CSA-Z107.56-06, Procedures for the Measurement of Occupational Noise Exposure. (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)
o	CSA Standard CAN/CSA-Z460-05, Control of Hazardous Energy – Lockout and Other Methods (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)
p	CSA Standard CAN/CSA-C22.2 NO. 144-M91 (R2006), Ground Fault Circuit Interrupters. (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)

A.6.8 Other Applicable Standards and Codes

The standards prescribed below are applicable as referenced within the Regulations indicated or otherwise within this Appendix or the specification:

Ref	Standard
a	ANSI/ASSE Standard A10.8-2001, Scaffolding Safety Requirements; (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)
b	ANSI/ALI Standard A14.7-2006, American National Standard for Mobile Ladder Stands and Mobile Ladder Stand Platforms (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)
c	ANSI/ASSE Standard A10.11-1989 (R1998), Safety Requirements for Safety Nets. (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)
d	ANSI/IES RP-7-01, Lighting Industrial Facilities (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)
e	ANSI Standard ANSI/AMT B15.1-2000 (R2008), Safety Standard for Mechanical Power Transmission Apparatus. (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)

f	Guidelines for Canadian Drinking Water Quality, prepared by the Federal-Provincial-Territorial Committee on Drinking Water and published by the Department of Health. (As referenced in the Maritime Occupational Health and Safety Regulations, s. 73(2))
g	NSF/ANSI/CAN/61 – 2020 Drinking Water System Components – Health Effects (As Referenced in the CCG Fleet Safety Manual 7.A.12 & 7.A.13)
h	United States Environmental Protection Agency [US EPA] Method 24 – Surface Coatings (As referenced in CCG FSM 7.A.13)

A.7.0 CCG Specifications, Standards and Fleet Safety Manual (FSM) Publications

The following Canadian Coast Guard Specifications, Standards and Fleet Safety Manual (FSM) Publications, are to be followed:

Ref	Canadian Coast Guard Specifications, Standards and Fleet Safety Manual (FSM) Publications
a	CCG Trim and Stability Book Production MECTS# 3350860
b	CCG Color Coding Standard for Piping Systems 30-000-000-ES-TE-001
c	CCG /8001 03-2020 Paint Containing Lead on CCG Vessels
d	CCG/8006 Vessel Specific Asbestos Management Plan

Fleet Safety Manual (FSM) Publications	
Note: the applicable requirements in accordance with the Regulations as per sections A.2.0 to A.5.0 must be met and take precedence over the guidance contained within the Fleet Safety Manual.	
Publication No.	Title
EKME#3750834	Technical Drawings Modification (Redlining/Mark-ups) & Workflow process 8009-003.pdf (ccg-gcc.gc.ca)
CT-014-000-ES-TD-001	Computer Aided Design (CAD) using AUTOCAD DFO / CCG (ccg-gcc.gc.ca)
CA-014-000-NU-TD-001	Specification for Electronic Technical Data Deliverables DFO / CCG (ccg-gcc.gc.ca)
CCG/8015-001	Inspection of Anchors and Anchor Chains CCG ITS Type 1100 Standard Refit Specification (ccg-gcc.gc.ca)
EKME#3049715	CCG Welding Specification CCG ITS Welding Specification / GCC STI Specification de Soudage (ccg-gcc.gc.ca)

EKME 4195945	Piping Systems Material Selection Manual CCG ITS Piping Systems Material Selection Manual (cgc-gcc.gc.ca)
30-000-000-ES-TE-001	Colour Coding Standard for Piping Systems CCG ITS Standard Colour Coding Standard for Piping Systems (cgc-gcc.gc.ca)
CCG/8023-015	Potable Water Tank Epoxy Coating Standard 015 - Potable Water Tank Epoxy Coating Standard (cgc-gcc.gc.ca)
EKME#3319250	Marine Electrical Safety Manual CCG Marine Electrical Safety Manual / Manuel de sécurité électrique maritime de la GCC (cgc-gcc.gc.ca)
CCG/18-080-000-SG-003	Paints and Coatings Standard
CCG/6016	CCG Fleet – Federal Identity Program Guide
CCG 5737	Fleet Safety Manual (latest edition)
FSM 7.A.10	Handling & Containing Asbestos Materials
FSM 7.B.1	Diving Operations
FSM 7.B.2	Fall Protection
FSM 7.B.3	Entry into Confined Spaces
FSM 7.B.4	Hot Work
FSM 7.B.5	Lock-out, Tag-out
FSM 7.B.6	Electrical Safety – Working on Energized Electrical Conductors or Circuit Parts
FSM 7.E.3	Handling & Discharge of Black and Grey Water
FSM 7.E.5	Handling, Storage & Disposal of Hazardous Materials
FSM 7.E.6	Handling & Discharge – Solid Waste
FSM 10.A.4	Dry-docking
FSM 10.A.6	Paint & Other Coatings
FSM 10.A.7	Contractor Safety & Security

A.8.0 IACS

International Association of Classification Societies, unified interpretations or guidelines and may be consulted for guidance in cases where the applicable Regulations do not set out specific requirements in respect of the design, construction, installation or inspection, however compliance with the Regulatory requirements must be met and guidance must be accepted by CCG, ABS (or other RO) and TCMSS.

For Guidance the following IACS reference is provided: IACS No.47 Shipbuilding and Repair Quality Standard as amended.

A.9.0 Specified Rules, Codes, Standards or Guidelines

The following Rules, Codes, Standards or Guidelines are applicable as indicated within the particular section of the specification.

Ref	Referenced Document
a	SSPC/NACE Surface Preparation Standards, joint standards of the Society for Protective Coatings and NACE International SSPC-SP 1 through SP 14
b	ISO/TS 16431 - Hydraulic fluid power – Verification of cleanliness
	IEEE Std 45 Institute of Electrical and Electronic Engineers Recommended Practice for Electrical Installations on Shipboard
	IEEE STD 315 - Graphic Symbols for Electrical and Electronics Diagrams
	IEC/IEEE 80005, IEC/IEEE International Standard - Utility connections in port
	CSA C22.1 Canadian Electrical Code
	CSA C22.2 – General Requirements – Canadian Electrical Code Part II CSA C22.2 - Degrees of protection provided by enclosures (IP Code)
	CSA Z462-18 Workplace electrical safety
	ISO 4406 – Hydraulic fluid power -- Fluids -- Method for coding the level of contamination by solid particles
	ISO 5894 - Ships and marine technology — Manholes with bolted covers
	ISO 6743-9:2003 Lubricants, industrial oils and related products (class L) — Classification — Part 9: Family X (Greases)
	ISO 6743-99:2002 Lubricants, industrial oils and related products (class L) — Classification — Part 99: General
	ISO 7061:2015 Ships and marine technology - Aluminum shore gangways for seagoing vessels
	ISO 8501-1 - Preparation of steel substrates before application of paints and related products
	ISO 8573.1 - Compressed air — Part 1: Contaminants and Purity Classes

	ISO/TS 9002:2016 Quality management systems — Guidelines for the application of ISO 9001:2015
	ISO/TR 10949 - Hydraulic fluid power- Component Cleanliness Guidelines for achieving and controlling cleanliness of components from manufacture to installation
	ISO14726 Ships and marine technology — Identification colors for the content of piping systems
	ISO 15748-1 Ships and marine technology — Potable water supply on ships and marine structures — Part 1: Planning and design
	ISO 15748-2 - Ships and marine technology - Potable water supply on ships and marine structures - Part 2: Method of calculation
	ISO/TS 16431 - Hydraulic fluid power – Verification of cleanliness
	ISO 18413 - Hydraulic fluid power – Cleanliness of parts and components – Inspection document and principles related to containment collection, analysis, and data reporting
	AN/CGSB - ASTM F1321-14- Canadian General Standards Board, Standard Guide for Conducting a Stability Test (Lightweight Survey and Inclining Experiment) to determine the Light Ship Displacement and Centers of Gravity of a Vessel
	API 650 and 653 Welded Steel Tanks for Oil Storage/Tank Inspection, Repair, Alteration and Construction
	ASME Y14.100 - American Society of Mechanical Engineers Y14.100 - 2017 Engineering Drawing Practices - Nov. 14, 2017
	ASTM F992 Standard Specification for Valve Label Plates
	ASTM F1321 Standard Guide for Conducting a Stability Test (Lightweight Survey and Inclining Experiment) to Determine the Light Ship Displacement and Centers of Gravity of a Vessel
	CAN/CGSB-1.193-99 - Canadian General Standards Board for High-Build Epoxy Marine Coating
	CAN/CGSB 48.9712 (latest edition)- Non-destructive testing – Qualification and certification of NDT Personnel
	CAN/CSA-Z1001-18 Occupational health and safety training
	CSA Z462:21 Workplace electrical safety

	CSA Z795-03 (R2013) Coding of Work Injury or Disease Information
	CSA Z1000:14 (R2019) Occupational health and safety management
	CAN/CSA-Z1002-12 (R2017) Occupational health and safety - Hazard identification and elimination and risk assessment and control
	CSA Z1005:21 Workplace incident investigation
	CSA Z1006:16 (R2020) Management of work in confined spaces
	EACO Environmental Abatement Council of Canada (Formerly 'Environmental Abatement Council of Ontario') Lead Guideline for Construction, Renovation, Maintenance or Repair October 2014 (provided for guidance purposes)
	NSF/ANSI/CAN 61-2021 Drinking Water System Components - Health Effects
	PMBok 3rd Edition - A Guide to the Project Management Body of Knowledge (Project Management Institute guidelines to project management)
	SNAME (3-47)- Rules/Guidelines for Sea Trials-latest edition

Publication	Title	Supplied By
Ship Specific Asbestos	CCGS Limnos – Asbestos Reassessment Report (Pinchin) 2019-07-19	CCG
	Guidelines for Canadian Drinking Water Quality https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html	Contractor
SSPC	The Society for Protective Coatings https://www.sspc.org/	Contractor
TP 11469	Guide to Structural Fire Protection	Contractor
TP 14612	Procedures for Approval of Life-saving Appliances and Fire Safety Systems, Equipment and Products	Contractor
IEEE 45-2002	Recommended Practice for Electrical Installations on Shipboard	Contractor
ANSI/NEMA 250-2020	Enclosures for Electrical Equipment	Contractor

IEC 60533	Electrical and Electronic installations in ships – Electromagnetic Compatibility	Contractor
TC SSB 06/1989	Grounding Safety in Dry-dock	Contractor
ABS Publication #49	ABS Guidance Notes on The Application and Inspection of Marine Coating Systems https://ww2.eagle.org/en/rules-and-resources/rules-and-guides.html	Contractor
AkzoNobel, Ref 223 Issued 12/16/2020	Intershield 300 – ENA300/A (Bronze) & ENA301 (Aluminium) – Abrasion Resistant Aluminum Pure Epoxy	Contractor
AkzoNobel, Ref 269 Issued 12/16/2020	Intergard 263 – FAJ034/A – Epoxy Tie Coat (Light Grey)	Contractor
AkzoNobel, Ref 736 Issued 5/19/2016	Interspeed 640 Free Polishing Anti-fouling - BRA642 Technical Data Sheet	Contractor
AkzoNobel, Ref 456 Issued 12/13/2019	Intersheen 579 – LAF287 Top Coat Modified Acrylic Finish (White and RAL3000 Flame Red)	Contractor
ASME Y14.100	American Society of Mechanical Engineers Y14.100 – 2017 Engineering Drawing Practices – Nov. 14, 2017 https://www.ashrae.org/	Contractor
NSF/ANSI/CAN 61	Drinking Water System Components https://www.techstreet.com/nsf	Contractor
SSPC-Guide 15-2020	Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates	Contractor
CSA W47.1	Certification of Companies for Fusion Welding of Steel Structures -Division 1 or 2 Certification	Contractor
CSA W47.2	Certification of Companies for Fusion Welding of Aluminum	Contractor
CSA W48	Filler Metals and Allied Materials for Metal Arc Welding	Contractor
CSA W59	Welded Steel Construction – Metal Arc Welding	Contractor
CSA W59.2	Welded Aluminum Construction	Contractor
CSA W178.1	Certification of Welding Inspection Organizations	Contractor
CSA W178.2	Certification of Welding Inspectors Endorsement: Ships and Marine Structures and Buildings and Industrial Structures	Contractor
CSA Z462	Workplace Electrical Safety	Contractor
IEC 60529	Ingress Protection Code	Contractor
IACS Rec No 20	Non-destructive testing of ship hull steel welds http://www.iacs.org.uk/publications/	Contractor

IACS Rec No 47	Shipbuilding and Repair Quality Standard http://www.iacs.org.uk/publications/	Contractor
ASTM E165-18	Standard Practice for Liquid Penetrant Testing for General Industry https://www.astm.org/	Contractor
TP127E-2018	Ships Electrical Standard	Contractor
70-000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment	Contractor
NFPA 306 2014	Standard for the Control of Gas Hazards on Vessels	Contractor
CAN/CGSB 48.9712	National Non-Destructive Testing Certification Body of Natural Resources Canada https://www.nrcan.gc.ca/science-data/national-non-destructive-testing-certification-body/22056	Contractor
NACE No. 2 / SSPC-SP10	Near-White Metal Blast Cleaning https://www.nace.org/home	Contractor
NACE_WJ-3/SSPC-SP_WJ-3	Waterjet Cleaning of Metals—Thorough Cleaning (WJ-3) https://www.nace.org/home	Contractor
NACE 6A192/SSPC-TR 3-2000-SG,	Dehumidification and Temperature Control During Surface Preparation, Application, and Curing for Coatings/Linings of Steel Tanks, Vessels, and Other Enclosed Spaces	Contractor
ISO 11126 Parts 1 - 8	Preparation of steel substrates before application of paints and related products — Specifications for non-metallic blast-cleaning abrasives https://www.iso.org/standards.html	Contractor
ISO Standard 4406/2017	Hydraulic Fluid Power – Fluids – Method for coding the level of contamination by solid particles https://www.iso.org/standards.html	Contractor
DNVGL-CP-0165	Cable & Pipe Penetrations	Contractor
ISO 9712:2005	International Standards for NDT	Contractor
ISO 8501-1:2007	Preparation of steel substrates before application of paints and related products	Contractor
ISO 8502-6	Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 6: Extraction of soluble contaminants for analysis — The Bresle method https://www.iso.org/standards.html	Contractor
TP 3669	Standards for Navigating Appliances and Equipment	Contractor



C Appendix C: Photographs



B1: Grey- & Black-Water Tanks overview, showing access doors

D Appendix D: Conditions and Definitions

The following conditions and definitions are applicable to all work contained in the Specifications and are intended to outline the quality of workmanship and practice that is the minimum acceptable level:

Term	Condition/Definition Meaning
Install	The Contractor must connect mechanically and electrically and provide the labour and materiel to complete the installation
Reinstall	The Contractor has affected repairs on/or removed/alterd a piece of equipment to complete another section of the specification. The Contractor must return/install the equipment in its original location and be mechanically and electrically connected. The Contractor must provide the labour and materiel to complete the reinstallation
Remove	The Contractor must provide all labour and materiel to remove the unit, equipment, materiel, or system in its entirety. Part of the removal process is to blank openings, restore insulation and paint
Relocate	The Contractor must provide all labour and material to remove the unit, piece of equipment, or system and to install the same unit, piece of equipment, or system in the new location
Or equivalent	A substitute which has equal characteristics i.e. (size, materiel type, life, weight, input, and output) as approved by the TA. A comparison of the general specifications must be provided to the TA for the equipment specified and the "or equivalent" (i.e. old compared to the new)
Overhaul	Any mechanical equipment, structure or system comprising: disassembly into component parts; cleaning examination of parts for defects; gauging of parts for wear; reporting of parts worn beyond specification limits or otherwise defective and reassembly followed by specification adjustments; tests; and functional trials
Disconnect	The Contractor must mechanically and electrically disconnect the piece of equipment of all piping, wiring, seating and other attachments permitting the removal of the unit as a whole
Disassemble	The Contractor must provide all labour to take apart, piece by piece, the equipment, machinery or system to be examined or repaired
Reassemble	The Contractor must provide all labour and material to put together, piece by piece, the equipment, machinery or system on completion of examination or repair
Additional Work Procedures	The procedures as defined in solicitation and contract and includes any additional work required on a system, sub-system or equipment which the original specification did not specify
Calibrate	The adjustment of readings and measurements to a known standard;

Check	The Contractor must provide labour to find faults by sighting, feeling or listening. The checking of any equipment does not involve the disturbance or removal of parts, components or sub-assemblies
Examine	The Contractor must provide labour for the process of systematically examining, checking and testing equipment, records or administrative procedures to detect actual or potential defects or errors
Test	The Contractor must provide labour to conduct the operation of a unit in relation to a stated standard or procedure
Set-to-work	The tuning, alignment and adjustment of equipment/systems required subsequent to satisfactory installation. Inspection to make the equipment/systems ready for technical acceptance trials
Trials	An element of Quality Assurance that means an action(s) by which the Contractor proves by a visual or instrumental presentation that the equipment or system satisfies the requirements of the specified trials agenda
Functional test	The operation of a piece of equipment in all its normal operating modes and throughout its operating range to establish that it will perform its designed function within normal operating parameters as indicated in the manufacturer's documentation

E Appendix E: Abbreviations

The following abbreviations are used in this specification and are provided in English and French

ACM	Asbestos Containing Material	MCA	Matériaux contenant de l'amiante
CA	Contract Authority	AC	Autorité contractante
CFM	Contractor Furnished Material and/or Equipment	MFE	Matériaux fournis par l'entrepreneur
CLC	Canada Labour Code	CCT	Code canadien du travail
CSA	Canadian Standards Association	CSA	Association canadienne de normalisation
CWB	Canadian Welding Bureau	BCS	Bureau canadien du soudage
DFO/CCG	Department of Fisheries and Oceans, Canadian Coast Guard	MPO/GCC	Ministère des Pêches et des Océans, Garde côtière canadienne
FASP	Factory Approved Service Provider	FSAU	Fournisseur de services approuvé par l'usine
FSR	Manufacturer's Field Service Representative	RSF	Représentant de service du fabricant
FSM	Fleet Safety Manual	MSSF	Manuel de sûreté et de sécurité de la flotte
GSM	Government Supplied Material and/or Equipment	MFG	Matériel fourni par le gouvernement
HC	Health Canada	SC	Santé Canada
IA	Inspection Authority	AI	Autorité inspectant
IEEE	The Institute of Electrical & Electronic Engineers Inc.	IEEE	Institute of Electrical and Electronic Engineers
MOHS	Marine Occupational Health and Safety	SSTM	Santé et la sécurité au travail en milieu maritime
MSDS	Material Safety Data Sheet	FS	Fiche signalétique
NDT	Non Destructive Testing	END	Essais non destructifs
OEM	Original Equipment Manufacturer	FEO	Fabricant d'équipement d'origine
OHS	Occupational Health and Safety	SST	Santé et sécurité au travail
PSPC	Public Service and Procurement Canada	SPAC	Service public et approvisionnement Canada

PWGSC	Public Works and Government Services Canada	TPSGC	Travaux publics et services gouvernement aux Canada
RO	Recognized Organization as defined by Canada Shipping Act.	OR	Organismes reconnus par la Loi sur la marine marchande du Canada
SSMS	Safety and Security Management System	SGSS	Système de gestion de la sécurité et de la sureté
TBS	Treasury Board of Canada Secretariat	SCT	Secrétariat du conseil du trésor du Canada
TA	Technical Authority – CCG Superintendent, Marine Engineering Central Region, or delegated Representative.	AT	Autorité technique – Représentant du propriétaire (GCC)
TCMS	Transport Canada Marine Safety	SMTC	Sécurité maritime de transports Canada
TI	Technical Inspector – CCG delegated.	AI	Autorité de l'Inspection – Inspecteur technique (GCC)
TSR	Technical Service Representative	RST	représentant du service technique
VCS	Vessel Condition Survey	DCC	Demange de changement de configuration
VLE	Vessel Life Extension	PVN	Prolongement de vie d'un navire
WCB	Workers' Compensation Board	CNESST	Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST)
WHMIS	Workplace Hazardous Materials Information System	SIMDUT	Système d'information sur les matières dangereuses utilisées au travail