

CCGS MARTHA L. BLACK DRYDOCK FY 2022-2023

Specification No. F7949-210340

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G 1.0 GENERAL REMARKS

G 1.1 OBJECT

- G 1.1.1** CCGS Martha L. Black is currently a fully operational vessel with all valid ABS navigation certificates. The drydock will allow for the replacement of three new diesel propulsion alternator sets and their associated systems, the refurbishment of the helicopter retractable hangar, the installation of new electronic equipment, and asbestos-containing materials removal. The refit also includes a range of regulatory and certification work requiring drydocking and various regulatory inspections on the Sea Bay, and Sea Chest.
- G 1.1.2** The various project's, requirements, objectives, performances, standards and engineering requirements for the life extension of the CCGS Martha L. Black for the Canadian Coast Guard are described and defined in various sections of the Statement of Work (SOW).
- G 1.1.3** Regardless of any errors, omissions, discrepancies, redundancies, or lack of clarity in these project requirements, it is the responsibility of the Contractor to ensure the following:
- The performance of the work specified herein is in accordance with the requirements of the Inspection Authorities (IA) and regulatory agencies as delegated by Transport Canada Marine Safety to ABS.
 - All items and equipment provided are required to ensure the safe seaworthiness and operation of the vessel in all respects in accordance with the requirements for a vessel of this class.
 - Sections 10 through 21 of these specifications define each item of work for which the Contractor is responsible on the CCGS Martha L. Black Life Extension Project.
 - The performance requirements presented in Sections G1 through G8 of this project specification must apply in all respects to Sections 10 through 21.
 - A complete list of CCGS Martha L. Black's drawings is included is included, and listed in each specification work section. It is the responsibility of the Contractor to seek clarifications and additional vessel drawings, if required.

G 1.1.4 Abbreviations used in these specifications are provided in Appendix of this Statement of Work.

G 1.1.5 The vessel will not be fully crewed during the contract, except for the period of preparation for re-certification and sea trials.

G 1.2 GENERAL VESSEL INFORMATION

Name	CCGS Martha L. Black
Type	Heavy duty multi-task ship type 1100
TCMS Notation	Lloyd's Register X100A1 ice rating 1A Super X LMC Regulations for the Prevention of Pollution of Arctic Waters from Ships Arctic Rating 2
Propulsion	
Year of construction	1986
Travel class	Unlimited - over 200Nm
Manufacturer	Burrard Drydock, Vancouver
Port of Registry	Three diesel propulsion engines, with three main constant speed alternator, 900RPM, Alco 251F that power two electric motors and propeller shafts. Each shaft drives a fixed pitch propeller. The existing bow thruster is a Wartsila thruster installed in 2018. The single rudder is equipped with an independent electrohydraulic steering mechanism.
Main dimensions	
Length Overall	83.0 meters
Length between parallels	75.0 meters
Width over chords	13.7 meters
Loaded Draft	6.2 meters
Tonnage	3853 GT, 1528 NT
Loaded displacement	4968,7 tons
Light displacement	3323.45 tons

G 1.3 **REFERENCES**

G 1.3.1 Applicable Project Documents Provided by the CCG

The Contractor receives the following set of documents related to the Scope of Work for the CCGS *Martha L. Black* Life Extension Project – drydock 2023-2024:

- Technical specifications (this specification and annexes)
- Design drawings - electronic format
- CCGS Martha L. Black drawings - electronic format
- CCGS Martha L. Black Recent Asbestos Assessment Report
- Relevant CCG Standards and Guidelines - electronic format

G 1.3.2 Applicable Publications, Standards, and Regulations (not provided by CCG):

The latest edition, at the time of contract signing, of all Acts, regulations, standards, publications, and procedures listed below are to be used as reference. The Contractor must ensure all work, completed in the specification, are done to all pertinent federal, **provincial** and territorial regulations and standards. CCG procedures are to be used as a guide if no other regulation takes precedence.

G 1.3.3 List of the Minimum Applicable Documents, Standards, and Regulations

Publications / Standards / Regulations	Title / Description
ABS Rules - Part 7	Survey After Construction
ANSI/TIA-568	Commercial Building Telecommunications Cabling Standard
ASTM A105-2010	Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A106-2021	Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A193-2020	Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
ASTM F1321-92 (2004)	Standard Guide for Conducting a Stability Test (Lightweight Survey and Inclining Experiment) to determine the Light Ship Displacement and Centers of Gravity of a Vessel (Guide)
ASTM G8295 -(2003)	Standard Guide for Development and Use of a Galvanic Series for Predicting Galvanic Corrosion Performance
CAN/CGSB-1.193-99	Epoxy Resin Coating, High Build, Marine

Publications / Standards / Regulations	Title / Description
CAN/CGSB 1.61-2004	Alkyd Enamel Paint, Exterior and Interior, Marine
CAN/CGSB 3-GP-11D	Marine Fuel Oil, 2002-11-01
CAN/CGSB 4.155-M88	Ignition Resistance of Soft Flooring - Sampling Plans
CAN/CGSB 48.9712	Qualification and Certification of Non-destructive Testing Personnel
CAN/CGSB 51.53-95	Poly (Vinyl Chloride) Sheeting for Insulated Pipe Jackets, Containers and Ductwork
CAN/CSA-C22.2 No. 60529-05 (R2015)	Degrees of protection provided by enclosures (IP Code)
CAN/CSA-Z180.1-00	Compressed Breathing Air and Systems
CAN/ULC-S102-03	Surface Burning Characteristics of Building Materials and Assemblies
CAN/ULCS10903	Fire Tests of Flame-Resistant Fabrics and Films
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
CSA C22.1 SB06	Canadian Electrical Code, Part 1: Safety Standard for Electrical Installations
CSA C22.2 - No. 0M91 -(R2006)	Canadian Electrical Code, Part 2 - General Requirements
CSA C22.2 – No. 0-10 (2014)	General Requirements – Canadian Electrical Code Part II
CSA CAN3Z299-.385 -(R2002)	Quality Assurance Program - Category 3
CSA W47.1-09	Certification of Steel Fusion Welding Companies
CSA W47.2M1987 -(R2003)	Certification of Aluminum Fusion Welding Companies
CSA W48-18	Filler Metals and Allied Materials for Arc Welding
CSA W59-08(R2008) -	Welded steel construction
CCG Technical Bulletin 2015-01	Potable water tank epoxy based surface coatings update, lessons learned and recommendations
EPS Report 1/RA/2 April 2015, Errata June 2021	Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems - Environment Canada
FHR 2022	Federal Halocarbon Regulations, 2022

Publications / Standards / Regulations	Title / Description
FSM 7.A.12	Fleet Safety Manual, section on drinking water quality
FSM 7.B.3	Fleet Safety Manual, section on Entry into Confined Spaces
FSM 7.B.4	Fleet Safety Manual, section on Hotworks
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
IACS No. 47 (Rev. 5, Oct 2010)	Shipbuilding and Repair Quality Standard
IACS 47	Shipbuilding and repair quality standard
IEC 60092-504 -Ed. 3.0 in : 2001	Electrical installations in ships - Part 504: Special features - Control and instrumentation
IEC 60533 Second edition	Electrical and electronic installations on board ships - Electromagnetic compatibility
IEEE 45-2017	Institute of Electrical and Electronics Engineers, Recommended Practice for Electrical Installations on Shipboard
IEEE 315-1975 (Reaffirmed 1993)	Graphic Symbols for Electrical and Electronics Diagrams
IEEE 45.6-2016	IEEE Recommended Practice for Electrical Installations on Shipboard – Electrical Testing
IMO MSC.1/Circular.1432	Guidelines for the Maintenance and Inspection of Fire Protection Systems and Appliances
IMO MSC./Circular 808	Recommendations on Performance Standards for Public Address Systems on Passenger Ships, including Cabling
IMO Resolution A.1021(26)	IMO Code on Alerts and Indicators
ISO 4406 - 1999	Hydraulic power transmission - Fluids - Method of coding the level of solid particulate pollution
ISO 18413:2002	Hydraulic power transmission - Cleanliness of parts and components - Inspection documents and principles for extracting and analyzing contaminants and expressing the results
ISO/TR 10949:2002	Hydraulic power transmission - Component cleanliness - Guidelines for achieving and maintaining component cleanliness from manufacture to installation
ISO/TS 16431:2002	Hydraulic transmissions - Verification of cleanliness

Publications / Standards / Regulations	Title / Description
ISO 157481-:2002	Ships and marine technology - Water supply on ships and marine structures - Part 1: Planning and design
ISO 157482-:2002	Ships and marine technology - Water supply on ships and marine structures - Part 2: Calculation method
ISO 2081 - 1986	Metal coatings - Electrolytic zinc coatings on iron or steel
LSA Code	International Life-saving Appliance (LSA) Code
NFPA 306 (2014)	Standard for the Control of Gas Hazards on Vessels
NFPA 10 (2019)	Standard for portable fire extinguishers
NFPA 96	Kitchen Hood Cleaning Requirements
NACE 6G186-2010-SG	Surface Preparation of Soluble Salt Contaminated Steel Substrates Prior to Coating
NSF/ANSI/CAN 61	Drinking Water System Components Program
Provincial Regulation on Asbestos	Industrial Health Regulations of the provincial Ministry of Labour with respect to asbestos removal
PMBOK Guide 3rd Edition	Project Management Institute Project Management Guidelines
SA-2½ SSPC SP10	Near White metal blast cleaning
SNAME T&R Bulletin 3-39	Guide For Shop & Installation Tests - 1985
SNAME T&R Bulletin 3-47 (2015)	Guide for Sea Trials
SOLAS Consolidated Edition	IMO Convention for the Safety of Life at Sea
SOR/2010-120	Occupational Safety and Health (Ships) Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations
SSPC SP3	Power tool cleaning
SSPC Guide 15	Methods for Extraction and Analysis of Soluble Salts on Steel and other Nonporous Substrates Society for Protective Coatings (SSPC) Standards
TC Bulletin 06/1989	Transport Canada - Grounding Safety in Drydock
TP 127 (2002) (05/2018)	Ships Electrical Standards

Publications / Standards / Regulations	Title / Description
TP15211	Canadian Supplement to the SOLAS Convention
TP 1861E (1991)	Standards for Navigation Lights, Shapes, Sound Signal Appliances and Radar Reflectors
TP 2072E (1974)	Deck Safety Code
TP 7301 (1975)	Stability, Subdivision and Load Line Standards
TP 11469 (1993)	Guide to Structural Fire Protection
TP13585	Plan Approval And Inspection Requirements Under the Vessel Fire Safety Regulations
TP 14231	Marine Occupational Health and Safety Program
TP 14612 (2019)	Procedures for Approval of Life-saving Appliances and Fire Safety Systems, Equipment and Products
UL 1309 – 21 April 2017	Standard for Safety for Marine Shipboard Cable
	Lloyd's Register Rules for the classification of ships
Current Edition	ABS Rules for the classification of ships
70-000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment
CA-014-000-NU-TD-001	<i>Canadian Coast Guard Specification for Electronic Technical Data Deliverables</i>
30-000-000-ES-TE-001	Color Coding Standard for Piping Systems

G 1.3.4 Sources to access the listed Applicable Documents, Standards, and Regulations

Publications/ Standards/Regulations	Source
Transport Canada Publications (TP)	http://www.tc.gc.ca/fra/securitemaritime/tp-menu-515.htm
CGSB standards/ publications	http://www.scc.ca
ULC standards/publications	http://canada.ul.com/fr/
CSA standards	http://www.csa.ca/cm/ca/fr/home
ISO Standards	http://www.iso.org/iso/fr/home.htm?="
IEEE Standards	http://www.standards.ieee.org

Publications/ Standards/Regulations	Source
ANSI Standards	http://www.ansi.org
ASTM Standards	http://www.astm.org
SNAME Publications	http://www.sname.org
British Standards	http://www.bsi-global.com
Project Management Institute guidelines	http://pmi.org

G 1.3.5 Units of Measurements

The International System of Units (SI) must be used for designing, constructing, refitting, and testing of hull, machinery and equipment – and for reporting – unless specifically stated in this Specification.

G 1.4 **FEES AND COSTS**

G 1.4.1 The Contractor must include the following fees and costs in its bid:

- Services (Section S.1 of this specification)
- Manufacturer's service representatives
- Tests and trials of equipment and vessel
- Provision of safety services, e.g., tank degassing, fire protection, cocooning of asbestos-containing areas;
- Certification of lifting devices as required
- Standard approval for equipment to be installed as required.

G 1.4.2 The Contractor must communicate, coordinate and schedule all regulatory inspections and/or class surveys by the applicable authority: i.e. ABS (TCSM), HC, Environment Canada or others as required by the specification. The costs associated with these inspections will be borne by the Coast Guard.

G 1.5 **QUALITY ASSURANCE**

G 1.5.1 Canada may audit the quality assurance program.

G 1.5.2 The Contractor must submit, as part of its bid package, confirmation that its quality assurance program meets the above standards included in Section G. 1.3.2

G 1.6 **INITIAL INSPECTION**

G 1.6.1 In cooperation with the Technical Authority TA and the IA, the Contractor must conduct an inspection of the vessel. All parties must sign the assessment of the vessel's equipment and systems. This activity must be completed before the Contractor assumes Custody of the vessel. The Contractor must provide a photographic record (section G5.6) of the inspection to the IA and the TA.

G 1.7 PROPERTY OF CANADA

General

G 1.7.1 All materials and equipment removed from the vessel by the Contractor must remain the property of Canada unless the Project requirements explicitly provide for their disposal.

G 1.7.2 The Contractor must preserve and maintain such materials and equipment in good condition pending instructions from the CA.

G 1.7.3 The Contractor must obtain approval from the Contracting Authority (CA) for the disposal of materials and equipment that have no market value after removal from the vessel. A cost estimate must be provided and environmental regulations may apply to some products.

Categorization

G 1.7.4 Any item owned by Canada that is to be removed from the vessel temporarily or permanently must be classified in one of the three (3) categories below as determined by the TA and this specification:

Category A

These items must be permanently removed from the vessel and remain the property of Canada. The Contractor must store and protect these items from physical damage. The Contractor must store these items on pallets, flatbeds or in containers suitable for shipment until Canada has inspected them and has agreed to take charge of them and keep them. The Contractor must provide storage of these items for Canada for the duration of the Contract. Canada is responsible for removing these items from the Contractor's premises.

Category B

These items remain the property of Canada and must be temporarily removed from their location on the vessel during the contract work. They must be returned to their original location on the vessel before the vessel leaves the Contractor's facility. The

Contractor must protect these items from physical damage. These items must be stored in such a manner that they can be moved, to allow access for inspection, refurbishment or maintenance of these items as required. The Contractor must take care not to damage equipment and materials.

Category C

Once removed, these items become the property of the Contractor and must be disposed of in accordance with applicable laws, rules and regulations.

G 1.7.5 Before any items are removed from the vessel, they must be tagged with magnetized labels to clearly indicate whether they are Category A, B or C.

G 1.7.6 This requirement is in addition to any spare parts required for regulatory purposes. All such spare parts must be supplied individually packaged and marked to show the equipment description, model number and catalog or part number.

G 1.8 **SPARE PARTS**

G 1.8.1 All spare parts for the systems must be listed on a spare parts list provided by the Contractor in electronic form, on an MS Excel spreadsheet, listing the recommended quantity for each.

G 1.8.2 All new machinery and equipment furnished by the Contractor for installation on the vessel must be complete and must be delivered with sufficient manufacturer's recommended spare parts for 6 months or 2000 hours of operation, whichever is later, or unless otherwise specified.

G 1.8.3 All spare parts for the systems must be listed on a spare parts list provided by the Contractor in electronic form, on an MS Excel spreadsheet, which lists the number of each basic part installed and the unit price of each spare part. This list must include the following fields:

- the supplier;
- the manufacturer;
- the manufacturer's part number;
- the unit price;
- Unit of Issue (each, box, meter, liter, set, kit, assembly, container, etc. that is related to the purchase price per unit);
- the recommended amount or quantity;
- the system and the related equipment.

- G 1.8.4** An electronic copy of the spare parts list must be provided to the IA and the TA in PDF format on an unlocked USB key.
- G 1.8.5** The Contractor must notify the IA and the TA when the listed spare parts are received and ready for visual inspection.
- G 1.8.6** The Contractor must store the spare parts in accordance with the manufacturer's requirements and ensure that they are protected from weather, physical damage or total loss.
- G 1.8.7** The Contractor must deliver the spare parts to the following address after inspection by TA (Cost will be paid by CCG):

**Canadian Coast Guard
CCGS Martha L. Black
101 Boul. Champlain,
Quebec City, Quebec,
G1K 7Y7**

- G 1.8.8** Any item owned by Canada that is to be removed from the vessel temporarily or permanently must be classified in one of the three (3) categories below as determined by the TA and this specification:

G 1.9 **PROJECT MANAGEMENT**

Introduction

- G 1.9.1** Project management refers to the systems integration, engineering control, and activity management related to the CCGS *Martha L. Black* Life Extension Project.

NOTE: Items below marked with an asterisk (*) must be delivered with the bidder's proposal.

Project Action Plan (PAP)

- G 1.9.2** The Contractor must document the management of the project work in a PAP and update the plan monthly or more often as required by the CA.
- G 1.9.3** At a minimum, the PAP must include organizational structure charts, master schedule, sub-schedules, Sub-Contractor schedules, and timelines for completion of the work and delivery of Government Supplied Materiel (GSM) and Contractor equipment.

G 1.9.4 Monthly updates to the PAP must include schedule updates, a progress report, and review meetings. The components of the PAP and its updates are described in the following subsections.

Project Integration Management

G 1.9.5 The Contractor must provide an organizational chart of the entire project showing all key personnel and Sub-Contractors. In addition, the Contractor must indicate the contractual duties assigned to each Sub-Contractor.

Change Management Log* (CM Log)

G 1.9.6 The Contractor must provide a CM Log to be used throughout the project to manage changes to the project.

G 1.9.7 The CM Log must track project issues according to the following criteria:

- Individual tracking numbers.
- Date the issue was raised.
- Scheduled resolution date.
- Date the issue was resolved.
- Brief note on the resolution of the problem.
- Person who identified the-issue.
- Person responsible for solving the issue.
- Risk factor.

G 1.9.8 If there are issues that require a change in the defined scope work, they must be addressed by way of PSPC 1379 process.

Risk management

G 1.9.9 The Contractor must identify emerging risks and rank them according to their impact on the work. Mitigation strategies must be developed for all "high" risks issues. This "Risk Management Plan" must be updated every 15 days and provided to the TA and the CA. The "Risk Management Plan" must be included in the Record of Decision from the monthly progress meetings.

Planning

G 1.9.10 The Contractor must provide a breakdown schedule of the work down to the system and component level. This schedule must incorporate Sub-Contractor schedules at the same level. The Contractor must update the schedules monthly and submit the updates to the CA, IA, and TA.

- G 1.9.11** Schedules must show all work related to the project. They must include long lead items, GSE, teardowns, production, assembly, installation, bench testing, system commissioning and testing, and planned and required resources.
- G 1.9.12** Schedules must show major milestones, the critical path, and all links between tasks. Schedules must show the starting point with, at a minimum, the next major steps:
- Vessel Transit - Date of arrival of the vessel at the Contractor's facility
 - Docking, mooring, dry-docking, security: contract award + dry-docking for X weeks;
 - Asbestos removal
 - -Completion of planned work in section 18
 - Replacement of the propulsion generator 12.4: The generators landed and the foundations welded, the non-destructive welding tests are carried out;
 - -Replacement of the propulsion generator item 12.4: Genset piping systems completed, flushing certificates and pressure tests;
 - -Completion of all work planned for the helicopter hangar Item 11.6 and 17.5.
 - -Completion of planned work in the wheelhouse 11.7
 - Completion of all steel works
 - Completion of inspections of scheduled domestic systems, signed, and certified fire detection and fire fighting systems.
 - -Completion for all awarded work includes Sub-Contractor / FSR / OEM reports, class certificates and ABS certificates
 - -Vessel Commissioning: Return of crew to vessel to support shipyard dockside trials. ---
- G 1.9.13** The schedule must be delivered 14 calendar days after contract award.
- G 1.9.14** A milestone schedule must be provided in the bidder's submission package.
- G 1.9.15** The Project Management 'Microsoft project' must be used as a reference for planning purposes.

Project reports

- G 1.9.16** The Contractor must provide a monthly progress report, the introduction to which must describe the status, costs and performance of the project. Time, cost and performance will then be reviewed in detail. The report must identify significant risks to the program and the steps taken to prevent them. The risk analysis must identify any impact on project delivery and identify actions taken to address delays that may impact the contract completion date. The report, in hard copy or electronic format, must be submitted monthly, three (3) working days prior to the progress

review meeting, to the Contract Manager, IA and TA. The progress report must report the activity of Sub-Contractors and major component providers.

GENERAL TECHNICAL REQUIREMENTS

G 1.10 OPERATING CONDITIONS OF THE EQUIPMENT

G 1.10.1 All new machinery and equipment supplied and installed must be designed to operate under the following conditions:

- Exterior air temperature range from -40 C to 50 C
- Sea water temperature range 0 °C to 30 °C
- wind speed of 80 knots;
- state of the sea 6;
- a roll of up to 35 degrees to either side of the vessel with a 10 second cycle rate and a heel of 10 degrees with a 5 second cycle rate and a maximum linear acceleration of 1 g;
- 22.5 degrees of permanent inclination to port or starboard, and 10 degrees of permanent pitch from front to back.

Below deck equipment

G 1.10.2 All equipment must be capable of operating as intended under ambient conditions of 75 percent relative humidity at temperatures of 50 degrees Celsius. .

Equipment on deck

G 1.10.3 The equipment must be sealed against environmental elements (such as rain and spray) in order to be able to function as intended on the exterior upper deck. These equipment must have Ingress Protection level IP-66.

Electronic equipment compartments

G 1.10.4 Compartments that contain electronic equipment must receive different treatments on the ship to maintain the following conditions:

Compartments that are considered occupied work spaces:

- Room temperature: 20 °C to 25 °C
- Relative Humidity: 35 to 50%.
- noise level: 65 dBA.

Compartments that are considered machinery spaces:

- Indoor temperature: 20 °C to 25 °C
- Relative Humidity: 40 to 70%.
- noise level: 80 dBA.

Vibration

G 1.10.5 All equipment on the vessel, racks, cables and other appurtenances must be secured to perform as intended under the following conditions:

- Vibrations on board the ship up to 13.2 Hz with a displacement range of +/- 1 mm;
- Vibrations from 13.2 to 80 Hz with a displacement amplitude of ± 0.7 g with a maximum acceleration of 0.7 g;
- Natural frequencies of equipment or equipment supports must not be in the range of 0 to 80 Hz unless they cannot be kept outside this range by construction design methods, in which case the vibrations must be damped to avoid excessive amplification.

G 1.11 PROTECTION OF THE PERSONNEL

General

G 1.11.1 The Contractor must ensure that all rough corners, spikes, sharp edges and protrusions produced during the course of the work are removed.

G 1.11.2 Smoking is not permitted on board the vessel.

Hot work

The Contractor must take the following precautions if hot work is to be performed:

G 1.11.3 Compartment degassing must be certified by a certified marine chemist. The Contractor must provide copies of all certificates to the IA. Certificates must state "safe for Entry" or "safe for hot work" as appropriate. The Contractor must post a copy of all certificates at the entrance to the affected spaces.

G 1.11.4 Protective materials must be used to prevent the spread of sparks and to protect electrical wiring and other services.

G 1.11.5 Fire watch must be provided in each of the spaces where welding, grinding, and burning work is performed, and in all adjacent spaces. Persons manning the fire watches must be equipped with a fire extinguisher and trained in its proper use. They

must maintain the fire watch the designated location for at least thirty (30) minutes after the hot work is performed.

- G 1.11.6** All hot work performed on the vessel during the contract period must be performed in accordance with the Canadian Coast Guard Fleet Safety and Security Management System (CCG FSMS) procedures and work instructions on board the vessel. Copies of the manual and work instructions are available from the TA. The Contractor's Standard Operating Procedures (SOPs) may supersede this requirement upon review and acceptance of these SOPs by the CA and the TA.

Access to confined spaces

- G 1.11.7** The Contractor must provide a copy of the degassing certificate from a certified marine chemist or other qualified person to the IA prior to the start of work. Certificates must state "safe for Entry" or "safe for hot work".
- G 1.11.8** For all work requiring entry or work within confined spaces; the Contractor should note that Canadian Coast Guard vessels currently operate under the ISM code and that each vessel has a Fleet Safety and Security Manual. This manual is also available in electronic format and can be distributed upon request. As a minimum, the Contractor must comply with the work obligation requirements as outlined in the Fleet Safety and Security Manual during the period of work. In accordance with the Fleet Safety and Security Manual, all work that requires entry into confined spaces must utilize a qualified rescue team. This team must be available at all times when tank or confined space entry is required. All costs associated with the confined space rescue team are the responsibility of the Contractor. All confined space access during the contract period must be managed in accordance with the CCG FSMS procedures and shipboard work instructions. The Contractor's Standard Operating Procedures (SOPs) may supersede this requirement after review and acceptance of these SOPs by the CA and the TA.

Rotary machines

- G 1.11.9** Newly installed machines must be equipped with a protective device to prevent contact with rotating parts.

Electrical equipment

- G 1.11.10** When working on electrical equipment, the equipment must be isolated with electrical interlocks and electrical warning labels must be placed on the switches supplying the equipment being serviced at the main power and distribution panel, and the power must be checked at the terminals to ensure that the power is off.

G 1.11.11 Any lockout requirements on board the vessel during the contract period must be met in accordance with CCG FSMS procedures and vessel work instructions. The Contractor's Standard Operating Procedures (SOPs) may supersede this requirement after review and acceptance of these SOPs by the CA and the TA.

Working at height

G 1.11.12 Any work performed at heights must be performed in accordance with CCG FSMS procedures and shipboard work instructions. The Contractor's Standard Operating Procedures (SOPs) may supersede this requirement after review and acceptance of these SOPs by the CA and the TA.

Asbestos

G 1.11.13 The use of asbestos-containing materials is prohibited. All handling of asbestos-containing materials must be performed by trained and certified personnel in accordance with provincial labour regulations. The Contractor must provide the certifications of certified personnel to the IA prior to the commencement of such work. Immediately after contract award it is the Contractor's responsibility to take the required samples to determine the presence of asbestos in the areas affected by the works. The Contractor must include in their pricing the cost for collecting and analyzing a minimum of thirty (30) Asbestos samples on various surfaces that will be disturbed by the refit activities. A unit price per test/analysis is to be provided in the Contractor's bid and any additional tests/analyses required will be dealt through the PSPC 1379 Process

G 1.11.14 It is the responsibility of the Contractor to safely dispose of any asbestos-containing materials, where applicable. The Contractor must provide the IA with copies of certifications related to the disposal of asbestos containing materials in accordance with federal, provincial and municipal regulations.

G 1.11.15 Note: The last survey conducted determined that non-friable asbestos containing materials were present in small quantities on board the CCGS *Martha L. Black*. The latest reports, 001_201-10553-47_rev0_Rapp_MCA_M-L-Black_ENG_220818 and 002_201-10553-47_rev0_HazMat_CCGS_M-L-Black_20220819, are attached to the technical package. Contractors must follow the ship's asbestos management plan when performing handling, alterations, or work in the vicinity of discovered asbestos-containing materials. Contractors must employ persons specifically trained or certified to work with asbestos-containing materials or must subcontract the work to parties who have certified and trained personnel for this purpose. There is a comprehensive list of the asbestos composition of spaces and materials on board. The Contractor must obtain site specific information from the TA to establish the presence

of these asbestos containing materials. All necessary documentation regarding compliance with these standards must be completed and submitted to the TA prior to, during and after the work in accordance with the process. Air quality testing must be conducted prior to and after the work by certified personnel using appropriate equipment. Copies of all air quality tests must be submitted to the TA.

Workplace Hazardous Materials Information System (WHMIS)

- G 1.11.16** The TA will identify to the Contractor any hazardous materials on board the vessel in accordance with WHMIS.
- G 1.11.17** The TA will provide the Contractor with Safety Data Sheets (SDS) for designated hazardous materials on board the vessel.
- G 1.11.18** The Contractor is responsible for all products and materials supplied and used on the vessel. The Contractor must identify these materials to the TA and the IA. A copy of the SDS must be provided to the IA and the TA.

G 1.12 EQUIPMENT PROTECTION

- G 1.12.1** The Contractor must take steps to ensure that all surfaces and components of materials or equipment installed on the vessel, finished surfaces, topcoats, and other final work are free from damage, soiling, or contaminants.
- G 1.12.2** Throughout the contracted work, all electrical and electronic equipment and components must be protected from direct or indirect physical damage and from the effects of temperature or other adverse environmental conditions.
- G 1.12.3** Any surface, equipment, furnishings or décor affected by the Work that has been damaged prior to acceptance by Canada must be restored to its original condition at no cost to Canada.
- G 1.12.4** All machine or system openings must be kept covered with covers or plugs at all times until connections are made.
- G 1.12.5** The Contractor must obtain and follow instructions from its Sub-Contractors regarding any necessary special protective measures relating to the equipment they provide during the course of the work. These instructions must be forwarded to the TA and the IA.
- G 1.12.6** The Contractor must ensure that the vessel's machinery, equipment and systems are protected from all hazards, including damage from work in progress, corrosion,

sandblasting (direct or indirect), overspray of paint, hot work, detrimental temperatures or any other environmental and contaminating conditions.

Access to the vessel and equipment

Access for installation and removal

- G 1.12.7** If the Contractor intends to modify the physical structure of the vessel to simplify removals or installations, the approval of the TA and the IA must be obtained.
- G 1.12.8** Unless otherwise specified, all obstructions, which are protected, removed or damaged in the course of maintenance, removal or installation, including insulation and thermal insulation coverings, must be restored to their original condition upon completion of the work.

Breakthroughs

- G 1.12.9** Sealing of excess penetrations must be done in a manner acceptable to ABS. The Contractor must notify the IA of the penetrations that have been sealed and provide copies of all documentation to the ABS inspector.

Access for maintenance

- G 1.12.10** The configuration of machinery and equipment must be designed to allow easy access for inspection, maintenance and repair without disturbing other machinery, structures or equipment. Accommodations for the removal of machine parts must be provided.

G 1.13 ASSEMBLY OF SYSTEM COMPONENTS AND EQUIPMENT

Capitalization of component sets and system equipment

- G 1.13.1** All systems, equipment and components, old or new, that are installed or moved as a result of the work must be protected to prevent damage from the vessel's operating conditions.
- G 1.13.2** The Contractor must follow the manufacturers' recommendations for facility configuration. If this information is not available, capital arrangements must be approved based on regulatory requirements before the Contractor begins capital activities.
- G 1.13.3** The Contractor must follow the manufacturer's torque specifications. If the manufacturer does not provide this information, standard SAE screw-nut torques must be used.

Cleaning

G 1.13.4 The Contractor must ensure that upon completion of installation, the assembled parts and equipment are cleaned to remove any stains, spatter or excess brazing, filler metal, metal spalls or other foreign matter. This includes any particles that may become loose or move during the normal expected life of the equipment. Any corrosive material must be removed. This cleaning must be done before final assembly of the equipment parts. Damaged paint must be restored before closing the machines.

Damaged elements

G 1.13.5 Panels, covers, parts and equipment damaged by the Contractor must be replaced at no cost to Canada.

G 1.14 WELDING

General

G 1.14.1 For fusion welding of steel, the Contractor must be certified by the Canadian Welding Bureau (CWB) in accordance with Subsection 2.1 of CSA Standard W47.1, 1983. The Contractor must provide proof of certification to the IA. All welds must conform to CSA Standard W59M "Welded Steel Construction (Arc Welding) (Metric Version)".

G 1.14.2 All welding of aluminum must meet the requirements of CSA W47.2M1987 -(R1998) "Certification of Companies for Fusion Welding of Aluminum Structures", Subsection 2.1, and must be performed by persons certified by the BCS in accordance with CSA W47.2M1987 -(R1988). Proof of certification must be submitted to the IA.

G 1.14.3 The Contractor must provide a copy of all welding certificates prior to the start of work.

G 1.14.4 The Contractor must submit BCS stamped welding specifications and welding method information sheets to the ABS inspector as required. Welding procedures for joining pipe fittings must be documented and approved by the BCS in accordance with ASME Section IX.

G 1.14.5 All hot work methods must be followed (Item G1.11.3 and G1.11.4).

G 1.14.6 All welding, non-destructive testing (NDT) and acceptance criteria must be in accordance with the "CCG- welding specification (April 2020)". Each weld must have 100% visual inspection (VI) and 100% liquid particle inspection (LPI).

G 1.14.7 The Contractor must provide NDT operators certified to CAN/CGSB-48.9712 - latest edition, Qualification and Certification of Non Destructive Testing Personnel, Level II, for the appropriate method. Copies of the operators' certificates must be provided to the TA.

Removal of fasteners

G 1.14.8 Cleats, lifting rings, and temporary fasteners used during maintenance of structures must be removed by burning or grinding, and any remaining irregularities must be ground flush with the surface of the base plate. Any damaged paint must be repaired.

Welding design requirements

G 1.14.9 Size, length and details of welds must be approved by ABS.

G 1.15 PAINT

General

G 1.15.1 The Contractor must prepare bare and disturbed steel surfaces in accordance with the specific area and coating system requirements identified in the MLB 2022 CCG Summer refit Coatings Specification.

G 1.15.2 Where it is not possible to prepare bare or disturbed surfaces in accordance with the CCG MLB 2022 Summer Restoration Coatings Specifications, surfaces must be prepared at a minimum in accordance with SSPC SP 1 and SSPC SP 11.

G 1.15.3 Prior to painting Contractor must flatten edges of existing coatings accordingly to interface with new coating and apply coating strips to all corners and welds in accordance with SSPC PA 11.

G 1.15.4 Upon completion of the welding work and acceptance by CCG and ABS, the Contractor must apply a coat of paint to all bare and disturbed steel, compatible with the paint system used on board the vessel. New coatings must be integrated with existing coatings

G 1.15.5 The Contractor must prepare a painting schedule and submit it to the TA and the IA for review and acceptance. The paint schedule must list all compartments of the vessel to be worked on as part of the project and indicate the type of paint proposed, color scheme, surface preparation, type of coating, number of coats, thickness and color. All paint used must be compatible with the paint already on the vessel.

G 1.15.6 Pipe markings must be in accordance with the color code standard for piping

- G 1.15.7** All steel and aluminum components, new and relocated, must be painted in accordance with DFO Publication 5847 and the paint manufacturer's specifications.
- G 1.15.8** All paints must be suitable for marine use and comply with CAN/CGSB 1.61-2004 - Exterior and Interior Alkyd Enamel Paints, Marine and CAN/CGSB-1.193-99 - Epoxy Resin Coatings, Marine. Paints, varnishes and other coatings used on interior surfaces must be listed in the TCMS list of approved products, TP 438.
- G 1.15.9** Each coat of paint must be of a different tone to determine adequate coverage and must be completely dry before applying subsequent coats. At least the first coat of primer must be applied by brush or airless spray.
- G 1.15.10** Final coats of finish must be protected from soiling or damage until the vessel is released to Canada. The Contractor must ensure that furnishings and equipment subject to more severe damage from overspray are adequately protected at the time of paint application.
- G 1.15.11** The following items must NOT be painted:
- Screw threads.
 - Lubricators.
 - Bronze rods.
 - Door screens
 - Identification plates
 - Seals.
 - Stainless steel or Monel alloy elements.
 - Machined surfaces.
 - Instruments.
 - Interior gratings.
 - Electrical wires, insulators and accessories.
 - Electrical panels.
 - Rubber seals on doors and watertight hatches.
 - Joints of fire doors.
 - In general, all moving parts.
- G 1.15.12** For paint to be applied to the vessel's hull or hull surface, the product applied must be registered and approved for use by Agriculture Canada. The Contractor must provide a copy of said approval to the IA and the TA.
- G 1.15.13** The Contractor must ensure that the ambient environmental conditions meet the acceptable parameters for the application of any hull coating. The Contractor is

responsible for mooring the vessel to ensure that the environmental conditions during the dry dock allow for the application of hull coatings.

Coatings containing heavy metals.

G 1.15.14 The Contractor must not use paint containing lead, mercury or copper.

G 1.15.15 CCG vessels have been painted with lead-based paints in the past and as a result some of the Contractor's processes such as grinding, welding and burning have the potential of releasing this lead from the coatings.

G 1.15.16 The Contractor must ensure that existing coatings in all affected work areas are tested for lead content prior to the work being performed and that the work is performed in accordance with applicable Federal and Provincial regulations.

G 1.15.17 The Contractor must demonstrate that the appropriate lead paint work procedures are in place and have been approved by the workplace Occupational Health and Safety Committee and that these safe work procedures are in compliance with provincial regulations.

G 1.15.18 The Contractor must demonstrate that their health and safety department has the capacity to monitor on-site work progress, is capable of performing air quality monitoring on an ongoing basis as required by the Occupational Health and Safety Regulations and is able to assess the affected areas post abatement process.

G 1.15.19 The Contractor must provide the TA will all records from lead abatement processes and the final disposal certificates for all materials generated from the abatement process.

G 1.15.20 The Contractor must include in their bid the cost for collecting and analyzing a minimum of fifty (50) lead paint samples on various surfaces that will be disturbed by the refit activities. A unit price per test/analysis is to be provided in the Contractor's bid and any additional tests/analyses required will be dealt through the PSPC 1379 Process.

G 1.16 IDENTIFICATION

Nameplates

G 1.16.1 Nameplates must be affixed to all new equipment, compartments, doors and closures.

G 1.16.2 All nameplates must be in both French and English for operational safety reasons.

- G 1.16.3** Entries must be clear and concise with as little use of abbreviations as possible. The type size of primary information must be larger than the type size of secondary information.
- G 1.16.4** The type of nameplate must match the location on the vessel.
- G 1.16.5** Plastic must be used in rooms and navigation areas where the nameplate is not exposed to mechanical damage and is not likely to be covered with ice, paint, oil, grease or dirt.
- G 1.16.6** Nameplates must be rigid laminated phenolic resin type fastened with stainless steel or brass machine screws and must be mechanically engraved. Unless otherwise specified, nameplate lettering must be white on a black background for regular signs and white on a red background for warning and emergency signs.
- G 1.16.7** Plastic laminate nameplates, black with white background, inscription engraved to the center, to be provided for all devices attached to the external surfaces of the switchboard.
- G 1.16.8** Nameplates must be attached to the switchboard with machine screws. New nameplates to be installed on the existing switchboard must match the size and lettering of those already installed. Nameplates for feeder circuits must show the name and number of each circuit, as well as the fuse size or breaker trip rating.
- G 1.16.9** Warning or cautionary nameplates must be red plastic laminate with white center, engraved to the center. They must indicate circuit breakers with trip coils that require remote circuits to be installed prior to use, as well as circuit breakers where the power source could be connected on both sides, and any other potentially hazardous situation.
- G 1.16.10** Engraved metal, stainless steel, or brass nameplates must be used in machine rooms and in areas exposed to the weather. Engraved metal nameplates must be secured with stainless steel or brass machine screws and must be accented with black wax.
- G 1.16.11** Prior to ordering or manufacturing the plates, a complete list of their design drawings, specifying the size of the plates and the size of the letters and their inscription, must be submitted to the IA and the TA for review and acceptance.

Key Tags

- G 1.16.12** Plastic labels must be provided for all new keys. They must have a description that identifies the space they open. The description must be identical to that used on the

space or equipment identification plate. The complete list of new keys and tags must be submitted to the IA and the TA.

G 1.16.13 All new keys and tags must be submitted to the TA as part of the vessel acceptance process.

Safety Related Signs

G 1.16.14 Instructions must be written in French and English for operational safety reasons.

G 1.16.15 Painted signs indicating directions to muster stations, fire stations, emergency equipment, etc., must be provided and installed as approved by the ABS Inspector.

G 1.16.16 The Contractor must prepare and submit a drawing showing the location, type and size of lettering for all signs. Said drawing must be submitted to the ABS Inspector for approval prior to fabrication or installation of signs.

G 1.17 LOCKING AND IDENTIFICATION OF EQUIPMENT

G 1.17.1 No inspection or maintenance work can be performed on electrical and mechanical equipment or systems without proper isolation.

G 1.17.2 The Contractor must, prior to commencing work lock out and tag the systems. The locks and tags must remain in place for the duration of the work. The ship's TA will assist the Contractor in identifying the areas where he must perform the lockouts, but will not perform the actual lockouts.

G 1.17.3 The Contractor must provide and install their own locks and retain all keys for the duration of the work. When required the Contractor must install a multiple lockout system at the completion of all work, the TA must be present when all locks and tags are removed.

G 1.18 COVID –NOT USED

G 1.19 SMOKING IN THE WORKPLACE

The Contractor must ensure compliance with the Non-Smokers' Health Act. The Contractor must ensure that no one smokes on the vessel, either its employees or Sub-Contractors, including employees of any Sub-Contractor.

G 1.20 CLEANING

- G 1.20.1** The Contractor must ensure the cleanliness of the vessel. Debris and trash must be removed from the vessel and disposed of at the end of each work day.
- G 1.20.2** Hazardous materials, such as flammables and toxic waste, require special attention. They must be disposed of in accordance with federal, provincial and municipal regulations.
- G 1.20.3** Prior to commencing work in the engine rooms, the bilges must be cleaned. Cleaning must include pumping out and disposing of bilge water, and cleaning all bilges to remove all grease, oil and contaminants. Disposal must comply with all federal, provincial and municipal regulations. Certificates of disposal must be submitted to the IA and the TA. Section 10.3 of these specifications addresses bilge cleaning and Section S1.2.30 addresses oily water disposal.
- G 1.20.4** To ensure the cleanliness of the vessel, the Contractor must also ensure that the bilge compartments are free of oil, water or debris throughout the project.
- G 1.20.5** Prior to Coast Guard acceptance, the Contractor must thoroughly clean all spaces on the vessel, including all engine room bilge compartments, and drain the accumulation of liquids and solids.

G 2.0 ENGINE AND MACHINERY ROOM

G 2.1 GENERAL

- G 2.1.1** The Contractor must furnish all materials or equipment within the requirements of these specifications unless otherwise specified.
- G 2.1.2** All replacement machines, equipment and fittings must be new and unused, manufactured by a reputable manufacturer with North American facilities, parts and service distribution.
- G 2.1.3** All machinery and equipment must be approved by a classification society for use on this class of vessel and must comply with all applicable regulations. The Contractor must provide the IA and the TA with copies of the classification society approval certificates. The certificates of approval must be current and appropriate for the type and model of equipment installed by the Contractor. The Contractor must refer to Section G.5 for complete documentation requirements.
- G 2.1.4** All machines must be capable of operating under the conditions established in Section G1.10 of these specifications. All machines must be installed in accordance with the

manufacturer's recommendations, with particular attention to attenuation of noise and vibration transmission. All rotating machines must be installed on a longitudinal or vertical axis unless approved by TCMS for a different axis. The location of all units must consider accessibility, maintenance and repair.

G 2.2 PIPING

General installation

G 2.2.1 The piping must be installed so as not to interfere with the following:

- Passage through doors, hatches, scuttles, openings covered by removable sheet metal or work areas. In frequently used passage areas, the minimum pipe clearance must be 6 feet 6 inches.
- Operation of the machinery, equipment, controls and periodic maintenance of the machinery and structure of the vessel.
- Removal routes for designated equipment or removable structural parts of the vessel provided for equipment access, removal or maintenance.

G 2.2.2 The piping must be installed in a location where it is not likely to be exposed to physical damage.

G 2.2.3 Protection of piping must be provided when vulnerability to physical damage is unavoidable. Piping must be as direct as possible and use the minimum amount of fittings that would increase the friction flow characteristics of the piping. Piping must be removable on mechanical, electrical, or hydraulic systems that require periodic maintenance. Isolation valves must be provided to facilitate the movement of piping to minimize the effects of the operation of the rest of the system.

G 2.2.4 Where high and low points in the piping are unavoidable, vent drains or other effective means must be installed to ensure proper operation of the system. Pump suction pipes must be as short as practical, of sufficient diameter and laid in such a manner as not to form bends that would likely produce air pockets. Rear pipe connections must be 0.5 D above the bottom of the tank at the deepest point, where D is the inside diameter of the suction pipe.

G 2.2.5 Bulkheads and decks must generally be penetrated as close to the compartment boundaries as possible. Cutting bulkhead and deck braces and plating the ends and joints is not permitted without Transport Canada Marine Safety approval.

G 2.2.6 Piping must not pass-through tanks and interior bottom dead spaces unless essential to supply the tanks themselves, or to prevent penetrations of fuel, potable water, and

- ballast tanks through less desirable piping at locations other than tanks and interior bottom dead spaces. Piping used under pressure must not pass-through dead spaces, cofferdams, and other spaces that are generally not vented.
- G 2.2.7** Deflections of bulkheads, decks, and other structures due to work on the vessel must be taken into account, and piping must be arranged to provide the necessary space and flexibility.
- G 2.2.8** The amount of pipe that passes through squares and living spaces must be kept to a minimum. In these areas, piping must be installed symmetrically and in a manner that provides the necessary space and flexibility. Piping must not pass through the machine control room.
- G 2.2.9** Piping must not pass through the following spaces unless necessary to operate them:
- Chain locker.
 - Cabling and boxes.
- G 2.2.10** Where systems other than those that supply a tank or similar tanks are permitted to pass through the fuel oil or diesel fuel tanks, 80 gauge piping must be used and the joints welded.
- G 2.2.11** Supports must be designed and located to safely support the weight of the piping, its operating or test fluid (whichever is heavier), insulation and lagging (if applicable). The supports must also withstand the loads imposed by the expansion and contraction of the piping and the work on the vessel.
- G 2.2.12** The number of supports installed, their type and location must prevent excessive vibration of the piping under all operating conditions of the system. They must not stress the piping under any operating condition, as this would result in excessive load transfer from the bracket to the piping or from one bracket to another, or the transmission of excessive stress from the piping to the machinery, equipment or structure of the vessel.
- G 2.2.13** Rigid anchors must be designed so that noise and vibration from piping components and excessive heat from high temperature circuits are not transferred to surrounding areas through the anchor.
- G 2.2.14** Changes in direction of piping must be made by means of elbows and pipe offsets where space permits; otherwise, the straight sections of pipe and tubing specified for the system must be used. Mitered joints must only be permitted on piping such as air vents and overflows where their use will not result in unacceptable pressure drops or turbulence in fluid flow. Service connections must be located to minimize turbulent

- flow and the type used (cross, single and 90° tee with two bent branches, y-fittings and side connections) and must be suitable for the required flow characteristics.
- G 2.2.15** Direct-reading thermometers, manometers, or manovacuumeters must be installed in locations where they can be easily read and protected from damage. All pressure gauges and manovacuumeters must be provided with an isolation valve.
- G 2.2.16** Galvanic corrosion must be minimized in seawater systems that join dissimilar metals. Galvanic corrosion control can be achieved by coupling a relatively small portion of cathodic material to a large portion of anodic material, or by separating dissimilar metals by means of a short length of very heavy galvanized steel pipe (disposal items). The allowable potential difference must not exceed 0.4 volts. This should be installed only where indicated.
- G 2.2.17** Raised face flanges must not be used against valves, fittings or flanges made of bronze or other relatively weak composition.
- G 2.2.18** Where pipes pass through holes in the non-watertight structure, provisions must be made to prevent them from pressing on the structure.

Choice of materials

- G 2.2.19** The following tables show materials acceptable for use in specific piping systems and materials for various piping systems and components.
- G 2.2.20** Piping and components must conform to these specifications, except where the material listed is incompatible with the materials remaining in the piping. The use of other pipe not listed is permitted only if approved or recommended by the original equipment manufacturer or supplier of said equipment or component. In such situations, the TA must give instructions before proceeding.
- G 2.2.21** Steel pipes used for raw water must be hot-dipped galvanized at the end of the manufacturing process.

Acceptable materials in specific piping systems	
Element or system	Figure corresponding to the material
Raw water systems	Reference
Fire main, sanitary service (black water), sewage, ballast, AFFF, bilge suction (oil-water separation-)	4t, 6b, 1a, 2a, 3a, 6a, 7a, 3fl, 4fl, 5fl, 11fl, 12fl, 1f, 2f, 3f, 4f, 19f, 20f, 21f, 1v, 2v, 3v, 5v, 6v, 7v, 8v, 22v, 5g (AFFF 11g only)

Acceptable materials in specific piping systems	
Element or system	Figure corresponding to the material
Main and auxiliary systems	4t, 9v, 10v, 11v, 12v, 8f, 9f, 10f, 11f, 12f, 20f, 21f, 4fl, 5fl, 5g, 6g, 7g, 1b, 2b, 6b, 1a, 2a, 4a
Petroleum fuel, marine diesel and distillate	Reference
Filling and transfer	4t, 1b, 6b, 6g, 7g, 1a, 5a, 6a, 4fl, 5fl, 8f, 9f, 10f, 9v, 10v, 19v
Indoor tanks	1b, 6b, 6g, 4fl, 8f, 9f
Fresh water	Reference
Drinking water (including vents, overflows-, sounding tubes, suction from indoor tanks), sanitary system (grey water)	3t, 5g, 4b, 1a, 2a, 3a, 6a, 1fl, 2fl, 1f, 3f, 4f, 5f, 3fl, 1v, 2v, 3v, 5v, 6v, 7v, 8v
Circulation (engines)	5t, 5g, 2b, 6b, 1a, 2a, 3a, 6a, 3fl, 4fl, 5fl, 11fl, 12fl, 8f, 9f, 10f, 11f, 12f, 19f, 20f, 21f, 9v, 10v, 11v, 12v, 13v, 14v, 18v, 19v, 20v
Lubricating oil	Reference
General Service (PSIG rating of 150)	4t, 6g, 7g, 1b, 6b, 1a, 5a, 4fl, 12fl, 8f, 9f, 10f, 21f, 9v, 10v, 11v
Hydraulic oil	8t, 9t, 1b, 1g, 1a, 6fl, 12fl, 13f, 14f, 15f, 21f, 22f, 14v
Steam (150 psig)	Reference
Feed water, condensate	3t, 4t, 3g, 1b, 6b, 1a, 1fl, 2fl, 12fl, 1f, 2f, 4f, 5f, 21f, 1v, 2v, 3v, 4v, 6v
Compressed air	Reference
3,000 PSIG 150° F	1t, 2g, 1a, 17f, 16f, 21v
250 PSIG 150° F	5t, 3g, 1b, 6b, 1a, 4fl, 5fl, 8fl, 12fl, 8f, 9f, 10f, 11f, 12f, 21f, 4v, 6v, 9v, 11v, 12v, 13v
Bridge drains and scuppers	Reference
All "as-built"	5t, 4b, 6b, 5g, 6g, 4fl, 8f, 9f

Materials for pipes and tubes		
Description	Material	
Pipe - seamless (pipe for pressures above 150 PSI)	ASTM B46679	7030 -CUNI
Tube, seamless	ASTM B46679-, Alloy 706	9010 -CUNI
Tube, seamless	ANSI/ASTM B8878	Copper
Pipe, seamless	ANSI/ASTM A 53 GR A or B Sch 40	Steel
Pipe, seamless	ANSI/ASTM A 53 GR A or B Sch 40	Ordinary steel
Tube	ANSI/ASTM A37679B	Stainless steel type 316L
Tube	ASTM B5978	Mild steel
Tube, seamless	ASTM A179	Ordinary hydraulic grade steel
Pipe, seamless	ANSI/AASTM A37679B -AISI 316	Stainless steel

Materials for valves	
Description	Material
Square valve	ANSI/ASTM B 6176
Pressure regulator	ANSI/ASTM B 6176
Discharge	ANSI/ASTM B 6176
Y-filters	ANSI/ASTM B 6176
Diaphragm	ANSI/ASTM B 6176
Non-return and vertical lift valve	ANSI/ASTM B 6176
Butterfly	ANSI/ASTM B 6176
-Flanged gate valve	ANSI/ASTM B 6176
With angle valve and check valve	Steel
Valve	Steel
Replacement	Steel
Pressure regulator	Steel
Angle, relief, check, bleed control, ball valve	Ordinary steel
Angle valve, -ball valve -(fire resistant)	Type 316 stainless steel

Materials for valves	
Description	Material
Square, discharge	Type 316 stainless steel
Butterfly	Spheroidal graphite cast iron or cast steel
Various sizes	AISI 304, 316/A51M, A 182 Teflon lining
Various sizes	Alloy 642
Sprinkler control valves	ASTM B61

Materials for fittings	
Description	Material
Brazing	ANSI/ASTM B61 only (do not use ASTM B 150)
Flanged	ANSI/ASTM B61 only
Threaded	ANSI/ASTM B61 (125 psi rating)
Fittings	ANSI/ASTM B61 only
Soft solder joint	Beaten copper ANSI B16.22
Soldering bumps	ANSI/ASTM B61 only
Refrigeration	Beaten copper ANSI B16.22
Butt welding	ANSI/ASTM A234WPB
Socket weld	ANSI/ASTM A 105
Welding bumps	ANSI/ASTM A 105
Threaded	ANSI/ASTM A 105
Connection	ANSI/ASTM A 105
Socket weld	AISI 316L
Butt welding	AISI 316L
Flanges	AISI 316L
Brazing	Bronze
Connection	Bronze
Butt welding	9010 -CUNI
Type Victaulic	Spheroidal graphite cast iron for grooved end pipe
Pipe fittings	Stainless steel (Swagelok)
All types of compression fittings	316L or ordinary steel

Materials for Flanges	
Description	Material
Brazing	ANSI/ASTM B61 only
Threaded	ANSI/ASTM B61 only
composite	ANSI/ASTM B61 - brazing ring, with sliding flange according to ANSI/ASTM A18177 -GR1 and ANSI/ASTM A181GR1
Weld-in, push-on, sliding flange	ANSI/ASTM A181GR1
Extension weld collar	ANSI/ASTM A181GR1
Welded	AISI 304L, 316L
Socket weld flange	ANSI/ASTM A105GR2
SAE 4 Slotted bolt, solid	Ordinary steel
composite	Inside flange 9010 -CUNI Ordinary steel outer flange
Victaulic	Spheroidal graphite cast iron for grooved end pipe
Swagelok Bridles	316L or ordinary steel

Materials for joints	
Description	Material
O-ring seal	Buna N
O-ring seal	Buna N
Solid washer	Classification measurement sheet Without graphite
Solid washer	Classification measurement sheet With graphite
Solid washer	Synthetic rubber, max. temperature 180° F
Solid washer	Buna N
flat ring bend	Teflon
Spiral wound gasket	Teflon impregnated
Dish	Ethylene Propylene Diene Terpolymer -(EPDM)

Materials for nuts and bolts	
Description	Material
Bolts	ANSI/ASTM A19379A
Fully threaded	GR B16
Dowel or hexagonal head	ANSI/ASTM A19379A
Implementation net	GR B16
Nuts: hexagonal, HSF	ANSI/ASTM A19479A -GR4
Bolts	Phosphorus, Bronze ASTM
Fully threaded	ANSI/ASTM B13979
Dowel or hexagonal head	Alloy B1 or B2
Implementation net	
Nuts: hexagonal, HSF	
Bolts	Mild steel
Dowel or hexagonal head	Hot dipped galvanized
Hexagonal nuts	
Studs	
Fully threaded	
Implementation net	
Nuts: hexagonal, HSF	
Bolts: hexagonal head	ASTM A307 -Cadmium
Nuts: hexagonal head	
Bolts: hexagonal head	ASTM -A320 Stainless steel
Nuts: hexagonal head	

Materials for Various Components	
Description	Material
Fixing hooks	Steel
Diaphragms	Monel
Strainers	
Type of plate	ANSI/ASTM B 6176
Flat panel	ANSI/ASTM B 6176
In Y	ANSI/ASTM B 6176

Panner type	ANSI/ASTM B 6176
Strainers	Steel
In Y	
Panner type	
Strainers	Stainless steel 304
In Y	
Closure for sounding tube	Bronze
Fire hose - supply manifold	Bronze

Fire Protection Systems

G 2.2.22 Piping for fixed CO₂ and FM 2000 fire protection systems must comply with Transport Canada Marine Safety (TCMS) regulations and the manufacturer's specifications.

Exhaust Piping

G 2.2.23 Exhaust piping must consist of the materials shown on the design drawings. Flanges must be constructed of 1035 kPa forged steel, "Light Pattern", per ASTM A181-59T. Expansion pieces must flex to fit flange joints, one fixed and one free floating, and internal stainless steel sleeves (Senior Flexsonic^{MC} or equivalent, suitable for the function of the exhaust at the systems operating temperature).

Manufacturing of the Piping

G 2.2.24 Flange faces must be in a plane perpendicular to the longitudinal axis of the pipe, tube or fitting to which they are attached. All components and component assemblies must be thoroughly cleaned after fabrication and before installation on the vessel. Foreign matter, such as dirt, grit, and chips, must be removed by methods and materials that are compatible with the fluids employed by the shipboard service.

Bulkhead and deck parts

G 2.2.25 Bulkhead and deck parts must be three flange marine standard steel, or other approved method, galvanized for sea water, black for oil. Penetration must be suitable for very heavy pipes. Copper pipes must be bronze type, with a nut on each side of the bulkhead or deck piece.

Gaskets and Fittings

G 2.2.26 Brazed joints must be used whenever possible in non-ferrous systems and welded joints in carbon and alloy steel systems. The number of joints must be minimized by bending the pipe. For 3D and smaller bending radii, prefabricated bends must be used. Prefabricated piping systems must be used whenever possible. Fabrication of joints on board the vessel must take place in areas with sufficient clearance for welding and brazing activities. Disassembly joints must be located to allow sufficient clearance for proper assembly and maintenance. Joints located in areas inaccessible for maintenance must be welded or brazed. All flanged pipe joints must be connected using appropriate jointing compounds for the intended service and approved by TCMS.

G 2.2.27 Choke valves and automatically or semi-automatically operated valves, such as safety valves, relief valves, and regulating valves, must be flanged unless they are 3/4" or smaller in nominal size, in which case they may be threaded.

Contact strips

G 2.2.28 All copper joints insulated by joining with other materials must have contact strips securely fastened from flange to flange to provide a continuous circuit in the piping.

Hydraulic piping

G 2.2.29 Hydraulic piping must be phosphate stripped, neutralized, oil flushed and blow dried prior to installation. The cleanliness of the flushing fluid must be in accordance with ISO 4406 class 18/16/13 and must be determined on the basis of a fluid sample.

Identification of the piping

G 2.2.30 All piping must be identified in accordance with the CCG Piping Identification Standard.

G 2.3 PUMPS

General

G 2.3.1 Pumps, except motor driven pumps, must be furnished complete with electric motors suitable for the supply indicated on the one-line diagram. Motor and pump starter specifications must be as specified in Section G3 of these specifications.

G 2.3.2 Motor-driven pumps must be from the motor manufacturer's standard supply. Specific installation requirements must be considered when specifying pump performance parameters.

- G 2.3.3** Pump performance characteristics must be consistent with the overall system(s) to which they are connected. Pumps must operate at or near their design point. Pumps installed on resilient supports must have flexible suction and discharge connections that will withstand deflections caused by thrust and shock loads.
- G 2.3.4** Radial and thrust bearings must be sliding surface or rolling contact. Thrust bearing selection must take into account the roll and pitch of the vessel which could impose axial thrust, even when the pumps are in hydraulic balance.
- G 2.3.5** Wear rings must be attached to the casings of all centrifugal pumps. Wear rings must be attached to all rotors that are driven at a brake rating of 10 BHP or greater. Pump packing glands must have mechanical seals. Pump casings must be provided with a vent connection at each flow stage and a drain connection.
- G 2.3.6** Pumps operating in parallel must be able to do so in a stable and continuous manner.
- G 2.3.7** The major rotating elements of all pumps and all associated appendages must be dynamically balanced. Documented proof of this must be submitted to the IA.

Centrifugal Pumps

- G 2.3.8** Centrifugal pumps, unless otherwise specified, must have the following characteristics:
- Vertical cantilevered, in-line.
 - Bronze body with radial sealing surface.
 - Stainless steel shaft.
 - Mechanical shaft seal.
 - Rotor in cuproaluminium.
 - Replaceable wear rings.
 - Removable shaft spacers.
 - Pumped liquid lubricated bearings in ordinary bearing applications, or grease packed bearings.
- G 2.3.9** Pumps must be equipped with the following accessories:
- Pressure gauge, filled with liquid, with shut-off valve.
 - Suction manovacuumeter, filled with liquid, with isolation valve.
 - Drip tray.
 - All applicable protective elements.
- G 2.3.10** The design of the pump must allow removal of the complete rotating assembly without affecting the piping.

G 2.3.11 In cases where the discharge head may exceed the pressure rating of any part of the connected piping system, pumps must be equipped with a relief valve.

Volumetric Pumps

G 2.3.12 Unless otherwise specified, pumps must have the following characteristics:

- Constant displacement rotary screw.
- Modular cast iron body with 18% maximum elongation.
- Steel rotor.
- Integrated adjustable relief valve.
- Mechanical seal.

G 2.3.13 Pumps must be equipped with the following accessories:

- Pressure gauge, filled with liquid, with shut-off valve.
- Suction manovacuumeter, filled with liquid, with isolation valve.
- Drip tray.
- All applicable protectors.

G 2.4 VALVES

G 2.4.1 All valve bodies must indicate the pressure rating, manufacturer's name or trade name by means of a marking cast or forged on the valve body or stamped on a protected area of the valve body. Handwheels must be located where they can be easily operated.

G 2.4.2 Where a system may be supplied by more than one pump, check valves must be installed in the discharge side of each pump to prevent reverse flow.

G 2.4.3 Check valves and globe valves must be installed so that the disc will open with the flow, and the disc can be closed by gravity or springs. Check valves must be installed where reversal of flow would interfere with the proper operation of the system, or where reversal of flow would flood a space.

G 2.4.4 Globe and angle valves used for isolation must be installed so that system pressure or suction is not exerted on the valve head gasket or operating stem packing when the valve is closed.

G 2.4.5 Collectors must be used whenever possible.

G 2.4.6 Relief and safety valves and associated piping must be installed so that their discharge will not damage machinery or equipment or endanger personnel.

- G 2.4.7** Valves for branch lines must be installed in close proximity to the main supply line to maintain the integrity of the system in the event of a branch line failure.
- G 2.4.8** Butterfly valves or ball valves must not be used as hull isolation valves. Hull isolation valves must be designed as specified in section G.2.6.5
- G 2.4.9** Position indicators are required on all valves with shaft rotation greater than 360 degrees. The only exceptions are on specific valves where the position is evident from the operation of the system, or from the position of the shaft (unless otherwise specified by the ABS inspector).
- G 2.4.10** Check valves must be installed, where possible, where reversed flow would interfere with the proper operation of the system or where reversed flow would flood a space.
- G 2.4.11** All such automatically operated valves must be sized to meet capacity requirements. They must have the necessary sensitivity and control adjustment for all operating conditions. Where extreme sensitivity is required, pilot operated valves or pneumatically operated valves must be installed. Manually operated throttle valves and their operating mechanism must be provided with the necessary control sensitivity.
- G 2.4.12** Pressure relief valves must be installed to protect pressure vessels, heat exchangers, piping systems, machinery and equipment from damage due to excessive pressure. Relief valves must be of sufficient capacity to prevent a pressure increase greater than 10 percent of the allowable operating pressure of the system.
- G 2.4.13** A strainer must be installed in the suction line and a pressure gauge in the discharge line from each pressure reducing valve. A relief valve must be installed in the outlet piping unless otherwise specified. The strainer must be installed upstream of the pressure reducing valve and downstream of the isolation bypass valve. The pressure gauge and relief valve must be installed upstream of the pressure reducing valve and the bypass valve. Relief valves must be sized on the assumption that the pressure reducing valve could remain wide open. Outlet piping size must be increased to meet the flow characteristics of the system A straight pipe, of a length recommended by the pressure reducing valve manufacturer, must be installed at the larger end of a tapered fitting. A bypass must be installed around each pressure reducing valve unless otherwise specified. The bypass valve must be a manually operated throttle valve which must not allow a flow greater than the capacity of the pressure reducing valve.
- G 2.4.14** Relief valves must not be provided with a shaft seal. Relief valves that discharge to pump suctions or suction piping must not be secured with neoprene shaft seal sleeves. The closed spring design with tight covers must be used for the following services:

- flows to a closed system or tank that subject the valve outlet to back pressure when the valve is closed;
- flows to a closed system or equipment that subject the valve outlet to sub-atmospheric pressure when the valve is closed;
- flammable or combustible liquids;
- toxic and explosive gases.

G 2.4.15 All valves larger than 19mm must have flanged connections. All valves larger than 40mm diameter must have bolted bonnets, glands and screw-in replaceable seats.

G 2.4.16 Nameplates identifying the service must be installed on new or reinstalled valves. Valves installed under deck plates must be equipped with hinged access covers. Nameplates must be affixed to the deck plate.

G 2.5 INSULATION OF THE MACHINERY

General

G 2.5.1 New, approved, non-asbestos insulation must be installed on all parts of piping, machinery and equipment where insulation has been removed and where newly installed equipment requires insulation. Valves and fittings must be insulated with the necessary materials and thickness required for nearby piping. The Contractor must submit the complete schedule of insulation and lagging work to the TA and the IA for review prior to ordering the materials. All insulation and lagging must meet the requirements of the regulatory authority.

G 2.5.2 Piping and equipment with an internal temperature rating greater than 150 degrees Celsius must be insulated from their supports, or the supports insulated from the structures to which they are attached.

G 2.5.3 Pipe supports for pipes with an internal temperature of less than 5 degrees Celsius must be insulated from the steel structure to which they are attached. Piping exposed to the weather must be properly insulated against freezing. This requirement does not apply to systems in which liquid normally flows, or where the exposed portion of an affected system can be secured and drained to prevent freezing.

G 2.5.4 Wherever possible, insulation materials must be from a single manufacturer.

Heat insulating lining

G 2.5.5 New, approved, non-asbestos thermal insulation must be installed. The thermal insulation (covering or protective layer over the insulated materials) must be suitable for the temperature and location and must meet one of the following descriptions:

- Fiberglass cloth, tape and mesh, Flextra^{MC} or equivalent.
- Smooth or hammered aluminum mechanical protection elements, fixed with quick release fasteners.

G 2.5.6 Insulation on piping and/or equipment not exposed to the weather must be covered with a fabric or tape type of thermal insulation when not pre-covered with thermal insulation. The thermal insulation fabric covering must be secured with adhesive or seams. Tape insulation must be spirally wound with a minimum of 3/8" overlap and the ends attached to the insulation and/or sheathing with adhesive, seams or staples. Insulation and cements used for thermal insulation must conform to CGSB 51.9-92 and CAN/ULC-S102-M.

G 2.5.7 Insulating jackets, fabric, fiberglass matting, packaging and adhesives must be flame retardant with a maximum flame spread rating of 25, and a maximum smoke developed rating of 100, when tested in accordance with CAN/ULC S102-M.

G 2.5.8 Insulation on piping or equipment exposed to the weather or excessive moisture must be protected by the application of a 1/4 inch thick weather resistant covering over such items, and must be secured in place prior to the application of the thermal insulation. Cracks or openings in the continuity of the installed lagging, especially at valves, flanges and fittings, must be avoided to prevent the ingress of moisture, spray or water. For deck penetrations, the insulation must be protected by six-inch high steel bumpers welded to the deck and covered with the same insulation jacket.

G 2.5.9 Where insulation and thermal insulation could easily be damaged, a galvanized sheet metal protective thermal insulation n° 2 USSG must be installed. If the protective metal lagging is to be removed frequently for machinery maintenance, it must be smooth or hammered aluminum, secured with quick release clamps.

Fixing devices

G 2.5.10 All insulation materials must be secured to prevent sagging and to facilitate removal for equipment maintenance.

G 2.5.11 All high temperature piping systems must be insulated with reusable prefabricated covers made of the following materials from the pipe surface outward:

- Monel mesh
- Glass fiber mat, with a density of approximately 9 lbs/ft², which must contain no chemical binders and must be resistant to service temperatures up to 450 C.
- Silicon-coated, aluminum-lined, fiberglass thermal insulation attached to the insulation by staples: all edges must be sealed.

- G 2.5.12** Covers must be provided with stainless steel or Monel clips, secured with hooks around which a binding wire can be wrapped for mounting and fastening.
- G 2.5.13** Insulation, with all joints tightly abutted, must be secured to the ends of the pipe with a minimum of two metal strips per section, 3/4" wide, with quick release clamps.
- G 2.5.14** Where pipe insulation meets flanges and fittings, the ends of the insulation must be tapered to allow removal of the bolts.

Insulation thickness

- G 2.5.15** The surface temperature of the insulation must not exceed 150 degrees F. The maximum temperatures must determine the thickness of the insulation and correspond to 10% overload of a given machine or motor. When the total required thickness of insulation is greater than 25mm, the covering must be doubled. Sheathing layers must be of equal thickness. All strips must be staggered and all end joints must be overlapped.

Insulation, anti-condensation

- G 2.5.16** Cold water piping and equipment, including wastewater pipes, must be insulated with condensation control insulation. Condensation control insulation, other than elastomeric cellular plastic, must be covered with a thermally insulating fabric or tape covering, secured with an adhesive to form a moisture-proof finish. Condensation proof insulation must be protected by a thermal insulation covering or protective mesh in areas where damage is possible.
- G 2.5.17** Where pipes pass through kitchens or other high humidity spaces, the insulation must be doubled and the outside of each layer must be waterproof.

Insulation, removable and reusable covers or pads

- G 2.5.18** Flanges, flanged connections, flexible joints, expansion joints or components of machinery or piping that may be removed for inspection and maintenance must be covered with removable and reusable covers or plugs. They must be made of the same material as the main piping insulation. The voids between the pads and the installed insulation must be sufficiently filled with felted material to prevent air circulation.

Conduits

- G 2.5.19** All ducts must be insulated with a minimum of two inches of vapor tight duct insulation with factory applied vapor barrier (Manson AK Flex^{MC} or equivalent). The vapour barrier coating must be Chil-Perm^{MC} CP30 with fiberglass reinforcing fabric

or equivalent. Two (2) coats of 16 oz. fabric wrap must be applied with Bakor^{MC} insulation cement or equivalent as a final finish on all ducts. Alternative products may be used with approval of the TA.

G 2.5.20 Air duct penetrations must be sealed with non-shrink, non-hardening silicone caulking.

G 2.6 MACHINE & MACHINERY ROOM LAYOUT

General

G 2.6.1 Machinery compartments must be provided with ladders, gratings and cantilever plates to provide convenient levels of access to all machinery components for routine use and maintenance.

Floor plates/floor boards

G 2.6.2 Canopy sheets must be 20 lb. multi-grip steel covered plates supported by steel brackets and secured with 13mm stainless steel or brass countersunk screws on the sides. Panels must not exceed 1220mm by 1830mm. Smaller, portable plates must be provided where possible, when frequent access is required. Portable hinged openings must be provided over valves, taps and strainers and identified with brass nameplates. Open contours must be closed by turning them skyward, except in cases where access to machinery is restricted. Canopy supports must be painted. The supports provided must be able to support the weight of the machinery during the shifts (loads of 275kg).

Protection elements

G 2.6.3 Guards must be provided over all rotating drives accessible to personnel. They must be lightweight and portable. Open guards must be made of expanded and rolled metal, and closed guards must be made of steel or aluminum. Guards must allow visibility of drives and heat dissipation. Access must be provided to the centers of the shaft lines.

Suction to the sea and discharge to the sea

G 2.6.4 All new overboard suction and discharge devices must be constructed of sheet steel as used for the hull, and protected with sacrificial anodes. All components must be covered with a complete hull coating system.

Hull isolation valves

- G 2.6.5** Each overboard suction line must have a hull isolation valve attached as close to the intake as possible. The sea suction valves must be approved by the classification society, made of cast steel with stainless steel trim.
- G 2.6.6** Valves must be bolted to a steel base with blind tapped bolt holes that has been welded directly to the vessel's hull or sea chest. If it is not possible to attach the valve directly to the hull or sea chest, ABS approved extensions must be installed between the valve and the steel base. The extension must be as short as possible and must not have any joints other than with the valve and base.
- G 2.6.7** Hull isolation valves must be high lift globe valves. High lift angle valves may be used if globe valves cannot be installed. The minimum size of fasteners used for the sea side connections of isolation valves must be 19mm. Fastener bolting material must be phosphor bronze, ANSI/ASTM B139-79 alloy grade B1 or B2.
- G 2.6.8** When the pump or ejector has a direct suction to the sea and is located in a compartment away from the hull isolation valve, an additional hull isolation valve must be installed in the pump compartment.

G 2.7 INSTRUMENTATION OF THE MACHINERY

Pressure gauges and low pressure gauges

- G 2.7.1** Unless otherwise specified, only 115mm gauges must be used for instrumentation.
- G 2.7.2** All pressure gauges that exceed 1,000 psi (7,000 kPa) or that are used with compressible fluids must be safety gauges with a back pressure relief device.
- G 2.7.3** All pressure gauge lines must be equipped with a plugged test tee. All pressure gauges must be equipped with isolation needle valves. Pulsation dampeners must be attached to keep the gauge pulsating throughout the measuring range. The pressure gauge indication must be at one-half or two-thirds of its measuring range for variable or steady state operating pressure respectively.
- G 2.7.4** All pumps must be equipped with a suction pressure gauge and a discharge pressure gauge.
- G 2.7.5** All refrigeration compressors must be installed with suction and discharge pressure gauges, and Schroeder valves must be installed in the pressure gauge lines for connection to the portable refrigeration gauge manifold.
- G 2.7.6** All measurements on new pressure gauges must be in both imperial (lb/inch²) and metric (kPa or Bar) units. The dial face must be white with black figures, and the

needle must be adjustable to the micrometer. Pressure gauge moving parts must be stainless steel with stainless steel overpressure and under pressure rings and stops. Drone tubes must be bronze or type 316 stainless steel with brass or type 316 stainless steel bushings. Pressure gauge accuracy must be $\pm 0.5\%$ of range per ASME B40.1, Category 2A. Gauges must be filled with glycerin or silicone depending on ambient temperature requirements or the amount of vibration expected.

Temperature Indicators

- G 2.7.7** Unless otherwise specified, all thermometers must be standard 9-inch graduated thermometers with an adjustable angle universal stem, a cast aluminum housing with a hardened polyester powder coating, a clear window, and a removable brass thermometer pocket. Thermometers must have an acrylic window resistant to 300 degrees Fahrenheit and double-layer safety glass for temperatures above 300 degrees Fahrenheit.
- G 2.7.8** All thermometers must be housed in a Type 304 or 316 stainless steel thermometer well to allow removal of the thermometer without interfering with the measurement process. The thermometer and thermometer pocket must reach at least half the diameter of the pipe in the measurement process. When thermometers are installed in pipes with insulation, longer stem thermometers with removable extension neck thermometer pockets must be used. Extension necks must be at least 50mm long.
- G 2.7.9** Thermometers used to measure air temperature must be equipped with a perforated protective stem and mounting flange, instead of a removable brass thermometer pocket.
- G 2.7.10** All thermometers must contain a red alcohol filling. Thermometers must be selected so that the operating temperature of the process being measured reaches about half the scale. The face of the scale must be white with black figures, and must have graduations in degrees Fahrenheit and degrees Celsius. The accuracy of the thermometer must be ± 1 division.

G 2.8 EQUIPMENT BASES

- G 2.8.1** Steel or aluminum bases must be installed for all motors, machines, pumps, and all new or relocated equipment. Sample bases must be of adequate strength and thickness and must be approved by the ABS Inspector as required. Additional stiffeners must be installed as required to distribute loads and reduce vibration.

G 2.8.2 Covers must be installed around any hydraulic systems and pumps installed during the life extension of the vessel.

G 2.8.3 Insulation must be provided between ferrous and non-ferrous materials or equipment.

G 2.9 **ANTI-VIBRATION MOUNTS FOR EQUIPMENT**

G 2.9.1 All vessel main engines and power generators must be mounted on anti-vibration mounts. The Contractor must coordinate equipment installation requirements with the equipment supplier or manufacturer with consideration of the following:

- The weight of the equipment added to the weight of the sub-base.
- The center of gravity of the equipment.
- The requirement to limit vertical, longitudinal and lateral movement of equipment to minimize the impact on ancillary systems and services while maintaining the required isolation.

G 2.9.2 Anticipated ship motions are described in Section 2.1 of this specification; vibration mounts must provide between 75 and 85% isolation of all equipment generated vibrations on the hull structure.

G 2.9.3 The anti-vibration mounts must be installed with an anti-shock device with an elastic stop that can withstand an acceleration of up to 5 g. The metal parts of the vibration mounts must be protected against corrosion with Fe/Zn 8C according to ISO 2081 for marine environment. The elastic mounts must be protected with a cover to prevent contamination of the damping elements.

G 2.10 **HULL STRUCTURE**

G 2.10.1 Structural soundness must be maintained and any questions regarding structural soundness must be referred to the ABS inspector for resolution.

G 2.10.2 All welds must be made in accordance with the requirements of the Canadian Welding Bureau Welding Standard or the rules of the classification society, whichever is more stringent.

G 2.10.3 For new structures and locations where permanent removal of fittings will result in the need to install sheet metal embedded in the exterior plating, watertight bulkheads or watertight decks, the following procedure must be followed:

- The Contractor must prepare and submit a welding diagram approved by a Canadian Welding Bureau Engineer for approval by the ABS Inspector.
- All elements embedded in the outer shell must be level.

- All embedded underwater components must be fully x-rayed upon completion of the work.
- New and existing tanks, voids and areas where embedded components have been installed must be hydrostatically tested with a hydraulic load of 2.5 meters. These tests must be recorded and conducted in the presence of the ABS inspector and the IA.
- The location of any new recessed sheet metal must be noted on the ship's plating drawing.

G 3.0 ELECTRICITY AND ELECTRONICS

G 3.1 GENERAL

- G 3.1.1** The requirements of this section apply to all electrical work. Electrical modifications to the vessel must comply with TP 127E and IEEE 45 STD-2002 with the approval of the ABS inspector.
- G 3.1.2** All electrical and electronic equipment, fittings and appliances temporarily removed for access must be reassembled and secured, and all areas must be restored to their original condition.
- G 3.1.3** Contractor supplied equipment must meet the requirements of IP56, IEC 60529. and Section 2.1 of this specification.
- G 3.1.4** The Contractor must refer to Section G.5 for documentation requirements for the electrical system.
- G 3.1.5** Electrical conductive surfaces, heat transfer surfaces and ventilation registers must not be painted. These areas must be protected from dust and debris, including paint overspray, for the duration of the contract.
- G 3.1.6** The Contractor must remove all electronic equipment from compartments in which cutting, welding, grinding, etc., is performed. The Contractor must obtain approval from the TA for the equipment to remain in place, and said approval must require that the equipment be protected from any potential hazards.

G 3.2 NEW ROTATING MACHINERY

- G 3.2.1** Motors must be commercial marine grade and meet all regulatory requirements. Motor compartments to be installed must meet IEC 60529. Motors must be

- continuously rated, except for deck machinery where one (1) full rated load and one (1) light continuous load may be used.
- G 3.2.2** The windings of all motors must be covered with oil and water resistant class F insulation material. Motors must have the ability to operate continuously at an ambient temperature of 50°C when installed in engine rooms and 40°C when installed on enclosed decks. For motors operating on the open deck, a minimum continuous ambient temperature of -40 °C must be considered. Temperature increases, as measured by a thermometer after an 8-hour thermal test, must not exceed those stated by TCMS in TP 127F for Class B.
- G 3.2.3** The windings and compartments of rotating machines with slip rings or closed collectors must not contain any silicone impregnated material.
- G 3.2.4** All rotating equipment incorporating brushes must have inspection windows.
- G 3.2.5** All AC motors rated in excess of 0.37 kW (1/2 hp) must be squirrel cage induction motors, designed for continuous operation and capable of achieving design parameters with a three-phase 600 volt, 60 Hz supply, unless otherwise specified. Asynchronous motors rated at 0.37 kW or less may be designed to operate on a single phase 120 volt supply.
- G 3.2.6** Asynchronous motors must be carefully selected so that each motor is not too large for the intended use in order to avoid the low power factor inherent in asynchronous motors under load.
- G 3.2.7** Single speed induction motors must be 4 pole and 1800 RPM unless otherwise specified.
- G 3.2.8** Motors of 0.18 kW (1/4 hp) and larger must be equipped with anti-friction bearings designed to handle the imposed thrust and radial loads. When motors are used with solid couplings, a bearing designed to handle the thrust must be attached to the shaft end housing, and the axial clearance of the shaft is limited to the bearing clearance. Tandem ball bearings must not be used for axial thrust loads.
- G 3.2.9** Motors equipped with anti-friction bearings using pressure grease fittings must have a practical means of preventing the expulsion of grease to the motor windings, either by pressure relief plugs or fittings, or by a differential relief valve system.
- G 3.2.10** When antifriction bearings (ball bearings) are specified for electric rotating machines, they must:
- Be designed to work with and be suitable for the correct type of motor.

- Be noise tested.
- Be rigid ball bearings when the motor drives an end thrust.
- Be of the pre-lubricated type, unless otherwise specified.

G 3.2.11 Axial fan motors must be equipped with factory sealed pre-lubricated ball bearings or factory sealed pre-lubricated ball bearing housings. The bearing housing must not be drilled.

G 3.2.12 Motors used with a V-belt must have bearings designed for this purpose.

G 3.2.13 Motors rated over 0.75 kW (hp) must have statically and dynamically balanced rotors. All windings must be pressure impregnated followed by oven curing. Special attention must be paid to the removal of dust and dirt traps from the windings and motor compartment. Static and dynamic balancing data must be submitted to the IA and the TA.

G 3.2.14 Induction motors powering fans or pumps that require high and low operating speeds must be two-speed, two-winding motors with a maximum speed not exceeding the four-pole design, unless otherwise specified.

G 3.2.15 The Contractor must confirm all pertinent characteristics of replacement motors prior to purchase to ensure compatibility with the requirements of the retained machines.

G 3.2.16 Prior to placing an order, the Contractor must submit to the TA for review and approval a list of all electric motors to be installed. Said list must specify the following:

- The name of the manufacturer
- The use/overload factor
- The power in kilowatts and the speed at full power.
- The type of compartment
- Performance
- Power factor at full load, $\frac{3}{4}$ load, and $\frac{1}{2}$ load (AC motors)
- The torque and the locked rotor current
- Weight
- Northeast Energy and Mines Advisory Committee (NEEMAC) design features
- The insulation class
- The current at full load
- The warm-up class
- The tension
- Frequency
- The size of the chassis

G 3.3 ANTI-CONDENSATION HEATERS

G 3.3.1 Self-contained lightless, tubular, or flat resistance heater types must be installed on all new engines and generators rated 15 kW or greater, and on all electrical equipment installed on open decks or in wet or unheated spaces, where specified. Such self-contained heaters must be adapted to operate from a separate power source. Heaters must be adapted for use with a single phase 120 VAC, 60 Hz power supply.

G 3.3.2 The equipment control station must have a nominal lockout feature so that the heater is disabled when the associated equipment starts.

G 3.3.3 An on/off light must be installed on the equipment control station as follows:

- For motors, on their respective local control stations or control panels.
- For electrical control equipment, on the relevant panel.

G 3.3.4 Disconnect switches or other lockout station devices must be provided at equipment requiring local maintenance when the power device circuit breaker is not visible. The disconnect switch or lockout station must be visible from the protected equipment.

G 3.4 NAMEPLATES FOR ELECTRICAL EQUIPMENT

G 3.4.1 All electrical equipment must have nameplates. Each nameplate must identify the equipment along with the manufacturer's name, type, serial number, model number, power rating and date of manufacture of the equipment.

G 3.4.2 Any special precautions and instructions for maintenance or operation must be included on the nameplate or on a separate plate attached to the equipment.

G 3.4.3 Electrical equipment and enclosures containing hazardous voltages must have a warning that a hazard exists and must specify the maximum voltage of the system.

G 3.4.4 Switchboards must be provided with nameplates indicating the following:

- Date of manufacture
- The name of the switchboard
- The manufacturer
- The serial number (if applicable)
- The date

G 3.4.5 Each circuit breaker must be provided with a nameplate indicating the circuit name and function and the circuit breaker configuration. The Contractor must properly designate the functions and names of each instrument, switch, etc. on the switchboard and mark the full load or normal operation value with a red line.

G 3.4.6 Distribution signs must have nameplates indicating:

- The space, department, device or circuits controlled and the designation of the power supply device.

G 3.4.7 Internally, switchboards and motor control panels must have nameplates to identify bus bars and terminals. Bus bar phases must be color coded.

G 3.4.8 Electrical enclosures that house multiple electrical or electronic equipment and devices must have a unique identification code for each device, and each device must be labeled accordingly. Enclosure mounting drawings must clearly indicate the mounting and identification codes of the devices within the enclosure.

G 3.4.9 Terminal blocks and terminal wiring must be marked with the circuit designation and must be considered as devices within the enclosures. Terminal blocks must be labeled consecutively and in ascending order from left to right and top to bottom.

G 3.4.10 The size and other characteristics of the nameplates must be as specified in Section G.1.16.

G 3.5 **CABLES**

G 3.5.1 All cables must meet the requirements of TP127, and must be manufactured, tested, and installed in accordance with the requirements of the latest TCMS, IEEE, and Classification Society publications.

G 3.5.2 The Contractor must create a schematic listing all new electrical cables to be installed and all existing cables to be reused. For each cable, the following must be indicated:

- Driver size.
- Rated current.
- Estimated length
- Identification number and name of the manufacturer
- Approximate weight
- Voltage drop
- Insulation level (voltage)
- Insulation type designation and maximum temperature allowed

G 3.5.3 This schematic must be submitted to the TA for review and approval prior to the installation or removal of any cable. The schematic may be submitted in sections as the detailed design develops.

- G 3.5.4** No splices must be made on new cables. Splicing of existing cables of 600 VAC or less may be permitted with prior approval from TCMS, as long as splices are made in accordance with TP 127F. Radio frequency coaxial cables must not be spliced. In-line connectors must not be used on such cables except to terminate the cable. All cable and wire terminations must comply with TP127F.
- G 3.5.5** Where cables enter sheltered or watertight compartments, motors, or other equipment, TCMS-approved splice sleeves or voltage-reducing devices must be used. Cables must enter sheltered compartments from the bottom or side of the compartment.
- G 3.5.6** If cables enter a compartment from the side, they must run down the compartment before running up.
- G 3.5.7** A minimum of 15% clearance must be left for each new conduit and for all modified cable runs.
- G 3.5.8** Cables must be concealed except in machinery rooms, workshops and storage rooms. Location of cable runs, junction boxes, supports, etc., concealed by panels or coverings must be clearly indicated on "as-built" drawings. Concealed junction boxes must have the circuit designation stamped or painted on a portion of the box that cannot be removed.
- G 3.5.9** Permanently installed cables and all their connection points must be labeled with their circuit designation on both sides of bulkheads and bridges. Labels must be stamped stainless steel for all exterior cables. Both ends of the labels must be attached to the cable with a metal fastener after the paint has been applied. The clips must be passed through holes in the tags to ensure that the tags are secure. The ends of the ties must be bent and crimped permanently.
- G 3.5.10** Adhesive or indelibly printed plastic identification labels on each cable and conductor can be used inside equipment compartments and equipment racks.
- G 3.5.11** All conductor identification markings and cable labels must be reported on the "as-built" system drawings and must comply with the following instructions:
- Cable labels must be printed with indelible ink and must not be handwritten.
 - Each cable must be marked with the unique identifier of the installation.
 - Each cable label must contain the following information: unique cable designation and location of each end.
 - Conductor identification markings must be attached to the conductors so that they do not become detached when the conductor is connected to a device.

- G 3.5.12** Spare conductors in a cable must not be stripped or shortened and must be attached and labeled as spare conductors in an appropriate manner. Control cables and cables used for the alarm and monitoring system must include at least 10% spare conductors. Shielded control cables must be grounded at only one end of the cable run, preferably at the signal input end. The cable must not be grounded at both ends.
- G 3.5.13** To avoid mutual interference, cables must be grouped and separated. If spacing is not feasible, additional shielding must be provided with the approval of the ABS inspector.
- G 3.5.14** Low-loss coaxial cables of appropriate impedance must be used for the antenna feed lines.
- G 3.5.15** If foam core dielectric cables are used, shielded crimp connectors must be installed. The Contractor must not use solder connectors.
- G 3.5.16** The route of new generator cables must be as direct as possible, and the cables must be run over the cable trays used for existing generator cables or, where this is not practicable, over specially designed cable trays. When running cables from generators to their respective machines, sufficient slack must be left to allow the machine to be subsequently disconnected and reconnected without damage to the cable.
- G 3.5.17** The Contractor must dispose of all wiring deemed surplus to this specification item at their expense.
- G 3.5.18** The Contractor must ensure that all areas have been thoroughly cleaned and are free of any debris resulting from the performance of this specification item.
- G 3.5.19** The Contractor must use 316 stainless steel mounting hardware for the mounting of all equipment covered by these specifications.
- G 3.5.20** The Contractor must be responsible for unpacking and packing all cables and cable glands.
- G 3.5.21** For installation of cables, the Contractor must follow the existing cable trays throughout the vessel where they are installed. Once installed, all wiring must be secured in accordance with TP127E.
- G 3.5.22** Equipment that has been removed in the course of fulfilling this specification must be returned to Canada in working condition. It must be properly packaged. Shipping costs will be covered by the PWGSC 1379 process.
- G 3.5.23** The Contractor must ground all equipment in accordance with the manufacturer's documentation.

G 3.6 CABLE SEPARATION

G 3.6.1 The Contractor must refer to Figure 4-1 indicating the physical separation that must be maintained between the various categories of cables. Separations do not apply to cables that cross at or near right angles. All types of cables must be kept well separated from antennas, antenna couplers, or feed wires. Any deviation must be approved in advance by the ABS inspector and the TA, and documentation of approved deviations must be forwarded to the IA.

G 3.6.2 Cables must be grouped according to their category as shown in Figure 4-1 and in accordance with the following guidelines:

- Cables from groups A to E inclusive can be grouped with cables from the same groups and share the same cable tray with cables from other groups.
- Bundling of cables from groups F to K must be avoided and, if necessary, additional separation material must be provided.
- Cables from groups F to K must use separate cable trays where possible.

Recommended cable separation (in inches)

Cable group	Cable group classification	Recommended separation (in inches) between cable groups									
		A	B	C	D	E	F	G	H	J	K
A	Energy and lighting of the ship	-	4	2	2	4	12	18	18	18	18
B	Receiver antenna cables	4	-	4	2	2	12	18	18	18	18
C	Control device cables	2	4	-	2	4	12	18	18	18	18
D	TV and VHF antenna distribution cables	2	2	2	-	2	12	18	18	18	18
E	Telephone and audio distribution cables	4	2	4		-	12	18	18	18	18
F	Echo sounder transducer	12	12	12	12	12	-	18	18	18	18
G	Transmitter and coupler power cables	18	18	18	18	18	18	-	18	18	18
H	Coupler and antenna cables	18	18	18	18	18	18	18	-	18	18
J	VHF/UHF transceiver/antenna cables	18	18	18	18	18	18	18	18	-	18

Cable group	Cable group classification	Recommended separation (in inches) between cable groups										
		A	B	C	D	E	F	G	H	J	K	
K	Coaxial guide and waveguide for radar transceiver	18	18	18	18	18	18	18	18	18	18	-

G 3.7 CIRCUIT BREAKERS

G 3.7.1 Circuit breakers must be equipped with insulated, reinforced and individually protected connectors. It must be clear that a circuit breaker has been tripped when the handle is between the on/off positions or by means of a visual indicator.

G 3.7.2 All circuit breakers must be rated for their intended use with proper consideration of voltage, current, interrupting value, number of poles, auxiliaries, etc., in accordance with the final approved "Short Circuit Current Analysis" (4.4), and must be selected on the basis of the coordination study.

G 3.7.3 Circuit breakers must be rated for continuous use at 50°C.

G 3.7.4 Circuit breakers must be suitable for use in marine environments:

- They must have a molded housing.
- They must be rated for 600 VAC, 240 VAC or 120 VAC.
- They must be quick closing and opening.
- They must have inverse time overcurrent characteristics.
- They must be equipped with an overload device for each phase

G 3.8 CCM MOTOR CONTROLS

G 3.8.1 Motor controls must be suitable for use in marine environments. Motor controls and contactors that control machines that are required to operate continuously must be installed with a brownout trip with a time base circuit, adjustable from 0.5 to 10 seconds, that must restart all running motors in the event of a short-term power failure.

G 3.8.2 Motors of 30 kW and above must be equipped with solid state reduced voltage starters (soft starts) to limit inrush currents.

G 3.8.3 Each starter controlling three-phase AC motors must comply with the latest versions of TP 127F and IEEE STD 45-2002, and must:

- Have a means of locally isolating the motor when the starter is not adjacent to the motor.
- Be equipped with indicator lights at the starter to show the status of the disconnect switch.
- Be equipped with a molded case circuit breaker for each motor circuit to isolate the power supply and provide short circuit protection. The circuit breaker must have a means of indicating its status locally and must have auxiliary contacts for remote monitoring.
- Have two indicator lights: one to indicate that the associated motor is running, and the other to indicate that it is stopped.
- Have LED indicator lights.
- Be equipped with sheltered or waterproof ON and OFF push buttons.
- Be equipped with one (1) externally operated overload reset button, mounted on the front, for all three overload relays.
- Be equipped with an auxiliary contact to operate the anti-condensation heaters, if required.
- Allow cables to enter from the bottom via a connecting sleeve.
- Be equipped with an ammeter with a selector switch for reading the current on each phase for motors with a power rating of 20 kW or more.

- G 3.8.4** Where alarm lights are provided at the local control station, facilities must allow for the conduct of a light test.
- G 3.8.5** Where alarm bells are provided at local control stations, facilities must have a button to deactivate them.
- G 3.8.6** Starters controlling single-phase motors below 0.37 kW, unless intended for automatic operation, may be manual, two-pole switches in a fully enclosed housing suitable for marine use, supplemented by overload switches, provided the required protection is included in the switch housing.
- G 3.8.7** All internal wiring must be permanently numbered. This numbering must be included in the wiring diagrams to be provided under the "as-built" drawing requirement. Each motor control or starter must have a wiring diagram inside the door or cover.
- G 3.8.8** One schematic must be submitted for each starter. In the event that multiple motors have the same control scheme, submission of a single schematic will suffice, as long as the schematic refers to a table listing the conductor identification for each circuit.

G 3.8.9 The Contractor must submit to the TA for review and approval a list of all engine starters to be installed during the life extension of the vessel. Said list must specify the following:

- Manufacturer's name.
- Usage.
- Type of starter.
- Type of protection - overvoltage or undervoltage.
- Weight.
- Case.
- Wiring diagram.
- Starter size.

G 3.9 **TRANSFORMERS**

G 3.9.1 Where a three-phase transformer block is required, it must consist of three (3) single-phase transformers in delta-delta connection, unless otherwise specified. Transformers must be equipped with electrostatic shields.

G 3.9.2 In general, the following principles must apply to transformers:

- They must be of the single-phase type (unless otherwise specified).
- They must be suitable for three-phase operation, in delta-delta connection.
- They must be suitable for bulkhead or bridge installation up to 50 kVA and for platform or bridge installation above 50 kVA.
- They must be air-cooled.
- They must have a sheltered enclosure with shutters.
- They must be provided with winding insulation of class F or better.
- They must have a final operating temperature not exceeding a Class B temperature rise.
- They must have $\pm 2 \frac{1}{2} \%$ and $\pm 5 \%$ terminals on all primary windings (2 at full capacity above normal voltage and 2 at full capacity below normal voltage).
- They must be supplied with copper windings.
- They must be manufactured in accordance with the latest version of TP 127F and IEEE 45 STD-2002.
- Their sound levels must be at or below the latest Canadian Standards Association standards.
- Transformers must have nameplates that include the following:
 - a) The name of the manufacturer.
 - b) The nominal power in kVA.
 - c) Temperature increase at full load rating.

- d) The primary and secondary voltage ratings.
- e) The frequency in Hz.
- f) The nominal impedance.
- g) The noise level.

G 3.9.3 When a transformer is to be de-energized for relatively long periods of time, the transformer enclosure must include a self-contained heater in accordance with Section 4.6. Self-contained heaters must be capable of raising the internal temperature to 5°C above ambient, and maintaining it. The TA may waive this requirement if the transformer is located in a heated, dry space.

G 3.9.4 The Contractor must provide the IA and the TA with ABS approval certificates for all transformers rated 15 kVA or greater. Certification documents must be in accordance with Section G.5 of these specifications.

G 3.10 INSTALLATION OF ELECTRONIC EQUIPMENT

G 3.10.1 The Contractor must prepare mounting diagrams showing the location of electronic equipment at both the frame or console level and at the compartment level. These diagrams must be prepared for all compartments containing electronic equipment. An antenna layout diagram must also be prepared, if required.

G 3.10.2 The Contractor must prepare schematics based on the manufacturers' installation data. These schematics must show the electrical details of the installation of each electronic system (e.g., cable details such as identification number and type, connector details, or power supply details). Point connection details must be provided separately, but the diagram must reference the source.

G 3.10.3 The Contractor must provide a list of devices listing all information pertaining to the device and the manufacturer's data for the associated parts. Where devices are configurable via software or hardware (e.g., DIP switches and memory settings), the Contractor must document all software and hardware configuration settings and provide them, along with the device documentation, to the TA and the IA in an editable electronic format.

G 3.10.4 Each field device in a separate location must have a unique identification. This identification must match the field device identification used in all other documents.

G 3.10.5 Field device identification labels must include the following information:

- The location of the field device.
- The main drawing associated with the field device.

G 3.10.6 The objective of the field device documents is to provide a system whereby all devices have a unique identifier, allowing cross-referencing of all related OEM data, device-specific configuration parameters, schematics and electrical connections to a particular device within the system.

G 3.11 SAFETY SWITCHES

G 3.11.1 It is necessary to be able to locally deactivate each electronic device. This can be achieved by a switch normally provided on the front panel. For equipment that does not have this feature and is remotely activated, a safety ON/OFF switch must be installed.

G 3.11.2 Where an electronic unit or terminal box is concealed by ceiling or sheathing tiles, access to the concealed equipment must be provided. The access panel must clearly and permanently display the identification of the concealed equipment as shown in Section G.1.16.

G 3.12 RACK OR BRACKET MOUNTING

G 3.12.1 Rack or console mounting is the preferred method for mounting electronic equipment. The Contractor must provide the brackets or racks required to mount the electronic equipment.

G 3.12.2 All frames or brackets must consist of welded steel construction and must be securely fastened in the vertical position. Frames or brackets must be adequately reinforced to meet the shock and vibration requirements of Section G.2.9.

G 3.12.3 Racks or consoles must be designed for retractable and sliding mounting of standard 19-inch (483 mm) electronic equipment up to 24 inches (600 mm) deep. The height of the console must be as compatible as possible with its purpose and environment.

G 3.12.4 Mounting rails must consist of two pieces, one attached to the frame and the other attached to the equipment. A device must be provided to prevent snagging on cables when inserting or removing the slides.

G 3.12.5 Racks must be designed with removable side panels. They must be arranged so that adjacent frames can be bolted together without having side panels on the inside. Priority must be given to frames that readily accommodate forced ventilation.

G 3.12.6 Equipment must be mounted using retractable slides. Any equipment not mounted in this manner must be supported from below. Equipment must be retained in the frame

by the front panel retaining screws. For maintenance purposes, the retaining screws must be standardized.

G 3.12.7 Heavy equipment must be positioned in the lower part of the rack, while lighter equipment, without controls on the front panel, must be in the upper part. Equipment requiring frequent inspection or maintenance must be mounted in the center of the rack.

G 3.13 **MOUNTING ON WALL OR TABLE**

G 3.13.1 Equipment mounted on bulkheads must be attached directly or indirectly to the vessel structure. Under no circumstances must equipment be supported by cladding panels or ceiling tiles.

G 3.13.2 Tabletop mounting of the equipment is acceptable, but the use of window sills must be avoided unless approved by the TA. Maximum use must be made of the manufacturer's standard mounting hardware. All mounted equipment must be oriented to best serve the operator.

G 3.13.3 The equipment locker of any bulkhead or table mounted equipment must be connected to the metal structure of the vessel.

G 3.14 **SUSPENDED MOUNTING**

G 3.14.1 Suspended mounting of electronic equipment must be avoided and must only be used when other mounting methods are not feasible. This method must use a suspended console, securely fastened to the ship's structure and designed to allow easy access for maintenance. The installation of any such console must be done in such a manner that there is no risk of personal injury. Any equipment so mounted must be connected to the hull of the vessel.

G 4.0 **ELECTROMAGNETIC INTERFERENCE**

G 4.1 **GENERAL**

G 4.1.1 The Contractor must determine the sources of electromagnetic interference caused by the installation of the equipment, and eliminate any subsequent interference.

G 4.1.2 The following standards contain acceptable limits for the indicated frequencies of RF current and radiation fields:

- IEC n° 60533 ed. 2.0, 1999; Electrical and electronic installations in ships - Electromagnetic compatibility.
- Annex 7 of IEEE Standard 45, std-2002 Recommended Practice for Electrical Installations on Shipboard.
- IACS Test specification for E10 type approval.

G 4.2 INTERFERENCE LIMITS

G 4.2.1 Separate limits are defined for radiated interference, i.e., transmitted through the air; and conducted interference, i.e., transmitted by wire. Each type of interference has different tolerated levels above and below 15 kHz.

Radiated Interference (above 150 kHz)

G 4.2.2 Radiated interference limits must be within the test parameters in IACS E10.

Conductive Interference (from 30 Hz to 15 kHz)

G 4.2.3 The level measured at the input terminals of an electrical distribution panel must not exceed 3% total supply harmonic distortion. When measured at the terminals of electronic equipment, total distortion must not exceed 1%. Total distortion is the ratio of the root mean square value of all disturbance voltages to the root mean square value of the fundamental and all disturbance voltages.

Conductive Interference (above 15 kHz)

G 4.2.4 Voltage disturbance levels measured across a single piece of electrical equipment must not exceed the levels prescribed by the Department of Communications in Circular No. S11-10-47, Interference Suppression in Marine Craft.

G 4.2.5 Class 1 limits must apply when equipment or cables are not adequately shielded, for example:

- Any area above the deck, unless proper shielding has been used.
- Where there is a close coupling between the affected equipment and the associated cables.

G 4.2.6 Class 2 limits must apply in cases of adequate shielding, including:

- Inside the metal structure of the ship.
- Where armor has been specially provided.

Note: Measurements must be made using equipment that complies with Standards Council of Canada standard C108.1.1. Measurements must be made under the most adverse conditions.

G 4.3 INTERFERENCE SUPPRESSION S

G 4.3.1 Interference must be suppressed at the source or receiver in accordance with the following guidelines:

- All sensitive electronic equipment must be housed in a tested and certified enclosure that provides at least 40 dBm of shielding for the onboard electromagnetic environment.
- It is important to observe the minimum cable separations.
- If capacitors are used, they must be on the equipment side of any disconnect switch or have an uninterrupted creepage path.
- Capacitors must not be used to suppress arcing between electrical contacts.
- Metal enclosures that house components must be bonded to the metal of the interference source.
- Appropriate electrostatically shielded isolation transformers or line voltage stabilizers must be incorporated into the power lines for the electrical equipment, preferably at the equipment end of the coax.
- It is important to use double-sided printed circuit boards whenever possible.

G 4.4 CABLE SHIELDING

G 4.4.1 The shielding of the cables must respect the following basic rules:

- Shielding efficiency must be at least 90%.
- Low frequency cables (i.e. below 15 kHz) must have a single point grounded iron shield.
- High-frequency cables must be shielded with bronze, copper, or aluminum whenever possible, and must be grounded at intervals of less than 0.15 wavelengths at the highest frequency of interest.
- Metal ducts can provide adequate shielding provided that they are bonded when passing through any partition, and that all welds and joints are continuously welded.

G 4.5 GROUNDING AND PLATING

G 4.5.1 Grounding and plating must be in accordance with TP127E.

Frames and brackets

G 4.5.2 The following measures apply to the grounding of equipment frames and brackets:

- All frames and brackets must be welded and have a direct electrical connection between the frame or bracket and the metal part of the vessel. Where a direct connection cannot be made, ground braids must be used.
- The use of non-welded frames and brackets may be considered provided that each component is adequately tested. Components may be grounded individually, or bonded together with a braid. Electrical continuity between each adjacent component must not differ due to their proximity or mechanical connection.

Equipment lockers

G 4.5.3 Equipment racks must have attenuation capabilities of at least 40 dB. Sheet steel is preferred. Individual equipment lockers must be grounded as follows:

- They must be connected to the ground rail or metal of the rack or console in which they are installed.
- Each locker must be individually grounded, i.e. it is not permitted to connect lockers to each other to ground them.
- Wherever possible, equipment in the same system must be grouped together and tied to a single point ground.
- The grounding of the equipment racks must not rest on its fasteners.
- Access doors or covers must be tied to the equipment locker.
- Slide mounted equipment must have braids to allow removal of the equipment.
- On permanently installed equipment, the ground braid must be as short as possible.
- Flexible ground braids must only be used when required for equipment or component movement.

Methods and materials

G 4.5.4 The following points address the methods and equipment used to bond or ground a component:

- All contact surfaces must be clean and free of paint, scale, rust or any other material that may interfere with proper surface contact.
- The area of the contact surfaces must be as large as possible.
- Contact surfaces must be bonded using a method that does not impair the effectiveness of the contact, i.e. welding of a welding stud, etc.

- Braids must be made of solid copper, 1" wide and 0.025" thick, and as short as possible to avoid square bends and corners.
- All ground braids and joints must be easily accessible for maintenance purposes.
- the ABS inspector may approve the use of other low-strength, chemically compatible, corrosion-resistant materials.
- All fasteners must be low strength, corrosion resistant and preferably made of stainless steel. Upper deck fasteners must be made of stainless steel.

Additional precautions

G 4.5.5 Special attention must be paid to grounding and bonding of metal structures and equipment in areas with high levels of radio frequency energy, such as radio rooms and electronic equipment. Antennas, antenna tuning blocks and radar transceivers are also critical, regardless of their location. In these areas, any floating metal structures such as ducts, air distribution ducts, piping, cable boxes, cable shielding, and metal support frames for linerboard and ceiling tiles must be grounded at intervals of less than 1 m (3 ft). It is important to avoid the use of metal linerboard or ceiling tiles in these areas.

G 4.5.6 Any metal structure located on the upper deck, such as pipes, rails, legs and enclosures, must be bonded to the metal portion of the vessel.

G 5.0 DOCUMENTATION

All documents provided by the Contractor become the property of Canada. This includes electronic media. Such media must not be protected to prevent copying for internal use.

G 5.1 DRAWINGS

General

G 5.1.1 All drawings provided by the Contractor must be in AutoCAD 2018 DWG format. Electronic drawings must not be protected to make them read-only files. Text fonts must match the standard AutoCAD 2018 format. Blocks must not be grouped. All text in a block must match an attribute.

G 5.1.2 A complete list of layer names and a brief description of the purpose of each layer must accompany all files. Layer names, layer color codes, and layer line types must be consistent across drawings or drawing types.

- G 5.1.3** Electronic drawings must be provided to the TA via email, FTP server or USB device. All files must be clearly labeled with the project number, file names and drawing numbers. Files must be labeled as "working drawings" for those drawings that have been approved and are final.
- G 5.1.4** A complete list of symbol names (blocks) with a description of each symbol must be provided. One block per drawing must be provided in an electronic format compatible with AutoCAD 2018. Drawing sheet sizes, including vendor drawings where possible, must meet ANSI standards with a standard margin and title block in the layout section.
- G 5.1.5** Graphic representations and printouts of "as-built" plans must not contain handwritten marks or corrections, e.g., with marker, pen or pencil.
- G 5.1.6** The Contractor must provide the IA and the TA with all drawings requested or produced by the Sub-Contractors.
- G 5.1.7** System schematics must include all relevant system information including sizes, dimensions, labels, equipment locations, and all information that refers to the system apparatus.
- G 5.1.8** The Contractor must have a complete system for recording and controlling all drawings and drawing revisions that result from the Work. The Contractor must maintain a current list of drawings and revisions and provide this list to the IA and TA during the monthly progress meeting. This list must include a column of all drawings submitted to the ABS inspector for approval.

Design Plans

- G 5.1.9** The Canadian Coast Guard provides all engineering reference drawings to the Contractor for reference purposes only. The Contractor is responsible for producing as-built drawings and ensuring that all such drawings receive the appropriate regulatory approval. The Contractor must note that not all reference drawings provided are "as-built" drawings. The Contractor must physically verify each affected item and all dimensions required for the work.

Working drawings

- G 5.1.10** The Contractor must prepare detailed working drawings of all project work in accordance with the regulatory approval of the regulatory agency. All variations must be included in the working drawing revisions.

- G 5.1.11** Working drawings must clearly indicate the materials or equipment provided, all construction details, precise dimensions, capacity, operational characteristics and performance. Each working drawing must have a unique identification number, and blocks of numbers must be used to identify the various elements of the specification. Where multiple working drawings are required, each drawing must indicate the total number of sheets in its series.
- G 5.1.12** Each working drawing for non-catalog items must be prepared specifically for this project. Working drawings and brochures of catalog items must be clearly marked to show the items supplied.
- G 5.1.13** The Contractor must approve all working drawings and indicate the following:
- The design has been checked for compliance with all the requirements of the specification.
 - The equipment has been coordinated with the other equipment to which it is attached or connected.
 - All dimensions have been checked to ensure proper installation of the equipment in the available space.

Working drawings - Submission to SPAC and CCG for review

- G 5.1.14** The Contractor must submit to the TA two (2) copies of all working drawings, shop drawings and schedules required for the Work. The drawings must be submitted to the TA and the IA at least fourteen (14) days prior to the commencement of the work covered by the drawings. The IA and TA must review the drawings within five (5) working days. This review must include verification of compliance with the specification requirements. If necessary, the TA will return one (1) copy of the drawing to the Contractor with comments from the IA and the TA. The Contractor must make any necessary changes and return two (2) copies of the revised drawing, along with the revision dates and revision numbers, to the TA.
- G 5.1.15** Revised drawings may not be altered in any way without the written approval of the TA. In the event that revisions are made to previously revised drawings, the entire drawing (all sheets, revised or not) must be resubmitted for review.
- G 5.1.16** The working drawings must include space for the IA and TA to record review dates and sign off.
- G 5.1.17** Drawings submitted for review, unless otherwise specified, must be in the form of traced originals. Manufacturer's printed data sheets for standard items are acceptable provided that the relevant specifications are indicated and relate to the items shown.

Working Drawings - Submission for ABS Approval

- G 5.1.18** The Contractor must forward to ABS copies, as required, of the required working drawings, vessel drawings or diagrams, schedules and calculations for approval by ABS.
- G 5.1.19** It is the responsibility of the Contractor to ensure that the working drawings are approved by ABS prior to commencing work on any section of these specifications that requires ABS approval.
- G 5.1.20** Working drawings must have space for ABS to affix its seals of approval. This space must be free of any technical information and must not be on the back of the sheets.
- G 5.1.21** The Contractor must contact the appropriate ABS approval office to determine the number and type of documents to be submitted for approval.
- G 5.1.22** The Contractor must send to the TA one (1) copy of the original stamped drawings and three (3) copies of all ABS approved drawings.
- G 5.1.23** The Contractor must provide the TA with four (4) scanned copies, in TIF and PDF formats, of all ABS approved drawings via email, FTP server or USB device.

As-built" drawings

- G 5.1.24** Upon completion of all work, the Contractor must transfer all as-built drawing annotations into a final revision of all vessel drawings affected by the project work. These drawings must become the "as-built" drawings for the project work.
- G 5.1.25** The Contractor must update all vessel drawings affected by the project work.
- G 5.1.26** Prior to the end of the contract, the Contractor must provide the following to the TA:
- four (4) plotted copies of the latest revision of each "as-built" drawing.
 - An electronic copy of the latest revision of each "as-built" drawing each via email. FTP server or USB device in AutoCAD 2018 DWG format.
 - All designs become the property of Canada.
 - Plotted drawings must be submitted on standard ANSI format.
- G 5.1.27** If the drawings were not produced in AutoCAD format, scanned files must be provided to the TA in TIF format.
- G 5.1.28** "As-built" drawings must be delivered within 15 days of the completion of the sea trials.

Framed drawings

G 5.1.29 If applicable, the following drawings, modified to "as-built" drawings, must be printed, framed, and affixed to the vessel at locations designated by the TA:

- Drawings of the general configuration, plan view of all bridges and profile view.
- Capacity Plan.
- Firefighting system and rescue equipment.

Updates of work of drawings

G 5.1.30 As the drawings evolve during the performance of the work, the Contractor must provide the Field Inspector with one (1) hard copy of the latest revisions of each drawing. Drawings must be provided in their original size.

G 5.1.31 The frequency of drawing updates must be at least weekly.

G 5.1.32 An index of updated drawings must be provided with each batch of updated drawings, Manuals and Records.

G 5.2 MANUALS AND RECORDS

General

G 5.2.1 Each instruction manual and logbook must be bound in a hard cover 3-ring binder that can accommodate 8 1/2" by 11" sheets. Binder rings must be "D" shaped and have interlocking mechanisms. Drawings and larger documents must be accordion folded. The following information must be printed on the cover:

- CCGS Martha L. Black - Vessel Life Extension.
- Identification of the equipment or systems.
- Manufacturer of the equipment.
- Revision number and date.

G 5.2.2 All sections of the manuals must have laminated tabs. Major equipment components must be subdivided into separate sections of the manuals.

G 5.2.3 A master index must be located at the beginning of each booklet, listing all items included in each section.

G 5.2.4 A list of the names, addresses and telephone numbers of contacts associated with the manufacturers who may be consulted after completion of the project for maintenance and information management purposes must accompany the document.

- G 5.2.5** A copy of the final, approved "as-built" drawings must be included in the maintenance manual.
- G 5.2.6** The Contractor must provide four (4) hard copies to the TA of all manuals and data sheets in French for the items of equipment supplied by the Contractor prior to the expiration of the Contract.
- G 5.2.7** The Contractor must provide a copy to the TA of all manuals and data sheets via email, FTP server, or USB device, in PDF format, prior to contract expiration.

Operating Manuals – ‘as-built’

- G 5.2.8** Operating manuals must include the following:
- A general description of the sequence of operation of the equipment.
 - A detailed procedure that must be followed for the commissioning of the equipment.
 - A block diagram of the connections of the installed equipment;
 - All relevant equipment performance criteria.
 - When systems are accompanied by software or hardware, a user manual must include the following:
 - The complete system-specific software documentation manual, via email, FTP server or USB device, so that Canada can review the programs without recourse to the Contractor.
 - The minimum software documentation must include system level diagrams describing the overall software or hardware layout.
 - The functional specifications which must describe in detail the functional capabilities of the system and of each software component;
 - The list of project-specific programs, including any comments describing the specifics of the code functions;
 - All lists, files, manuals and related documents must be delivered and become the property of Canada.
- G 5.2.9** The Contractor must provide the number of hard copy and electronic copies of the operations manuals specified in Section G5.2.

Maintenance Manuals – ‘as-built’

- G 5.2.10** These manuals must include :
- The manufacturer's maintenance instructions for each piece of equipment that requires maintenance.

- Instructions must include installation instructions, part numbers, parts lists, master drawings and exploded views with identification of all mechanical, electrical and electronic parts, and the names of suppliers.
- A summary list of each piece of equipment that requires lubrication, including the name of each item, the location of all lubrication points, the type of lubricant recommended and the frequency of lubrication.
- Troubleshooting sections must be included for all equipment in the service manual under a separate heading.

G 5.2.11 The Contractor must provide the number of hard and electronic copies of the maintenance manuals specified in Section G5.2.

Records of Tests, Trials and Inspections

G 5.2.12 The Contractor must prepare a separate ring binder, arranged in accordance with Section G5.2, to assemble all tests, trials and inspections. The binder must be indexed for each test, trial, and inspection performed.

G 5.2.13 The Contractor must maintain a complete and accurate record of tests, trials and inspections performed during the course of the work. This must include tests, trials, and inspections performed at Sub-Contractors' facilities. Records must include all pertinent documents, test procedures and associated test sheets, including shop test data, test, trial and inspection data, and results from observations.

G 5.2.14 Original records of tests, trials, and inspections must be signed by the ABS inspector, the Contractor, and, if applicable, the Sub-Contractors or FSR who witnessed the tests.

G 5.2.15 Tests and inspections performed specifically to meet ABS requirements for updating the vessel's Vessel Inspection Reporting System (VIRS) must be documented in signed documents meeting the ABS Inspector's requirements to clearly indicate the piece of equipment or system with an associated field number that was tested and the results of the tests performed. All copies of the documents must be dated and signed by the ABS inspector present and the Contractor.

Register of Certificates

G 5.2.16 The Contractor must prepare a separate ring binder, arranged in accordance with Section G6.2.1, to assemble all records of certifications. The binder must be indexed for each item or piece of equipment for which certifications are available.

G 5.2.17 The Contractor must maintain a complete and accurate record of all certifications for work performed. Certifications must be current and appropriate to the type of

equipment installed by the Contractor. Where classification society approval certificates are required, as per G2.1, the Contractor must ensure that they are inserted in the booklet for that purpose. Where manufacturers provide equipment certificates in the operations manuals, copies of these certificates must be indexed in the Certification Log Book. The Contractor must also obtain and index all certificates issued by its Sub-Contractors.

G 5.2.18 The Contractor must provide the number of hard copy and electronic copies of test, trial and inspection records specified in Section G5.2.

G 5.2.19 NOTE: When original certificates are provided, especially those with ABS stamping, one of the three paper copies submitted must be the original document.

G 5.3 **ELECTRICAL SYSTEM DOCUMENTATION**

G 5.3.1 The Contractor must provide the following documentation to the TA with respect to the "as-built" load analysis:

- Four (4) hard copies of the "as-built" load analysis and final electrical system calculations approved by the ITA. This information must be detailed in Section G5.2.
- An electronic copy of the "as-built" ABS approved load analysis and final electrical system calculations. Electronic files must be in Microsoft Excel format and provided via email, FTP server, or USB device with an accurate listing of all files.

G 5.3.2 The Contractor must provide the following documentation to the TA with respect to the "as-built" short circuit current analysis of the electrical system:

- Four (4) hard copies of the "as-built" and approved short circuit current analysis and final electrical system calculations.
- An electronic copy of the approved "as-built" short circuit current analysis and final electrical system calculations. Electronic files must be in Microsoft Excel format and provided via email, FTP server, or USB device with an accurate listing of all files.

G 5.4 **DOCUMENTATION OF STABILITY TESTS**

G 5.4.1 The Contractor must refer to Section 21.2 of these specifications for details required for stability testing.

G 5.4.2 The Contractor must prepare and provide four (4) ABS Inspector approved hard copy stamped copies of the CCGS Martha L. Black stability test report in both Imperial and Metric units, of the retrofitted vessel. These reports must be delivered to the TA prior to the end of the contract.

G 5.4.3 The Contractor must provide the TA with an electronic copy of the stability test report via email, FTP server or USB device and in PDF file format. This must be a scanned copy of the ABS Inspector approved stability test report and must be delivered prior to contract completion.

G 5.5 STABILITY MANUAL DOCUMENTATION- NOT USED

G 5.6 PHOTOS AND IMAGES - GENERAL

Initial Photos and Images

G 5.6.1 The Contractor must use a professional photographer to deliver 1,000 digital images in high resolution JPEG format (8 mega pixels minimum). Images must be provided via email, FTP server or USB device. The IA and TA must be present for all images taken. The entire vessel must be photographed in sufficient detail to allow for the identification of specific parts or components. If Canada requires additional images to be taken, the price must be prorated by the PSPC 1379 process.

G 5.6.2 The Contractor must provide the IA and the TA with two (2) copies of all initial digital images on USB at the first progress meeting after delivery of the vessel to their facility.

Photos and Images of Progress

G 5.6.3 Contractor must provide high resolution (8 megapixel minimum) digital images in JPEG format via email, FTP server or USB device of the progress of the work during each phase of the project. The photos must be taken from the start of the work on the vessel and throughout the duration of the work.

G 5.6.4 The Contractor must take sufficient photographs during the retrofit project to ensure that an adequate representation of the progress of the work is provided. The date the photo was taken must be automatically included on all images.

G 5.6.5 The Contractor must provide the IA and TA with two (2) copies of all progress photos via email, FTP server or USB device in JPEG format at the monthly progress meetings.

G 6.0 TESTS, DOCKSIDE AND SEA TRIALS

G 6.1 GENERAL REQUIREMENTS

- G 6.1.1** The Contractor must demonstrate that the work performed and the equipment meets the performance requirements described in this specification. The Contractor must develop test and trial procedures, and must also perform any tests and trials required by this specification or by regulatory agencies to enable the issuance of appropriate certificates for the vessel. The Contractor must obtain, prior to completion of the contract, any certificates necessary to ensure that the vessel is fully certified and its seaworthiness for a vessel of its class is assured.
- G 6.1.2** The Contractor must prepare the test schedule indicating the dates, sequence, procedures and duration of each test or set of tests. This schedule, including the proposed test log sheets for the test set, must be submitted to the TA and the IA for review and comment, twenty (20) working days prior to the start of any test or test set. The Contractor must coordinate the test schedule with the ABS Inspector to ensure their participation, if applicable. The Contractor must ensure the availability of a Detached Representative (DR) or obtain written authorization from the manufacturer prior to the initial start-up of newly installed or modified equipment. The IA, as well as, if required, the ABS inspector, the DRs, and any Sub-Contractors, must be present at all testing. All tests must be performed on each component of the systems. All defects must be corrected to the satisfaction of the IA, ABS and the affected DR. Once deficiencies are corrected, the tests must be repeated to the satisfaction of the IA, and ABS if applicable.
- G 6.1.3** Shop, dockside, and sea trial procedures must be in accordance with the standards required by ABS. If ABS does not have a shop test procedure requirement, the Contractor must comply with the *Society of Naval Architects and Marine Engineers guidelines* as outlined in Section G6.3 of these specifications. The minimum standard for all dockside and offshore electrical testing must be in accordance with TCMS, TP127E and IEEE 45-2002. All static testing of electronic equipment must be performed prior to sea trials. Only operational testing must be performed at sea.
- G 6.1.4** Mechanical and piping systems must be tested in accordance with Section G6.2.
- G 6.1.5** Hydrostatic testing of piping and components of any system must be performed prior to any operational testing of the system. The Contractor must have signed and witnessed test sheets indicating the result of hydrostatic testing prior to the commencement of operational testing of the system. At a minimum, the IA must be notified of any hydrostatic testing of components.

G 6.1.6 The Contractor must provide the TA with a complete list of modified vessel services and systems that require functional and operational testing prior to completion of each specification requirement. The Contractor must develop specific test procedures to verify the operational and functional status of each of the modified vessel services and systems. The Contractor must submit the list of modified vessel services and systems, and associated specific test procedures, to the IA and TA for review twenty (20) working days prior to the testing of such systems.

G 6.1.7 The Contractor must refer to Section G5.2 regarding documentation requirements for tests, trials and inspection records.

G 6.2 **MECHANICAL SYSTEMS AND PIPING**

G 6.2.1 All subassemblies and piping systems manufactured by the Contractor must be hydrostatically tested to 1.5 times the operating pressure of the system and must demonstrate water-tightness to the satisfaction of the IA prior to installation on board the vessel.

G 6.2.2 Machines and equipment must not be exposed to pressures higher than the maximum allowable operating pressure during pressure testing of the system. Component valves may be closed or fittings plugged to protect components from excessive pressure. If the piping between a tank isolation valve and the open end of the column has flanged joints, or if the tank isolation valve has not been installed, the flanged joint near the open end of the column must be temporarily plugged so that a pressure test of the system can be conducted to that point. Instruments, pressure switches, and other components that could be damaged by excessive pressure during system testing must be removed or otherwise protected during testing.

G 6.2.3 For testing, calibrated pressure gauges must be installed at the fittings provided in the gauge piping for this purpose. During testing, the readings of the installed gauges must be verified with the calibrated test gauges. Installed gauges must be adjusted as necessary to accurately record pressure. The Contractor must provide calibration certificates for any instruments used during system testing to the IA and the TA.

G 6.2.4 If the duration of a pressure test is not specified, the test pressure must be maintained long enough to permit thorough examination of the system for leaks to the satisfaction of the IA.

G 6.2.5 Relief and safety valves, and any other components installed to limit operating pressure, must be removed, plugged, or bypassed as necessary to achieve the required test pressure. Upon successful completion of system testing, all removed components must be reinstalled and pressure tested to ensure their operation when subjected to

- approved set pressures. The set pressures indicated on the valve nameplates must be consistent with the approved set pressures.
- G 6.2.6** All components necessary for the safe operation of the system must be examined and adjusted during functional testing to comply with the specified and approved requirements for the system. The functional tests must demonstrate that the piping design and installation adequately meet the service requirements.
- G 6.2.7** Components, such as spring hangers, must be adjusted as necessary, and the operation of flexible coupling slip joints, expansion joints, and sound isolation fittings must be examined while the system in which they are installed is in operation.
- G 6.2.8** Where pumps or ejectors have a suction line connected to tanks or compartments, the functional test must demonstrate the ability of the system to remove operating liquid to the level of the open end of the suction column.
- G 6.2.9** Open systems such as drains, overflows, and deck drains must be tested to verify that there are no flow restrictions. This test must be performed using compressed air or water flow not exceeding 100 psi. Hand pump systems, portable drainage systems, and other miscellaneous systems must be functionally tested as well as the specified pressure test. Pressure tests must precede the functional tests.
- G 6.2.10** All systems must be visually inspected and found to be leakproof during the specified tests.
- G 6.2.11** All pressure and operational testing must be completed prior to system testing.
- G 6.2.12** If tanks have been opened for work, all tanks must be emptied, cleaned and inspected by the IA prior to closure. Failure to notify the IA does not relieve the Contractor of the responsibility to give the IA an opportunity to inspect any work performed. The inspection of any tank or space by the IA is not a substitute for the required inspections by the ABS inspector. Upon completion of the inspection, all tank covers must be re-sealed with new gaskets prior to resealing.
- G 6.2.13** Where work has been done to a structural part of a tank, the tank must be subjected to a hydrostatic pressure test at a water head of 2.5 m. The IA and ABS inspector must be present at the pressure test. Hydrostatic pressure tests must be recorded.
- G 6.3** **VESSEL PERFORMANCE TESTS AT SEA**
- G 6.3.1** In addition to the dockside and commissioning tests for each of the ship systems specified in these specifications, the Contractor must conduct a comprehensive sea

trial program in accordance with the "Guide for Sea Trials" published by the Society of Naval Architects and Marine Engineers (Section G1.3).

- G 6.3.2** The Contractor must develop any procedures and data sheets for the sea trials. Sea trial procedures and data sheets must be submitted to the IA and TA for review and approval twenty (20) days prior to the start of sea trials.

G 7.0 LIST OF DETACHED REPRESENTATIVES

The Contractor must ensure that the Detached Representatives are present on site to supervise their respective work. The Contractor must provide a schedule of the seconded representatives.

G 7.1 WARTSILA

- G 7.1.1** The Contractor must use the services of a **WARTSILA Canada Inc.** authorized representative to ensure that the work is performed in accordance with the applicable manufacturer's specifications, drawings and instructions and these specifications for the following sections:

- section 12.2 Maintenance of shaft seals
- section 12.3 Bow thruster maintenance
- Section 12.4 Propulsion Generator Replacement
- Section 21.1 Tests and trials

- G 7.1.2** Wärtsilä Canada's authorized seconded representatives can be reached by contacting the company:

Wartsila Canada Inc.
1771 Savage Road
Richmond, British Columbia V6V 1R1
Tel: (604) 244-8181
Fax: (604) 244-1181

G 7.2 ABB CANADA

- G 7.2.1** Given the scope of the Martha L. Black repowering work, it is necessary to validate the calibration of the new ABB cyclo-converter, installed in 2019 to ensure the performance of the propulsion system.
- G 7.2.2** The Contractor must use the services of an **ABB Canada** approved representative to ensure that the work is performed in accordance with the applicable manufacturer's

specifications, drawings and instructions and these specifications for the following sections

- Section 12.4 Propulsion Generator Replacement.
- Section 12.5 Cyclo-converter integration and calibration Annual maintenance of the cyclo-converter and installation of new AVR's.
- Section 12.6 Pre-magnetization Transformer Installation.
- Section 21.1 Tests and trials

G 7.2.3 ABB Canada representatives can be reached by contacting the company at:

**ABB Canada,
8585 Trans-Canada Highway,
Saint-Laurent, Quebec H4S 1Z6,
Tel: 1 514 789 7400
Fax: 1 514 856 6586**

G 7.3 MADSEN CONTROLS AND ENGINEERING

G 7.3.1 The Contractor must utilize the services of a **Madsen Controls and Engineering** approved representative to ensure that the work is performed in accordance with the applicable manufacturer's specifications, drawings and instructions and these specifications for the following section:

- Section 12.4 Propulsion Generator Replacement.
- Section 19.2 Integration of the propulsion generators to the Easygen system.
- Section 21- Tests and trials

G 7.3.2 Contractor must obtain the services of a Madsen FSR representative for the performance and integration of the new Wartsila engines with the EASYGEN power management system installed in 2018.

G 7.3.3 Madsen Controls and Engineering's authorized seconded representatives can be reached by contacting the company at the following coordinates:

**Madsen Controls and Engineering
141 Glencoe Drive
Mount Pearl, Newfoundland and Labrador
A1N 4S7
Tel: (709) 726-6774**

G 7.4 **TECHSOL MARINE**

G 7.4.1 The Contractor must use the services of a **Techsol Marine** approved representative to ensure that the work is in accordance with the applicable manufacturer's specifications, drawings and instructions and these specifications for the following sections

- Section 12.4 Propulsion Generator Replacement.
- Section 21 Tests and trials

G 7.4.2 The Contractor must obtain the services of a Techsol FSR representative to make the modification to the engine room monitoring system to accommodate the new Wartsila engines.

G 7.4.3 Techsol Marine's authorized seconded representatives can be reached by contacting the company at the following coordinates:

Techsol Marine Inc.
4800 Rideau Street
Quebec, Quebec
G1P 4P4
Tel: (877) 688-2230
Fax: (418) 688-2233

G 7.5 **DAF INDALL / CURTISS WRIGHT**

G 7.5.1 The Contractor must utilize the services of a **Daf Indall / Curtiss Wright** approved representative to ensure that the work is performed in accordance with the applicable manufacturer's specifications, drawings, instructions and these specifications for the following sections

- Section 11.6 -Steel work - Helicopter Hangar.
- Section 17-5 Helicopter Hangar – Maintenance.

G 7.5.2 The Contractor must obtain the services of a **Daf Indall / Curtiss Wright** representative to verify the steel preparation, and installation of the new hangar rails and scheduled maintenance on the hangar.

G 7.5.3 Daf Indall / Curtiss Wright's authorized seconded representatives can be contacted by contacting the company at the following coordinates:

Canadian Maritime Engineering Ltd,
90 Thornhill Dr, Dartmouth,
NS, B3B 1S3 (902) 468-1888

G 7.6 **TOROMONT- CARTERPILLAR**

G 7.6.1 Section 13.1 Five Yearly Maintenance of the Auxiliary Generator

The Contractor must utilize the services of a **Caterpillar** approved Detached Representative to ensure that the work is performed in accordance with the specifications, applicable manufacturer's instructions, and these specifications.

G 7.6.2 Toromont Cat representatives can be reached by contacting the company at

Toromont Cat
5001 Trans-Canada Highway,
Pointe-Claire, Quebec H9R 1B8
Office: 514-426-3000
www.toromontcat.com

G 7.7 **PALFINGER**

G 7.7.1 Section 10.2; Five-Yearly Maintenance of the Lifeboat Davit:

The Contractor must use the services of a **Palfinger Marine Canada** approved seconded representative to ensure that the work is performed in accordance with the applicable manufacturer's specifications, drawings and instructions and these specifications.

G 7.7.2 Palfinger representatives can be reached by contacting the company at the following coordinates:

PALFINGER MARINE CANADA INC
120-20575 Langley By Pass,
Langley BC V3A 5E8 CANADA
Office +1 604 530 0814
www.palfingermarine.com

G 7.8 **ICS (TBD)**

G 7.8.1 Section 18.1 ICS- replacement:

The Contractor must use the services of a representative authorized by **the manufacturer of the system supplied** to ensure that the work is performed in accordance with the manufacturer's applicable specifications, drawings and instructions and these specifications.

G 7.9 **GYROCOMPASS**

G 7.9.1 Section 18.2 Gyrocompass:

The Contractor must use the services of a representative authorized by **the manufacturer of the system supplied** to ensure that the work is performed in accordance with the manufacturer's applicable specifications, drawings and instructions and these specifications.

G 7.10 **DANELEC**

G 7.10.1 Section 18.5 SVDR:

The Contractor must utilize the services of a **Danelec and ABS** approved representative to ensure that the work is performed in accordance with the applicable manufacturer's specifications, drawings and instructions and these specifications.

G 7.11 **NAUTEL CANADA**

G 7.11.1 Section 18.8 NDB replacement:

The Contractor must use the services of a **Nautel Canada** approved representative to ensure that the work is performed in accordance with the applicable manufacturer's specifications, drawings and instructions and these specifications.

G 8.0 **ADDITIONAL WORK**

G 8.1 **GENERAL**

G 8.1.1 All additional work on this drydock specification resulting from the inspection must be negotiated by the PSPC representative on the PSPC 1379 process, using a written description.

G 8.1.2 The written description of this work will be provided by the IA to enable PSPC to obtain a firm price quote prior to the commencement of the work involved.

G 8.1.3 Additional work must be inspected and performed to the full satisfaction of the IA and the ABS inspector, if required.

G 8.1.4 The Contractor's Quality Control Officer must update their or her inspection plan and agree with the IA on the inspection items to be performed prior to, during, and at the close of each additional work package.

G 8.1.5 Final inspection by the IA is essential for acceptance of the work. The Contractor must take all necessary steps to allow the IA the opportunity to inspect the additional work.

- G 8.1.6** Inspection of an item by the IA does not relieve the Contractor from having the required inspections performed by the ABS inspector.
- G 8.1.7** Canada reserves the right to cancel any or all of the items in this specification in the event that, in the opinion of the ABS Inspector, an inspection is no longer required due to the good condition of the items.

S 1.0 SERVICES

S 1.1 DOCKING AND MOORING

- S 1.1.1 The Contractor is responsible for necessary for the maneuvering, drydocking, outfitting and re-floating of the vessel subject to the specifications in Section S.1 of these specifications. Details of berthing and mooring facilities must be included in the bidder's proposal. The Contractor understands that the vessel *Martha L. Black* will be ready to enter dry dock upon arrival at the Contractor's facility; the crew will depart the vessel shortly after arrival.
- S 1.1.2 The Contractor must be responsible for the berthing and mooring of the vessel for the duration of the Contract. Canada must have free access to the vessel at all times.
- S 1.1.3 The vessel must be located on the Contractor's premises for the duration of the contract, either in drydock or at the dock. Only one drydocking is provided for in the contract, and no additional time or money is allowed for successive drydockings or/and re-floatings. The Contractor will be responsible for the costs and delays inherent to this situation.
- S 1.1.4 The water must be deep enough to prevent the vessel from touching the seabed during low tide or low water conditions. The Contractor must ensure that there is sufficient water under the keel to permit testing of the propulsion system during dockside trials.
- S 1.1.5 The Contractor must provide all equipment, mooring lines and labour required for docking, mooring, dockside testing and re-floating of the vessel. The Contractor may use the vessel's lines for mooring upon arrival, but must replace them immediately. Vessel lines must be stored. The Contractor must provide all equipment and labour necessary for the drydocking and re-floating of the vessel, including any vessel movement, tug services, and mooring personnel.
- S 1.1.6 The Contractor must prevent the entrance of vermin (e.g. rats) on the vessel during the contract period. The Contractor must remove any vermin found on board the vessel if they enter the vessel during the term of the contract.
- S 1.1.7 Services must be connected upon arrival at the Contractor's facilities and must be maintained for the duration of the refit. Costs associated with services must include any connection, disconnection, consumption, and any interim arrangements.

- S 1.1.8 The vessel must have two separate and independent accesses at all times. The Contractor must provide and install gangways with safety nets that comply with the Canada Labour Code while the vessel is docked at the Contractor's facility. The Contractor is responsible for the safety of the gangways.
- S 1.1.9 The bidder must submit a written estimate of the price of consumption per cubic meter of potable water, non-potable water and seawater.
- S 1.1.10 The Contractor must furnish and install a calibrated flow meter for each domestic water supply line connected to the vessel for the duration of the work period. The flow meters must be of appropriate size for the services involved. Flow meter calibration records must be submitted to the IA. All flow meters must be read by the IA at the beginning and end of the contract period, and before and after any movement of the vessel to (or from) the ship's wall or dry dock, in the presence of the IA.

S 1.2 Services

a) Office and progress meetings

- S 1.2.1 The Contractor must provide an adequate meeting room to conduct progress meetings. Meetings must be held monthly, or more often, as directed by the CA.

b) Facilities for government personnel

- S 1.2.2 The Contractor must provide a minimum of 50 square meters of office space for Canadian Coast Guard personnel meeting the following requirements:
- two (2) lockable offices of at least 20 m² each;
 - one (1) furnished conference room with seating for ten (10) people (must contain a large conference room table and seating for ten people); The conference room must also be equipped with a 4' x 6' whiteboard, hung on a wall;
 - three (3) full-size desks on double racks equipped with drawers; the drawers of the desks must be lockable and one (1) of the desks must be an "L" shaped secretary desk with side tables;
 - one (1) desk-sized table;
 - Ten (10) chairs, six (6) of which must be fully adjustable and equipped with a swivel base and casters (in addition to the conference room furniture);
 - two (2) bookcases of 4 feet wide by 6 feet high;

- three (3) filing cabinets, each with four (4) drawers. All cabinets must be lockable;
- four (4) keys must be provided for each door, desk and lockable cabinet;
- three (3) direct dial telephones, one (1) of which must be in the conference room;
- three (3) high-speed Internet connections;
- one (1) desktop copier capable of handling 8.5" x 11", 8.5" x 14", and 11" x 17" sheets of paper. The copier must be equipped with an automatic sheet feeder and be capable of being serviced within two (2) hours in the event of a failure.

S 1.2.3 Offices must be equipped with heating, ventilation and air conditioning with lighting in accordance with provincial health and occupancy regulations.

S 1.2.4 Sanitary facilities must be located on site.

S 1.2.5 Six parking spaces must be provided for public authority personnel within the shipyard boundaries. The spaces must be clearly marked and the required passes must be provided to public authority personnel.

All of the above equipment and facilities must be in good condition to the satisfaction of Canada.

c) Storage space

S 1.2.6 The Contractor must provide 300 square meters of secure, environmentally controlled storage space for the vessel's equipment. The storage space environment must remain at 15 degrees Celsius and a maximum relative humidity of 70 percent for the duration of the contract.

S 1.2.7 The storage area must also be equipped with 500 square meters of conventional storage shelving, two (2) meters high, consisting of five (5) shelves equally spaced over 300 square meters, and three (3) shelves equally spaced over 200 square meters.

S 1.2.8 Contractor must provide 150 new pallets for storage of items.

S 1.2.9 All items must be stored in a manner that is easily accessible for inspection. No items must be stored directly on the floor.

S 1.2.10 The storage area must contain one (1) desk and two (2) chairs.

S 1.2.11 Storage space must be within the Contractor's facility.

- S 1.2.12 The Contractor must provide one (1) three (3) ton capacity truck and driver on hand for three days to empty the living quarters of the vessel.
- S 1.2.13 The Contractor must provide one (1) forklift and one (1) driver for three days to empty the vessel.
- S 1.2.14 The Contractor must provide one (1) three (3) ton capacity truck and driver for three days to refill the vessel.
- S 1.2.15 The Contractor must provide one (1) forklift and one (1) driver for three days to refill the vessel.

d) Storage - Diesel Fuel

- S 1.2.16 The Contractor must provide storage for the fuel remaining on board during the contract period. For the purpose of these specifications, the Contractor must provide a price for the storage of 100 cubic meters of diesel fuel. If the quantity of fuel is not 100 cubic meters, the storage price must be adjusted up or down on a pro-rata basis using PSPC 1379 process. The Contractor must provide material and labour for the handling and transfer of the Diesel fuel.

e) Storage - Lubricating oils

- S 1.2.17 The Contractor must provide storage for the remaining lubricating oils on board for the duration of the contract. The total quantity to be stored will be approximately 7 cubic meters. Note that there are two types of lubricating oil. For the purpose of these specifications, the Contractor must quote a price for the storage of 1 cubic meter of lubricating oil. Depending on the quantity, the storage price must be adjusted up or down, on a pro-rata basis, using PSPC 1379 form. The Contractor must provide material and labour for the handling and transfer of its lubricating oils.

f) Water supply

- S 1.2.18 A water supply set at a pressure of 670 kPa must be connected to the ship's fire hydrant. The water supply must be connected immediately after the vessel is docked. There must be no interruption of this supply until the vessel is delivered or accepted. Water consumption will be as needed for firefighting and cleaning purposes.
- S 1.2.19 A non-potable water supply set at a pressure of 380 kPa must be connected to the vessel's central cooling system. The water supply must be connected immediately after the vessel is docked. There must be no interruption of this

supply after connection, except during replacement of the chillers and their piping. The vessel will consume approximately 10,000 liters of water per day when the crew is on board. The Contractor must provide an estimate of this service based on a 250 day supply. The final quantity will be adjusted using a PSPC 1379 process.

- S 1.2.20 A potable water supply set to a pressure of 380 kPa must be connected to the vessel's potable water supply system. The water supply must be connected immediately after the vessel has docked. There must be no interruption of this supply after it is connected. The vessel will consume approximately 6,000 liters of potable water while the crew is on board. The Contractor must provide an estimate of this service based on a 250 day supply. The final quantity will be adjusted using a PSPC1379 process.
- S 1.2.21 For any water line connected to and supplying the vessel, it is the responsibility of the Contractor to take all necessary precautions to ensure that the lines do not freeze in cold weather. Particular attention must be paid to the fire main supply line.

g) Additional heating

- S 1.2.22 In cold weather, a supply of steam from an external source or additional electric space heaters must be provided and installed by the Contractor. The minimum acceptable temperature inside the ship must be 18°C in all the compartments.

h) Waste

- S 1.2.23 A waste bin must be provided and must be located near the bridge of the vessel. Waste from this bin will be collected every other day when the full crew is on board the vessel and once a week when the vessel has reduced crew aboard.

i) Protective covering

- S 1.2.24 The Contractor must supply, install, and remove 250 m² of 3mm Masonite floor and wall protective covering. This overlay must be installed in all access aisles of the vessel on the main deck, boat deck and bridge deck, as well as in the control room, engine room, lounge and galley on the main deck. All flange joints must be sealed with tape to prevent the ingress of dirt. The Contractor must complete the installation of this protective covering within 48 hours of the vessel's arrival at their facility. The Contractor must remove the protective

floor covering no earlier than 24 hours prior to the vessel's departure from their facility.

j) Crane

S 1.2.25 The Contractor must provide the services of a crane with a 20 ton capacity, as well as the personnel to operate it to load and unload the vessel's equipment. The Contractor must quote an hourly rate for the use of the crane. This price must include all costs.

k) Electricity

S 1.2.26 The Contractor must provide an estimate of the cost per kWh of a 600 volt AC, 60 Hz, 3-phase power supply. The estimate must be based on an average current of 150 amps unmanned and 300 amps when the crew is on board the vessel.

S 1.2.27 The electrical supply must be 600 volts AC, 300 amps, 60 Hz, 4 wire, 3 phase. The power supply must be connected after the vessel is docked and must remain connected for the duration of the contract. Electrical power must be supplied through an independent kilowatt-hour meter maintained by the Contractor. The Contractor must read the kilowatt-hour meter in the presence of the IA prior to the connection and disconnection of the power supply to verify the power consumption. The meter must be read before and after any movement of the vessel to (or from) the ship's side or dry dock in the presence of the IA.

l) Moving mooring blocks

S 1.2.28 The Contractor must include in their bid the movement of 5 keel blocks and 5 chock blocks. The Contractor must also provide in their bid a unit price per additional keel block movement and a separate unit price per chock block to be moved. The final quantity must be adjusted pro rata using a form PSPC 1379.process.

m) Draining the black water tank

S 1.2.29 The Contractor must provide a vacuum truck to perform a complete drain of the vessel's black water tank. The Contractor's bid must be for the removal of 10 m³ of black water from the system. The final amount will be adjusted using a PSPC 1379 process. The Contractor must provide a certificate of disposal issued by their sub-Contractor to the TA to confirm the amount removed.

n) Residual liquid

S 1.2.30 The Contractor must ^{give} a unit price per cubic meter for the disposal of each of the following items

- Oily water (estimated quantity 10 m³).
- Used oil (estimated quantity 5 m³).
- Treated water from the central cooling system (estimated quantity 7 m³).

Final quantities will be adjusted using a PSPC1379 process and supporting documentation.

o) Update of the Electrical Load analysis

As a result of the propulsion alternator replacement work, the Contractor must update the following studies:

S 1.2.31 Load analysis

The Contractor must update the load analysis for vessel B0312-DELA-PW_R00. The final version of the load analysis must be "as-built" and must be approved by ABS. Any changes to the one-line diagram must be reflected in the load analysis and vice versa.

S 1.2.32 Single line electrical diagram

The Contractor must update the One Line Electrical Schematic, an electronic version of which must be submitted to the IA and the TA upon each technical change that significantly affects the electrical system. The final "as-built" one-line electrical diagram must be approved by the ABS inspector.

S 1.2.33 Coordination study of distribution networks, short circuit and arc flash study

The Contractor must update the distribution system coordination, short circuit and arc flash studies B0312-SCC_AFL-EN_R00. Final calculations of the "as-built" short circuit current analysis must be approved by ABS. The Contractor must provide documentation of the "as-built" short circuit current analysis to the TA.

p) Optional- Services

S 1.2.34 Assistant Electrician

The Contractor must provide an hourly rate to provide a certified electrical assistant to the vessel. The Assistant Electrician may be required to perform various maintenance work throughout the vessel. They will report directly to the ship's electrician. Estimated time required: 200 hours. The number of hours will be adjusted on a pro-rata basis using a PSPC 1379 process and supporting documentation.

S 1.2.35 Mechanic

The Contractor must provide an hourly rate for providing an engineer to the vessel. The engineer may be required to perform a variety of maintenance work on the entire vessel. The engineer will report directly to the vessel's Chief Engineer. Estimated time required: 200 hours. The number of hours will be adjusted on a pro-rata basis using a PSPC 1379 process and supporting documentation.

S 1.2.36 Painter

The Contractor must provide an hourly rate for providing a painter to the vessel. The painter may be required to perform a variety of painting jobs inside the vessel. The painter will report directly to the Chief Engineer of the vessel. Estimated time required: 200 hours. The number of hours will be adjusted on a pro-rata basis using a PSPC 1379 process and supporting documentation.

S 1.2.37 The Contractor must quote a price for taking four readings on each shaft, using a depth gauge, to take the propeller shaft wear-down reading. This price must include all materials, labour, and equipment required to take these readings.

S 1.3 DRYDOCKING

S 1.3.1 The Contractor must furnish all labour, materials and facilities necessary to drydock the vessel to perform the work required in these specifications.

S 1.3.2 The vessel will be delivered to the shipyard entrance. The Contractor must provide resources for handling the vessel's mooring lines and towing assistance, if required, to conduct the drydocking and refloating of the vessel, and to make any other moves throughout the contract period. The Contractor must be responsible for all associated costs.

- S 1.3.3 Vessel specifications are found in Section G.1.2 of these specifications. The Contractor must provide proof that the berthing facilities are certified for drydocking vessels with these characteristics in its bid documents.
- S 1.3.4 Stability booklets are included in the electronic materials provided to bidders.
- S 1.3.5 The Contractor must prepare the necessary chocks and props to keep the ship's hull and machinery perfectly aligned during mooring.
- S 1.3.6 The Contractor is responsible for recording all tank levels, draught, trim and list information, and must perform the necessary stability calculations to properly secure the vessel. These calculations must be forwarded to the TA and the IA for review 48 hours prior to the vessel being dry-docked.
- S 1.3.7 The vessel must be moored so that docking plugs, transducers, anodes and intake screens are clear and accessible. There must be at least 1.3 meters of clearance under the keel. If any of the hull fittings are covered, the Contractor must provide all labour and equipment necessary to move the docking blocks, at their own expense, to allow access to the areas where the work is to be performed. The Contractor must refer to the docking plan.
- S 1.3.8 The Contractor must furnish and install drain connections to the various bridge scuppers if they interfere with the work in any way.
- S 1.3.9 The Contractor must supply and install a temporary drain for the ship's wastewater pipe. This drain must be maintained in place for the duration of the work. Upon removal, the Contractor must repair the paint damaged by the installation of this drain.
- S 1.3.10 The Contractor must provide a ground cable to connect the vessel to the dock while the vessel is in dry dock in accordance with Transport Canada Marine Safety Bulletin 6/89.
- S 1.3.11 After drydocking, the Contractor must provide material and labour to plug all diesel engine and boiler exhaust outlets, excluding the emergency generator outlet. The Contractor must maintain the plugged outlets for the duration of the work.
- S 1.3.12 As soon as possible, within a few days of drydocking, the Contractor must provide the labour and equipment to take shaft wear-down readings. These readings must be taken in the presence of the IA.

S 1.4 REFLOATING

- S 1.4.1 Before releasing the vessel, the Contractor must ensure that all tanks are filled to the same condition as at the time of drydocking. The Contractor must be responsible for the safe refloating of the vessel, taking into account the changes in stability caused by the work specified in these specifications. The Contractor must perform the necessary stability calculations for the refloating of the vessel. These calculations must be forwarded to the IA and the TA for review 48 hours prior to flooding the dry dock.
- S 1.4.2 Prior to flooding the dry dock, the Contractor must ensure that all openings along the vessel, including valves and drain plugs at berthing, are closed.
- S 1.4.3 The Contractor must furnish and install and remove, upon completion of the work, all fittings and lugs necessary to perform the work specified in these specifications. When the lugs or fittings are installed and removed, the welds must not show any relief from the hull. All work on damaged paint must be done in accordance with the paint manufacturer's requirements, and the paint must be applied in accordance with the vessel's exterior color scheme and markings.
- S 1.4.4 The Contractor must provide all labour necessary to handle the vessel's lines during the refloating process. The Contractor must provide towing services necessary to safely refloat the vessel and avoid damage during the refloating process.
- S 1.5 VESSEL SAFETY**
- S 1.5.1 The Contractor must ensure the safety of the vessel while it is in the care, custody and control of the Contractor. This must include provisions for the prevention of damage to the vessel due to wind, wave action, tide, flood, fire and weather conditions.
- S 1.5.2 The Contractor must provide monitoring of environmental conditions on board the vessel for the duration of the contract period to prevent damage from temperature variations. This monitoring must include freeze protection of any liquid containing piping system, as well as overheat protection of any space in which electronic equipment is susceptible to damage, such as the electronic equipment room, wheelhouse, or engine control room.
- S 1.5.3 In order to meet the above requirements, the Contractor must regularly monitor the mooring lines, and increase the frequency of monitoring activities during adverse weather conditions.

S 1.5.4 The Contractor must provide specialized and competent personnel to perform continuous on-board surveillance of the interior and exterior of the vessel. In addition to the hot work requirements, the Contractor must conduct vessel security rounds, at a minimum of every four hours, outside of normal working hours. These rounds must include a visual inspection of each compartment, and should a problematic situation arise with the vessel, immediate action must be taken. Records of these rounds must be submitted to the IA upon request. The Contractor must provide an estimate for this monitoring service based on a 250 day supply. The final quantity will be adjusted using a PSPC 1379 process and supporting documentation.

S 1.5.5 The Contractor must provide an emergency response system (for fire and flooding etc), including qualified personnel to remedy such situations and prevent possible damage to the vessel.

Damage to the vessel resulting from the Contractor's failure to meet these requirements will be repaired at the Contractor's expense.

10.0 SAFETY AND SECURITY

10.1 FIREFIGHTING SYSTEM

10.1.1 Identification

- 10.1.1.1 The objective of this item is for the Contractor to provide the services of a Marine Fire Inspection Company (FSR), certified by ABS (the RO under DSIP), for the annual inspection, testing and recertification of all fire detection and prevention equipment onboard the vessel.
- 10.1.1.2 The Contractor must submit to Canada the certificate of qualification for the Marine Fire Inspector as well as proof of the company's certification by the RO prior to the start of any work on the fire system.
- 10.1.1.3 The Contractor must provide all necessary materials and equipment.

10.1.2 References

10.1.2.1 Documents

The following drawings are applicable to the vessel and are to be considered as Guidance Drawings:

Drawing/Document Number/ Revision	Drawing Title
108-H-23_25_T- Rev9_ Sept_2011	General arrangement
FD1 to FD3 (12-08-21)	Fire Alarm System- Plan View_Martha Black
51333, Rev B (10-03-2003)	Fire Alarm Control Panel NFS-640-Programming- Manual
IQ-636X-2 (Sept 9-2021)	All Detectors_Martha Black
IQ-636X-2 (Sept 9-2021)	All Modules_Martha Black
010 02 00 (2016-10-27)	Installation des systèmes extinction de CO2 et FM200_Martha Black
Rev 0 (2020-02-14)	M017 VLE2023-Extincteurs portatifs_Rev 0_2020- 02-14_Martha Black
Rev 0 (2019-09-10)	M017 VLE2023- Système d'extinction fixe_Rev 0_2019-09-10_Martha Black

Drawing/Document Number/ Revision	Drawing Title
FP1 to FP6 Rev0 2022-09-18	CO2 Fire Suppression System/Component Replacement

10.1.2.2 Regulations and Standards

10.1.2.2.1 All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

10.1.2.2.2 Any TCMSS approvals, required for the design, material, and work, over and above the required ABS approvals, must be met as and when required.

10.1.2.2.3 The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section. The Contractor must ensure all Work, completed in this section, meet these Standards and Regulations as well as any other applicable Federal/Provincial Regulations and/or Standards not specifically listed here.

Standards & Regulations – Revision / Date	Title / Description
MSC.1-CIRC 1432 (31 May 2012)	Revised Guidelines for the Maintenance and Inspection of Fire Protection Systems and Appliances
TC SSB 04-2019 TP3231F (2019-03-18)	Bulletin 04-2019_Bulletin de la sécurité des navires Hydrostatic testing of pressure containers under the Vessel Fire Safety Regulations (part 1 or part 2 vessels applies)
DFO 5737	CCG Fleet Safety Manual
CSA 2001, SOR/2017-14	Vessel Fire Safety Regulations
NFPA 10	Standard for Portable Fire Extinguishers
NFPA 2001	Standard on Clean Agent Fire Extinguishing Systems
NFPA 72	National Fire Alarm and Signaling Code
NFPA 12	Standard on Carbon Dioxide Extinguishing Systems

10.1.3 Technical Description

10.1.3.1 General

- 10.1.3.1.1 The Contractor must provide the services of a licensed Marine Fire Inspection Company certified by ABS under DSIP for the inspection and certification of fire detection and fire prevention equipment onboard the vessel.
- 10.1.3.1.2 The Contractor must give notice to CCG, at least 24 hours in advance, prior to working on the fire suppression system.
- 10.1.3.1.3 The Contractor must give at least a 24-hour notice to the Chief Engineer prior to disengaging any system's operation for maintenance or inspection. All cylinders shall be disconnected prior to testing
- 10.1.3.1.4 Components and parts must not be replaced without prior approval from the technical authority.
- 10.1.3.1.5 The contractor must arrange for all inspections and approval of the fire fighting and fire detection systems by ABS and concerned authorities. The work must meet the requirements of the ABS inspector.
- 10.1.3.1.6 The final inspection of the work must be made by the contractor's personnel and the FSR in the presence of the designated vessel representative. All signed and dated official documents must be delivered to the CCG Technical Authority.
- 10.1.3.1.7 All certificates and maintenance reports, issued by the contractor for this work, must include the serial number and location of each component serviced on the vessel.
- 10.1.3.1.8 The work must be completed in such manner as to ensure adequate protection of the ship in case of an emergency.
- 10.1.3.1.9 All systems must be left in operating condition overnight.
- 10.1.3.1.10 Upon completion of the Work, the Contractor must return all spaces affected by the Work to their original functional state and cleanliness.

10.1.3.2 FM-200 System

- 10.1.3.2.1 The Contractor must have all Chemetron FM-200 fixed fire suppression systems thoroughly examined by a qualified service provider certified by Chemetron, Their qualification and certification documentation must be submitted to CCG for verification. These Systems must be inspected in accordance with ABS standards and Chemetron FM-200 manufacturer's

service manuals; and inspection certificates must be issued upon completion. The technical authority must witness the inspection and testing of all equipment.

- 10.1.3.2.2 Refer to the document “M017 VLE2023- Système d'extinction fixe_Rev 0_2019-09-10_Martha Black”.
- 10.1.3.2.3 The Contractor must inspect and test all:
- electrical or manual activation cables
 - sirens, horns and bells
 - pressure switches used to activate the fire alarm
 - pressure switches used for emergency shutdown
 - time-delay valve functions
- 10.1.3.2.4 The Contractor must inspect all gas piping, and apply air injection and pressure testing to ensure there are no obstructions.
- 10.1.3.2.5 The Contractor must weigh all gas cylinders to determine and record their net weights.
- 10.1.3.2.6 The Contractor must visually inspect all FM-200 fire extinguisher tanks at the deck level for excessive corrosion or possible rust buildup on the outside of the tanks. The Technical Authority shall be notified immediately when problems are found.
- 10.1.3.2.7 The Contractor must properly reassemble the system in the correct order. All fire extinguishers must be securely fastened in their respective holders.
- 10.1.3.2.8 The Contractor must submit all inspection certificates to the ABS inspector, and submit three (3) copies to the Chief Engineer.
- 10.1.3.3 Amerex (375) WET CHEMICAL Galley System - NFPA-17A
- 10.1.3.3.1 The contractor must perform the 6 months maintenance and inspection of the kitchen chemical system.
- 10.1.3.3.2 The Contractor must test the piping and nozzles for blockages. The contractor must ensure that there are no foreign objects in the piping that could prevent the proper operation of these systems. The Contractor must ensure that the pipe mounting brackets are properly secured in place.
- 10.1.3.3.3 The contractor must inspect the cylinder, cylinder valve and control head assembly. Cylinders must be free of corrosion and deterioration. The cylinder charge must be determined, recorded, and adjusted to the correct level. The contractor must verify the proper operation and adjustment of the control head.

- 10.1.3.3.4 The contractor must clean all fittings, wiring and pulleys; and change all fuse elements in the cockpit opening wiring.
- 10.1.3.3.5 The contractor must verify the proper operation of the fire curtains in the crew dining room and the dumbwaiter.
- 10.1.3.3.6 The contractor must take and send a sample of the chemical in use to a laboratory for examination to ensure that it is functioning properly. A copy of the laboratory test results must be provided to the Coast Guard.
- 10.1.3.3.7 Once the above system maintenance is completed, the Contractor must have all components properly reconnected.
- 10.1.3.4 Replacement of fixed CO2 System
- 10.1.3.4.1 The Contractor must replace the following fixed CO2 fire suppression systems:
- Forward cargo hold
 - Diesel generator room
 - Forward winch room (forecastle)
 - Propulsion Motor #1 (Port)
 - Propulsion Motor #2 (Stbd)
 - Aviation fuel cofferdam
 - Emergency generator room
 - Paint locker
 - Bow thruster compartment
 - Propulsion generator #1
 - Propulsion generator #2
 - Propulsion generator #3
- 10.1.3.4.2 The contractor must refer to the replacement plan entitled "CO2 Fire System/ Component Replacement".
- 10.1.3.4.3 The Contractor must provide material and labour to disassemble and remove the current systems from the vessel.
- 10.1.3.4.4 The contractor must ensure during disassembly that no damage is done to the parts of the system that are to be retained.
- 10.1.3.4.5 The contractor must refer to the replacement plan entitled "CO2 Fire System/Component Replacement" to identify which components or parts of the current system are to be reused.

- 10.1.3.4.6 The contractor must supply, install and have certified new complete replacement system identical to that in Troy replacement plan "CO2 Fire System/Component Replacement"
- 10.1.3.4.7 The contractor must completely remove the existing choking system, including the cylinders and all associated components, and dispose them according to the applicable regulations.
- 10.1.3.4.8 The Contractor must supply, install and certify a complete new replacement system identical to that in Troy life's proposal 'Martha Black CO2 replacement'.
- 10.1.3.4.9 At the end of the installation, the Contractor must:
- redesign the cylinders' base to accommodate the new cylinders; and
 - modify the cylinder securing system similar to what was in place prior to the dismantling, so that the cylinders would be properly secured.
- 10.1.3.4.10 The Contractor must clean the piping by blowing compressed air or nitrogen to ensure that it is not obstructed and that time delay valves and sirens are functioning properly. The proper operation of pressure-actuated switches must be demonstrated.
- 10.1.3.4.11 The contractor must confirm the proper operation of all local and remote manual controls.
- 10.1.3.4.12 Once the CO2 testing is completed, the Contractor must have all components properly reconnected and functional.
- 10.1.3.4.13 The Contractor must submit copies of all inspection/test certificates to the ABS inspector, and the Technical Authority.
- 10.1.3.5 Portable Extinguisher
- 10.1.3.5.1 The Contractor must perform the annual inspection of all portable fire extinguishers on board the vessel as per the list M017 VLE2023-Extincteurs portatifs_Rev 0_2020-02-14_Martha Black provided in the reference.
- 10.1.3.5.2 If for any reason fire extinguishers must be taken ashore, the Chief Engineer must be notified.
- 10.1.3.5.3 Each fire extinguisher will be removed from its wall mount and inspected for any discrepancies. Pressure gauges and the date of the last hydrostatic test will be checked.

- 10.1.3.5.4 All powder extinguishers with cartridges must have the cartridges checked and weighed.
- 10.1.3.5.5 Labels bearing the Contractor's name, date and initials of the person performing the inspection must accompany each extinguisher.
- 10.1.3.5.6 The Contractor must repair, recharge any fire extinguisher found to be defective below its normal load and hydrostatically test as required. The contractor will be responsible for removing the extinguishers, refilling them and replacing them in their respective locations.
- For bidding purposes, the bid must include a unit price for the following types of portable extinguishers:
- ABC: 2.5, 5, 10, 15 and 20 lbs;
 - CO²: 5, 10 and 15 lbs;
 - BC :20lbs.;
 - AFF 9.5 liters;
- 10.1.3.5.7 The Contractor must perform all hydrostatic testing and 6 year maintenance on portable fire extinguishing cylinders that are due to expire within the next 12 months, see list in the attached document entitled M017 VLE2023-Extincteurs portatifs_Rev 0_2020-02-14_Martha Black.
- 10.1.3.5.8 The Contractor must provide a replacement price for the listed fire extinguishers.
- For bidding purposes, the bid must include a unit price for the following types of portable fire extinguishers:
- ABC: 2.5, 5, 10, 15 and 20 lbs. of equivalent type to existing;
 - CO² : 5, 10 Lbs. of type equivalent to those existing;
 - BC : 20 lbs.of type equivalent to those existing;
 - AFF 9.5 liters of type equivalent to those existing;
- 10.1.3.5.9 It is agreed that the fire equipment will be accessible and available in case of emergency. Adequate protection will be taken when hot work is required to complete the inspection.
- 10.1.3.6 Double-agent FireCombat and Minute Man II for the Helicopter Hangar
- 10.1.3.6.1 The FireCombat twin chassis mounted agent unit includes a 100 liter AFFF foam tank and a 500 pound Purple K dry chemical tank. Each tank is equipped with a nitrogen cylinder. The Minute Man is a fixed 3% AFFF foam system.

- 10.1.3.6.2 The Contractor must ensure that the nitrogen tanks are at the proper level. Any nitrogen leaks must be repaired. Repairs and recharging, if required, must be dealt with by means of PSPC 1379 process.
- 10.1.3.6.3 The Contractor must take the following 3 samples of AFFF and send them to a laboratory for analysis to determine if they meet the recommended standards:
- FireCombat (note that this is already a pre-mix with water)
 - Minute man II
 - Pail (spare)
- 10.1.3.6.4 The contractor must inspect the contents of the Purple K chemical powder tank; and thoroughly mix the contents of the tank to prevent clumping of the agent.
- 10.1.3.7 Fixed Foam Fire Extinguishing System - Monitors and Reels
- 10.1.3.7.1 The system is of SECURILEX balanced pressure proportioner, model 1015-118, with 3% AFF 500 foam type, and is located in room # 316.
- 10.1.3.7.2 The Contractor must perform annual inspection and maintenance of the vessel's fixed firefighting system in accordance with the manufacturer's recommendations.
- 10.1.3.7.3 All repairs and recharging, if required, must be dealt with by means of PSPC 1379 process.
- 10.1.3.7.4 The contractor must ensure that lockout/tagout permits are properly placed and notify the Technical Authority prior to the start of the Work.
- 10.1.3.7.5 The Contractor must carefully disassemble and inspect the pressure balancing valve. The internal parts of the breather must be cleaned of any foam concentrate deposits. After inspection, the valve must be reinstalled in good working order.
- 10.1.3.7.6 The Contractor must check the level and content of the foam concentrate tank.
- 10.1.3.7.7 The Contractor must take and send a sample of the concentrate, from the foam tank, to a laboratory to be tested. The results must be submitted to the Chief Engineer.
- 10.1.3.7.8 The Contractor must check the condition of hoses, nozzles, valves, gauges, pipes, hoses and reels, monitors and pumps. If there are any defects, the cost of their replacement will be dealt with by means of PSPC 1379 process.

- 10.1.3.7.9 Upon completion of the related Work, the contractor must restore the system to operating condition.
- 10.1.3.7.10 The Contractor must submit the system inspection certificates and maintenance reports to CCG.
- 10.1.3.8 Notifier Fire Detection System NFS-640
- 10.1.3.8.1 The Contractor must have a qualified and authorized service provider to perform maintenance and inspection of the Notifier fire detection system. Their qualification and authorization documentation must be submitted to CCG for verification.
- 10.1.3.8.2 The Contractor must test each fire detection system's device to ensure that it is audible, and is visually displayed on the main Control Panel in the Bridge and in the Machinery Control Room.
- 10.1.3.8.3 The Contractor must test all detection devices for heat and smoke, as well as manual release devices.
- 10.1.3.8.4 The Contractor must submit proof of inspection and maintenance report for all devices to demonstrate proper operation and/or corrective action.
- 10.1.3.8.5 The Contractor must remedy all deficiencies and repair or replace faulty components. Their cost must be dealt with by means of PSPC 1379 process.

10.1.4 Proof of Performance

10.1.4.1 Inspection

The Contractor must submit proof of inspection and testing for all systems listed 10.1.C.

10.1.4.2 Certification

- 10.1.4.2.1 The Contractor must provide annual inspection certificates for all firefighting systems.
- 10.1.4.2.2 The Contractor must submit certification reports for all systems in this specification. Dates on the certificates must be set for November 2023 at the earliest.
- 10.1.4.2.3 The Contractor must submit the following certificates and proofs, at the minimum:
- Certificate of qualification for the Marine Fire Inspector as well as proof of the company's certification by the RO – para 10.1.A.3

- Certificate of qualification and authorization for the FSR working on the Chemetron FM-200 fixed fire suppression systems – 10.1.C.2.1
- Inspection certificates for FM-200 System – para 10.1.C.2.1
- Inspection certificates for CO2 and other Inert Gas Fire Suppression Systems – para 10.1.C.5.10
- Inspection certificates for the Fixed Foam Fire Extinguishing System – para 10.1.C.7.10
- Certificate of qualification and authorization for the FSR working on the Notifier Fire Detection System NFS-640 – 10.1.C.8.1

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

10.1.4.3 Reports

10.1.4.3.1 The Contractor must provide the Coast Guard with chemical and foam analysis reports obtained from laboratories.

10.1.4.3.2 The Contractor must provide maintenance reports of all inspections and work performed.

10.2 LIFEBOAT DAVIT AND ITS HOOKS – 5-YEAR INSPECTION

10.2.1 Identification

- 10.2.1.1 The purpose of this item is for the Contractor to perform the five-year inspection and maintenance of the lifeboat davit and hook as recommended by the manufacturer, and obtain ABS certification.
- 10.2.1.2 The contractor must provide the services of a fully trained Field Service Representative (FSR) certified by the davit manufacturer, PALFINGER, to perform the work described in this Work Specification. The Contractor must provide all equipment, hardware, personnel and transportation required to carry out the scope of work under the direction and guidance of the FSR.
- 10.2.1.3 The Contractor must verify current and valid certification of the FSR from PALFINGER, and submit a copy to CCG before start of any related work.
- 10.2.1.4 The Contractor must supply all materials, labour, equipment, and parts required to perform the specified work unless otherwise stated.
- 10.2.1.5 For bidding purposes, the bid must include an allowance of \$25,000 to cover the cost of services to be provided by the PALFINGER accredited FSR. The \$25,000 allowance must form part of the overall bid and must be adjusted, up or down, by PSPC 1379 process upon receipt of the final invoice from the FSR supported by copies of all related documentation to verify actual expenses.
- Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses.
- 10.2.1.6 The bid must also include the price for a total of 100 hours of work, by the shipyard personnel, to assist this FSR. This price must be adjusted up or down by PSPC 1379 process based on the actual hours spent assisting the FSR. The contractor must submit the invoice accompanied with the related time sheets, signed by the FSR, confirming the actual time worked, and any other related documentation, if required.

10.2.2 References

10.2.2.1 Documents

The following drawings are applicable to the vessel and are to be considered as Guidance Drawings:

Drawing/Document Number/ Revision	Drawing Title
2710SC750B-01, Rev G (2013-01-16)	PALFINGER General arrangement plan LBT-750T
I-1055-003, Rev 06b (2013-10-21)	PALFINGER General arrangement NPD 11300H with LBT 750 Stbd Version
I-1055-2003, Rev 06d (2015-12-08)	PALFINGER General Assembly NPD11300H for LBT750 Stardboard
NS1246, Rev B (2017-08-22)	PALFINGER Hydraulic Davit- Electric wiring diagram
NPD-DOC-OMM-001, Rev 6 (2017-05-12)	PALFINGER Operation and Maintenance Manual NPD 6000H, NPD 7700H, NPD 11300H, NPD 14800H, NPD 18200H

10.2.2.2 Regulations and Standards

10.2.2.2.1 All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

10.2.2.2.2 Any TCMSS approvals, required for the design, material, and work, over and above the required ABS approvals, must be met as and when required.

10.2.2.2.3 The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section. The Contractor must ensure all Work, completed in this section, meet these Standards and Regulations as well as any other applicable Federal/Provincial Regulations and/or Standards not specifically listed here.

Standards & Regulations – Revision / Date	Title / Description
MSC.1-CIRC 1206, Rev 1	Measures to Prevent Accidents with Lifeboats

Standards & Regulations – Revision / Date	Title / Description
(11 June 2009)	
TP 14475 E	Canadian Life Saving Appliance Standard
CSA 2001, (CRC., c. 1436)	Lifesaving Equipment Regulations
DFO/5737	Fleet Safety and Security Manual
	CCG Welding Specification
	CCG Paints and Coatings Standard

10.2.2.3 Equipment Data

Equipment	Brand	Model	# series
Davit	Palfinger	NPD11300H	1711006
Lifeboat	Palfinger	LBT750C	1875001
Hooks	Palfinger	JXN-1B	QF17067 & QF17068

10.2.3 Technical Description

- 10.2.3.1 All manufacturer's procedures and recommendations must be followed during the scope of work with all technical specifications being adhered to as a minimum by the Contractor. The Contractor must arrange for the ABS Inspector as required for onsite inspections / testing during the course of the work.
- 10.2.3.2 The Contractor must supply all the necessary staging and crange as required to work on, remove, transport, and install the various components during this scope of work. All personnel working on the davit system must be suitably trained in fall restraint; all fall restraint equipment must be certified and current.
- 10.2.3.3 Prior to the commencement of any work, the Contractor must lock out the following equipment:
- a) The power pack unit.
 - b) All associated 110 volt condensation heaters.
 - c) The oil reservoir immersion heater.
 - d) The hydraulic system associated with the davit
- 10.2.3.4 The Contractor must supply and install their own locking devices and retain all keys during the scope of this work. The Contractor must install and remove locks and tags accordingly during the scope of work. The ship's Electrical Officer will assist the Contractor in determining locations to perform the lock-outs but will not perform the actual lock-out.
- 10.2.3.5 Condition of the hydraulic hoses must be noted. All defective hoses must be identified to the TA, and replaced by the Contractor at his cost. The cost of any replacement hose will be dealt with by means PSCP process.
- 10.2.3.6 The Contractor must supply weights for the load test as instructed by the FSR. The Contractor must contact Palfinger Marine Canada Inc. for the specific type of weight and the quantity required for this specific lifeboat. The supply and removal of these weights for this specification item must be included in the overall bid.
- 10.2.3.7 The forward and aft release hooks in the lifeboat must be disassembled for inspection. The operation of all locks, diaphragms, bushings, hooks, side plates, and releases must be proven for ABS inspection.
- 10.2.3.8 On completion of the work, survey, and re-assembly, the davit assembly must be both functionally tested alone, and then load tested using the lifeboat, as per sub-section "Testing" herein.

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- 10.2.3.9 Upon completion of testing, all weights must be removed from the lifeboat. Lifeboat must be fully cleaned of any debris, dirt, or water and stowed in its' davit.
- 10.2.3.10 The contractor must remove the lifeboat from its davit, and clear out and any item that may damage it. CCG will provide the cradle for the lifeboat.
- 10.2.3.11 It is the Contractor's responsibility to identify any interference items not identified in this specification, and with the TA's approval, ensure they are safely removed, stored, and reinstalled in working order as required.
- 10.2.3.12 The Contractor is responsible for protecting the surrounding area and equipment while carrying out this work.
- 10.2.3.13 The contractor must remove the main cable from the davit. Upon completion of the work, the contractor must install a certified replacement cable identical to the one currently in place. Refer to drawing NPD-DOC-OMM-001, Rev 6 (2017-05-12). For bidding purposes, the price of the replacement cable must be identified in the Bid as a separate line item.
- 10.2.3.14 Referring to the drawings NPD-DOC-OMM-001, Rev 6 (2017-05-12), the Contractor must identify and remove all pulleys, sheaves, pins, including the davit pivot pins, and clean each part for inspection.
- 10.2.3.15 The Contractor must measure all pulleys, pulley shafts and their bearings as well as the main pivot shafts and their bearings, and submit a report containing the recorded measurements.
- 10.2.3.16 All axles must be checked with penetrating fluid (NDT) by a competent person
- 10.2.3.17 All pulleys must be checked with magnetic particles by a competent person.
- 10.2.3.18 The Contractor must have all grease paths cleaned, and replace all grease nozzles with new ones during reassembly.
- 10.2.3.19 The contractor must provide all equipment, tools, parts and fluids to perform the inspections listed in Section 5.2 of NPD-DOC-OMM-001.
- 10.2.3.20 The list of all disassembled davit components must be submitted to the ABS inspector. All disassembled parts must be examined and accepted by the ABS inspector for reassembly.

- 10.2.3.21 At the end of the inspections, the contractor must proceed with the reassembly of the parts. During reassembly, the contractor must grease all required parts. The grease will be provided by the CCG.
- 10.2.3.22 The contractor, with the assistance of the FSR, must inspect the hooks and their release mechanism; and recertify defects, if any.
- 10.2.3.23 At the very end of the work, the contractor will have to touch up the paint on all the areas that have been affected by the work.

10.2.4 Proof of Performance

10.2.4.1 Inspection

- 10.2.4.1.1 The Contractor must arrange for scheduling the on-site presence of CCG Representative and an ABS Inspector as required for inspections/testing throughout this scope of work. Prior to commencement of work, the Contractor must verify with ABS any inspection hold points in this specification, along with any not identified, and adjust their Work schedule accordingly.
- 10.2.4.1.2 The Contractor must provide the TA with 5 days' notice of completion of all hardware and cabling specified herein to allow for the coordination of an Installation Check (IC) and testing.
- 10.2.4.1.3 The Contractor must undertake to rectify defects and deficiencies in the Contractor's installation or repair work, as soon as practicable. The Contractor is responsible to schedule such repairs at its own risk and cost.
- 10.2.4.1.4 The Contractor must reschedule unsatisfactory inspections after the required repairs have been completed.

10.2.4.2 Testing

- 10.2.4.2.1 On completion of the Work, survey and re-assembly, the Contractor must arrange with ABS and the TA to witness all testing of the lifeboat davit.
- 10.2.4.2.2 The davit assembly must be functionally tested under no load to confirm all controls and stops are operational.
- 10.2.4.2.3 The davit must then be load tested at 110% SWL using the lifeboat, fully loaded to its registered weight capacity. Load testing includes hoisting the lifeboat aboard and stowing it in its resting position, lowering it to the water and then returning it to its stowed position.
- 10.2.4.2.4 Following the 110% load test, a visual re-inspection of the davit components must be done to detect any defects.

10.2.4.2.5 The lifeboat must be then lowered to a couple of inches off the water, in order to test the on-load releasing mechanism in the forward and aft hooks.

10.2.4.2.6 While the lifeboat is in the water, a buoyancy test must be conducted.

10.2.4.3 Certification

10.2.4.3.1 Welders must be qualified by CWB to CSA Standard 47.1 for the Mode and Class of weld being used.

10.2.4.3.2 Persons performing and interpreting Non-Destructive Testing (NDT) – Liquid Penetrant (LP), Magnetic Particle (MP), Radiographic (RT) and Ultrasonic Inspection (UT) – must be currently qualified by the National Non-Destructive Testing Certification body of Natural Resources Canada (NRCan) to CAN/CGSB 48.9712 Level 2 or Level 3. Level 1 personnel may observe or assist. Certificates must be in accordance with the Documentation section of the General Notes. These certificates must be submitted to Canada.

10.2.4.3.3 The contractor must submit to CCG one (1) electronic copy and two (2) hard copies of the inspection certificates along with the original copy bearing the ABS seal.

NOTE: Final acceptance will be based on FSR and ABS certification.

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

10.2.4.4 Reports

10.2.4.4.1 All documentation must be provided to demonstrate OEM compliance. No material substitutions will be undertaken without the expressed written consent of the TA and Palfinger.

10.2.4.4.2 The Contractor must supply two (2) **type-written** reports upon completion of all work from the FSR. The report must, at a minimum, list all work performed, repairs made, parts used, parts replaced/substituted, modifications and cause of failure (if any), measurements and readings – including the results of all non-destructive tests performed as part of the davit inspection.

10.2.4.4.3 None of drawings or measurements taken must be given to CCG in hand written form.

10.3 CLEANING AND PAINTING OF BILGES

10.3.1 Identification

This specification work item has two purposes. The first is to clean the propulsion generator room bilges in preparation for the welding work in item 12.4 Propulsion Generator Replacement. The Contractor must pump-out, clean and certify the bilges, specified herein, safe for entry and safe for Hot Work, as required prior to commencing other work in these specifications that require the bilges to be certified for work. The second purpose of this item is to clean the propulsion generator room bilges after the welding work in item 12.4 and to touch up the paint.

10.3.2 References

10.3.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
108-H-23_25_T- Rev9_ Sept_2011	General arrangement
108-H-0026 rev2 -April_2001	Capacity Plan
108-555-H-0003_Rev1_Mars-1984	Tank top and double bottom
108-555-H-2740_Rev4_Fev-1985	W.T. Manholes and W.T. Access and Escape Hatches
50-00-01_01_Rev3_May-1986	Machinery Arrangements
50-00-03-02 50-00-03_02_Rev2_May-1986	Machinery Arrangements Sectional
SSIS-TDS-PDF-Intergard_264_eng_usa_A4_20160719	Intergard264 -Technical data Sheet

10.3.2.2 Regulation and standard

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations Revision / Date	Title / Description
FSM 7.B.3	Fleet Safety Manual, section on Entry into Confined Spaces
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
SSPC SP3	Power tool cleaning
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations
DFO 5737	Fleet Safety and Security Manual
IACS No. 47 (Rev. 5, Oct 2010)	Shipbuilding and Repair Quality Standard
Standards (SSPC)	Society for Protective Coatings Standards
IACS 47	Shipbuilding and repair quality standard

10.3.3 Technical Description

The cleaning of all specified bilges must be completed before any hot work commences, or any equipment is opened and exposed as per the following sections of this specification. The cleanliness of the bilges must be maintained for the duration of the work period. Any subsequent cleaning required due to Contractor work must be completed by the Contractor at the Contractor's expense and before the end of the Contract.

10.3.3.1 Cleaning before the start of hot work

10.3.3.1.1 The Contractor must provide material and labor to perform the cleaning of the bilges in the propulsion generator room between frames 70 and 107,

including the two bilge wells on the port and starboard sides forward of frame 70. The cleaning must be done with the intent of performing hot work on the entire surface. The cleaning must be completed before the hot work begins.

10.3.3.1.2 The Contractor must certify the area being safe for personnel to enter prior to work being carried out internally as per Coast Guard Safety Management System. Copies of certificates must be given to the TA, and must be posted adjacent to points of entry. The certificate must be issued by a naval chemist or an approved/certified person.

10.3.3.1.3 The Contractor must ensure that the above-mentioned certificates are kept valid for the entire period of the work specified in item 12.4 of this SOW. Any subsequent cleaning will be at the Contractor's expense.

10.3.3.1.4 All waste and debris generated during cleaning must be removed from the vessel and disposed of according to applicable regulations.

10.3.3.1.5 The Contractor must refer to item S1.2.30 for disposal of residual liquids. The Contractor must provide load manifests to substantiate the volumes of residual liquids disposed

10.3.3.2 Cleaning at the end of hot work

10.3.3.2.1 The Contractor must provide material and labor to perform the cleaning and degreasing to SSPC-SP1 standard of the bilges in the propulsion generator room between frames 70 and 107 including both port and starboard side bilge wells forward of frame 70. The cleaning must be done to remove all foreign matter or loose paint and to prepare for paint work.

10.3.3.2.2 The Contractor must keep these areas clean for the duration of the painting. Any subsequent cleaning will be at the Contractor's expense.

10.3.3.2.3 All waste and debris generated during cleaning must be removed from the vessel and disposed of according to applicable regulations.

10.3.3.2.4 The Contractor must refer to item S1.2.30 for disposal of residual liquids. The Contractor must provide load manifests to substantiate the volumes of residual liquids disposed.

10.3.3.3 Paint

10.3.3.3.1 The Contractor must perform touch-up painting of the bilge floors, including framing. The Contractor will supply the paint.

10.3.3.3.2 All surfaces to be coated must be clean, dry and free of contamination.

10.3.3.3.3 The Contractor must include in his price a surface of 100m². This price must include the installation of exhaust fan, surface preparation to SSPC-SP3 standard and the application of white paint Intergard 264 as per manufacturer's instructions. For bidding purposes, the Contractor's bid must include the price for preparation and coating a surface area of 100 m², as well as the unit price per each square-meter. The final cost must be adjusted, up or down, using the PSPC 1379 process. The cleaning of the surface area must to bare metal (SSPC-SP-3 standard), and coating must be white paint Intergard 264, two (2) coats, as per manufacturer's instructions.

10.3.3.3.4 The final minimum thickness must be 6.2 mils wet (5 mils dry) per coat.

10.3.4 Proof of performance

10.3.4.1 Inspections

10.3.4.1.1 The Contractor must notify the IA at each step so that the IA can inspect the bilges and bilge wells after completion of cleaning prior to painting, and after completion of painting.

10.3.4.2 Tests

10.3.4.2.1 Contractor must verify paint thickness in the presence of the TA.

10.3.5 Deliverables

10.3.5.1 Reports and documents

10.3.5.1.1 The Contractor must submit a type-written report to the CCG TA detailing the work undertaken, defects, repairs made, measurements and readings taken, in a PDF format, on a non-password protected USB drive.

10.3.5.1.2 The Contractor must provide copies of manifests for residual liquids that have been removed from the vessel

10.3.5.2 Certificate

10.3.5.2.1 The Contractor must provide a copy of the certificate of competency of the person taking the air samples for certifying safe entry .

10.3.5.2.2 The Contractor must submit the disposal certificates for the removed residual liquids.

11.0 HULLS AND RELATED STRUCTURES

11.1 CLEANING AND PAINTING OF THE HULL

11.1.1 Identification

11.1.1.1 The objective of this specification work item is to clean the entire hull of the vessel using high pressure water to remove marine vegetation, degrease the hull surfaces, apply the Inerta hull coating below the waterline and apply compatible coating to hull surfaces above the waterline in accordance to the exterior colour scheme and markings of the vessel. This Work is to be performed at the same time as the following Work Packages:

- 11.2 Hull plating butts and seams welding
- 11.3 Seabay, sea chests and sea strainers
- 12.4 Replacement of Propulsion Generators

11.1.1.2 The Contractor must engage services of an International Paint/Coating TSR, with a NACE International certification of Coating Inspector, Level 2 as minimum, to **oversee** the work in this section. The Contractor must include an allowance of \$5,000 to cover the cost of this TSR. The \$5,000 allowance must form part of the overall bid and must be adjusted by PSPC 1379 action upon receipt of the final FSR invoice supported by copies of all related documentation to verify actual expenses.

Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses.

11.1.2 References

11.1.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
108-H-0001_Rev8_ Oct-2013	Shell Expansion
108-H-23_25_T- Rev9_ Sept_2011	General arrangement
108-H-0026 rev2 -April_2001	Capacity plan
07352S42_rev8_oct 2013	Shell Expansion- surface
108-H-0022_Rev3_ Oct-1998	Docking Plan
07352-SF_Rev-E_July-2010	Federal Symbolization
5660-144-001 Rev0_ Oct-2019	Docking Plan
C14-53-009-01	TANKS SURFACES
Fairleads and bollards, after	Martha L. Black, fairleads and bollards, after
Fairleads and bollards, forward	Martha L. Black, fairleads and bollards, forward

11.1.2.2 Regulations and standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations Revision / Date	Title / Description
FSM 7.B.3	Fleet Safety Manual, section on Entry into Confined Spaces
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
NACE 6G186-2010-SG	Surface Preparation of Soluble Salt Contaminated Steel Substrates Prior to Coating
SA-2½ SSPC SP10	Near White metal blast cleaning
SSPC SP3	Power tool cleaning
SSPC Guide 15	Methods for Extraction and Analysis of Soluble Salts on Steel and other Nonporous Substrates Society for Protective Coatings (SSPC) Standards
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard
CSA W59-08(R2008) -	Welded steel construction
CSA W47.1-09,	Certification of steel fusion welding companies
Standards (SSPC)	Society for Protective Coatings Standards

11.1.3 Technical Description

Pertinent Information on surfaces & their colouring scheme

The underwater hull area, that must be included in is 2000 m² that includes: 1288 m² below the ice belt, 618 m² for the ice belt, 72 m² for the drift well, and 78 m² for the drift. The total 2000 m² area includes all the underwater area from the keel up to the seven (7) meters load line including: the rudder, ship's bow covering anchor pockets (a triangle leading to the aft upper edge of each pocket from frame 164), rudder trunk, drift well and bossing, the shapes of the stern tubes, the sea chests grates, as well as the bow thruster tunnel and grates. The above water area is 722 m².

Part of the hull must be painted red (from four (4) meters load line and above). This area covers the complete perimeter of the vessel. The rest of the hull, including the hawse pipes, rudder and rudder trunk, must be abrasive blasted and painted in black (only on bare metal).

Docking and cleaning

- 11.1.3.1 The Contractor must dock the vessel in accordance with the Wartsila docking Plan, 5660-144-001 Rev0 Docking Plan, selected for the replacement of the propulsion generators.
- 11.1.3.2 Unless otherwise specified, the Contractor must furnish all materials, equipment and parts necessary to perform the work indicated.
- 11.1.3.3 The Contractor must provide all necessary scaffolding, cranes, screens, lighting and other environmental controls, services, equipment, and materials required to perform the work described in this specification work item.
- 11.1.3.4 The Contractor must furnish and install a temporary shelter covering the entire hull of the vessel requiring painting with Inerta 160 black and red. This shelter must be ventilated and heated. No combustion gases from the heating system must be allowed inside the shelter. It must be weatherproof and watertight with the ship's hull. This shelter must be removed after painting is completed and drying times are finished as directed by the NACE representative.
- 11.1.3.5 Adequate storage facilities must be provided in the vicinity of the work area for materials and equipment. These facilities must be maintained at the temperature recommended by the coating manufacturer to facilitate preparation and ensure proper application.
- 11.1.3.6 The Contractor must protect all anodes and transducers during high pressure water cleaning, abrasion and coating. The protection must be removed before undocking. Transducer locations are as follows:
- Speed Tr transducer, Frames 161 and 162, port side
 - Echo sounder transducer, Frame 127, port and starboard
- 11.1.3.7 The Contractor must hydro blast the entire hull area within four hours of docking including up the top of all bulwarks. High pressure fresh water washing (5000 PSI minimum) to remove all marine growth and allow inspection by ABS and TA. This must include rudder, drift & well, propellers sea bay, sea chests and the thruster tube. All marine growth must be removed. This inspection must identify areas of the underwater and above water hull that must be grit blasted and have new hull coatings applied. The Contractor must repair any butt and seam welds identified during the hull inspection.

Preparations

- 11.1.3.8 The Contractor's bid must include the price for providing a half-a-day lift service for hull inspection by the ABS Inspector and the vessel's TA, as well as price per hour, to adjust the final price up or down, by use of PSPC 1379 process.
- 11.1.3.9 The Contractor must cover all deck machinery and equipment, including all snatch blocks, cables, and fast-moving crane connections, as well as openings in the vessel, to prevent penetration of debris from the stripping. The Contractor must remove all protection after coating operations.
- 11.1.3.10 The Contractor must plug all scuppers and deck outlets and take other necessary precautions to prevent liquids from contaminating surfaces that are primed or painted. The plugs must be hollow and contain extension tubes so that rainwater runoff will drain from the hull. The Contractor must also make every effort to ensure that the hull preparation process or paint coat applications do not result in damage, unnecessary cleanup, or repairs. It is important to ensure that the abrasive used for stripping cannot enter any area of the vessel. The Contractor must adequately cover all openings on the vessel where blasted abrasive could enter. The Contractor must ensure that surfaces and equipment other than those specified above are not covered and that hull inlets or outlets are not obstructed by the coating. The Contractor must remove any overspray on the vessel resulting from this work. The Contractor must remove all covers and plugs once the coating is applied and sufficiently dry.
- 11.1.3.11 The NACE TSR must verify that the surface preparation and coating, storage, preparation and application of coatings are as per the manufacturer's specification
- 11.1.3.12 The Contractor must provide safe access to the areas covered by this specification item where the work is to be performed, including storage and mixing areas, to the extent that the TSR deems such access is necessary.
- 11.1.3.13 The Contractor must provide all necessary coatings and paints, compatible with the vessel's paint schedule, for the underwater and overwater sections of the hull.
- 11.1.3.14 The Contractor must remove all abrasive after blasting. It is the Contractor's responsibility to ensure that the hull is free of debris and is clean before, during and immediately after the coating application.

- 11.1.3.15 If oxidation occurs during the period between abrasive blast cleaning and coating application, the surface must be re-stripped by the Contractor in accordance with the indicated surface preparation standard at the Contractor's expense.

Underwater Hull (about 1288 m² of hull under Ice Belt + 618m² of Ice Belt)

- 11.1.3.16 Approximately 15% (i.e. 290 m²) of the underwater surface (195 m² of area under Ice Belt and 95 m² of the Ice Belt area) must be abrasive blasted in accordance with SSPC-SP-10 and feathered transition with existing paint.

The Contractor's bid must include a bid price for abrasive blasting of 290 m² as well as unit price per meter square of the underwater hull area to SSPC-SP-10 standard and feathering transition with existing paint. The final price must be adjusted, up or down, by means of PSPC 1379 process.

- 11.1.3.17 Bare surfaces of the underwater hull area (195m²), must be abrasive blasted to SSPC-SP-10 standard, and must be coated with one layer of Intershield 163/Inerta 160 black at a dry film thickness of 20 mils.

The Contractor's bid must include a bid price for application of one layer of paint, as specified above, on bare metal surface of 195 m² as well as unit price per meter square. The final price must be adjusted, up or down, by means of PSPC 1379 process.

- 11.1.3.18 Bare surfaces of the Ice Belt area (95 m²), abrasive blasted to SSPC-SP-10 standard, must be coated with one layer of Intershield 163/Inerta 160 red at a dry film thickness of 20 mils.

The Contractor's bid must include a bid price for application of one layer of paint, as specified above, on bare surface of 95 m² as well as unit price per meter square. The final price must be adjusted, up or down, by means of PSPC 1379 process.

- 11.1.3.19 The Contractor must then prepare the remaining surface area of the Ice Belt (approximately 523 m²) to receive the coating as per TSR recommendations, and apply one coat of Intershield 163/Inerta 160 red at a minimum dry film thickness of 10 mils over the total area of the ice surface (618 m²).

The Contractor's bid must include separate bid prices for:

- Surface preparation of the remaining approx. 523 m², as well as the unit price per m² to adjust the final price, up or down, by means of PSPC 1379 process;

- Application of one layer of paint, as specified above over the total surface area (618 m²),

11.1.3.20 In the drift well and the drift, the Contractor must remove all Teflon sliding plates.

11.1.3.21 The Contractor must Abrasive blast all surfaces of the drift well and the drift, a total of approximately 150 m², in accordance with SSPC-SP-10 standard.

The Contractor's bid must include a bid price for abrasive blasting of approximately 150 m² as well as unit price per meter square of the drift well and the drift to SSPC-SP-10 standard and feathering transition with existing paint. The final price must be adjusted, up or down, by means of PSPC 1379 process.

11.1.3.22 On all surfaces, the Contractor must apply the following paint system:

- apply two (2) coats of INTERSHIELD 300 paint at a thickness of 125 microns dry (208 microns wet) (under coat).
- Apply two (2) coats of INTERSPEED BRA 640 antifouling paint from International at a thickness of 4 mils dry (6.4 mils wet) (top coat)

11.1.3.23 The Contractor must apply the coating to fair straight line along waterline, In addition, the superstructure coatings must be applied to the ice reinforcement area down to where the waterline meets a visible line of demarcation. In order to ensure proper adhesion between the Intershield 163 / Inerta 160 and the surface layer, a layer of Intergard 264 Coating must be applied with a roller and paintbrush to the coating of the Ice Belt reinforcement area as long as it can be printed with a thumbprint. The Contractor must contact the Coatings Manufacturer's TSR for information regarding the appropriate time.

11.1.3.24 The access opening for the replacement of the Wartsila propulsion units, Section 12.4 of the specifications, must be prepared and painted according to the procedures described in this Section 11.1, with full abrasive blasting of all new welds.

11.1.3.25 The Contractor must take measurements of the dry film thickness between layers. The Chief Engineer must be present at the tests.

11.1.3.26 Seawater box grates must be protected during coating application so that the openings are not blocked or reduced.

11.1.3.27 Draught scales, load lines, thruster symbols and other symbols and icons required by public authorities must be painted with two (2) coats of Intersheen White 579. Dry film thickness must be 2 mils per coat. Stencils for the Federal Identity Program markings will be provided by CCG.

Above Waterline Hull (about 722 m²)

11.1.3.28 The Contractor must remove the gangways from the vessel on the port and starboard sides prior to the start of stripping. The gangways must be reinstalled after all work is completed. This is to allow for the preparation and painting of the bulwarks located near the gangway stowage area.

11.1.3.29 All bare and rusted areas must be abrasive blasted in accordance with SSPC-SP-10 standard. The edges of the existing coating must be thinned by stripping or by suitable mechanical means to ensure that the surface is sound enough to receive the new coating.

For bidding purposes, the Contractor's bid must include the price for abrasive blasting of approximately 20% of the area (145 m²) to SSPC-SP-10 standard and feathering transition with existing paint, as well as unit price per meter square. The final price must be adjusted, up or down, by means of PSPC 1379 process.

11.1.3.30 The Contractor and TA will inspect the surface preparation prior to the application of any coating and mark areas that require further preparation.

11.1.3.31 All marked areas must be re-inspected by the Contractor and the TA prior to coating application.

11.1.3.32 The Contractor must prepare the entire surface of the hull, a total of 722 m², from the waterline to the top of the bulwarks, for the application of the coatings specified below. This surface preparation includes abrasive blasting of 145 m² to SSPC-SP-10, and preparation of the remaining area as per TSR recommendations.

➤ *Two coats of Interguard 264 (oxide red) primer on all bare surfaces. Apply 3 mils of dry film per coat.*

➤ *Two full coats of Interthane 990 Marine Alkyd Enamel RAL3000 (Coast Guard Red 509102). Apply 2 mils of dry film per coat.*

11.1.3.33 For bidding purposes, the Contractor's bid must include the price for:

- a) Abrasive blasting and applying the under coating as specified above of approximately 145 m² of surface area to SSPC-SP-10 standard and feathering transition with existing paint, as well as unit price per meter square. The final price must be adjusted, up or down, by means of PSPC 1379 process.
- b) Surface preparation of the remaining approx. 523 m², as well as the unit price per m² to adjust the final price, up or down, by means of PSPC 1379 process.
- c) Applying the coating as specified above, on the total area (722 m²).

11.1.3.34 The Contractor and CCG's representative must inspect the previous coat and areas marked for further preparation between coats. All marked areas must be re-inspected by the Contractor and CCG's representative prior to the application of any additional coating.

11.1.4 Proof of performance

11.1.4.1 Inspection

11.1.4.1.1 The NACE TSR must verify that surface preparation is in accordance with the manufacturer's specifications and instructions, as well as the storage, preparation and application of coating materials.

11.1.4.1.2 The NACE TSR must inspect the surface preparation and each coating application of all components, including the work environment, equipment and mixing and application processes. It is the Contractor's responsibility to have the NACE TSR present at the required times to inspect the preparation and applications. At each stage, the coating must also meet the requirements of the Chief Engineer or his delegate.

11.1.4.1.3 The Contractor must arrange for the hull inspection by the ABS inspector and ensure that approvals are obtained. Copies of the inspection must then be provided to the Chief Engineer and the Technical Authority after completion of the work.

11.1.4.1.4 All work in this Section must be completed to the satisfaction of the TA/IA and FSR

11.1.4.1.5 Any application that results in an unacceptable coating to the FSR and TA must be redone (blasting included) by the Contractor at the Contractor's expense within the allotted dry dock time period.

11.1.5 Deliverables

11.1.5.1 Documents and reports

11.1.5.1.1 The Contractor must prepare submit to CCG a type-written 'coating application report from the NACE TSR that details all of the particulars of the coating application process as completed by the Contractor, in unprotected PDF format that includes the following:

- The result of the various inspections, detailing the quality of surface preparation and application of coatings
- The areas and surface measurements of underwater hull that have been repaired;
- The areas and measurements of surfaces that were blasted, the type of blasting material and the air pressure used;
- The areas and measurements of surfaces that have been painted, type and quantity of coating products used
- Thickness measurements of applied coatings.
- Details of all environmental conditions at the time any hull coatings were applied and at which areas on the hull the coating was applied and include but not be limited to the dry and wet bulb temperatures, relative humidity, dew point and the times when painting was started and stopped as well as the temperature of the product at application time and wet and dry film thickness gauge readings The temperature of the ship's hull.

11.1.5.2 Certification

11.1.5.2.1 The Contractor must provide a copy of the certification of the independent NACE TSR.

11.2 HULL PLATING BUTT AND SEAMS WELDING

11.2.1 Identification

- 11.2.1.1 The purpose of this item is to determine which plating butts and seams welding joints need to be re-welded to meet the ABS inspector's requirements.
- 11.2.1.2 The extent of this work will be determined following the hull inspection of the vessel, which will immediately follow the dry-docking and cleaning of the vessel.
- 11.2.1.3 Following the inspection, plate replacement work, if required, is also described in this specification.

11.2.2 References

11.2.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
108-H-0001_Rev8_ Oct-2013	Shell Expansion
108-H-23_25_T- Rev9_ Sept_2011	General arrangement
108-H-0026 rev2 -April_2001	Capacity plan
07352S42_rev8_oct 2013	Shell Expansion- surface
108-H-0022_Rev3_Oct-1998	Docking Plan
07352-SF_Rev-E_July-2010	Federal Symbolization
5660-144-001 Rev0_Oct-2019	Docking Plan

11.2.2.2 Regulations and standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations Revision / Date	Title / Description
FSM 7.B.3	Fleet Safety Manual, section on Entry into Confined Spaces
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
NACE 6G186-2010-SG	Surface Preparation of Soluble Salt Contaminated Steel Substrates Prior to Coating
SA-2½ SSPC SP10	Near White metal blast cleaning
SSPC SP3	Power tool cleaning
SSPC Guide 15	Methods for Extraction and Analysis of Soluble Salts on Steel and other Nonporous Substrates Society for Protective Coatings (SSPC) Standards
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard
CSA W59-08(R2008) -	Welded steel construction
CSA W47.1-09,	Certification of steel fusion welding companies
Standards (SSPC)	Society for Protective Coatings Standards

11.2.3 Technical Description

11.2.3.1 Preparation and inspection

11.2.3.1.1 The Contractor must provide sufficient staging or mobile scaffolding to access all hull butt joints and seams so that inspectors can assess the condition of the welds.

11.2.3.1.2 Once the hull is properly cleaned, the Contractor must notify the CCG Technical Authority and the ABS inspector so that a visual inspection of the entire hull and associated welds can be performed.

11.2.3.2 Welding

11.2.3.2.1 On both the port and starboard sides of the ship's plating, the Contractor must rework approximately 152 m (500 ft) of plating weld seams (ends/butts and seams) with an average of 12 weld passes, for a total of approximately 1830 m (6,000 ft) of welding to be performed.

- 11.2.3.2.2 For bidding purposes, the contractor's bid must include the price for the above described welding requirement as well as the price per each liner meter, to adjust the final price up or down, by use of PSPC 1379 process.
- 11.2.3.2.3 The Contractor must perform this work only after the tanks in contact with this portion of the hull have been drained, cleaned and degreased, then certified for hot work in the identified areas and any other items, internal or external, in contact with the work areas have been removed.
- 11.2.3.2.4 For bidding purposes, the contractor's bid must include a separate price for certifying each of the double bottom tanks #7, #8, #9 and #10 to be gas free. A copy of those certifications must be submitted to CCG, and a copy must be posted at the point of entry to each tank.
- 11.2.3.2.5 The butt and seam welds to be repaired must be marked by the ABS inspector, and must be abrasive blasted by the Contractor to remove excess Inerta paint and all salt deposits, dirt and grease.
- 11.2.3.2.6 The Contractor must chamfer by air-arc gouging or grinding the welds at the ends and seams to be repaired and restore them to original grade using approved welding techniques and materials.
- 11.2.3.2.7 The Contractor must grind smooth, prior to welding, any undercut edges of the weld and its boundary plates.
- 11.2.3.2.8 The Contractor must remove all grit from welds and gouging by vacuuming or air blowing.
- 11.2.3.2.9 The Contractor must install a heavy-duty plastic fabric shelter in the work areas to prevent rain, snow, ice, or all of the above from rapidly cooling the welds.
- 11.2.3.2.10 The Contractor must preheat the flange welds to 200°F (93°C) before welding begins.
- 11.2.3.2.11 The Contractor must perform the work so the new welds present an excess of about 6.35 mm (1/4 inch) that will be grinded then abrasive blasted to SA 2 ½ standard to show a rounded and rough surface. The excess should look like a sheet metal joint made with an automatic welding machine.
- 11.2.3.2.12 The Contractor must quote for the price of gouging 152 m (500 ft) of full width weld on the welded surface and for grinding 152 m (500 ft) on the same surface. The Contractor must also quote for the price of gouging and grinding one meter of weld. The final cost of gouging and grinding must be adjusted, up or down, by means of PSPC1379 process.

- 11.2.3.2.13 The Contractor must provide in his bid the price of approximately 1830 m (6,000 ft) of weld beads. The Contractor must also provide the price per each meter of weld beads. The actual final cost for the welding must be adjusted, up or down, by means of PSPC1379 process.
- 11.2.3.2.14 The CCG will provide a Shell Expansion drawing of the vessel's hull. The Contractor must clearly indicate on this drawing, by thick red lines drawn on the port and starboard sides of the vessel, the full extent of the new plating welds made during these repairs.
- 11.2.3.2.15 The Contractor must, after all the welding work has been completed, apply the same preparation and paint scheme to the areas where the welds have been made as on the hull.
- 11.2.3.2.16 In a case welding work must be performed in areas near the tanks:
- A) The Contractor must reinstall manhole covers with new gaskets, nuts and washers after all work is completed and indicated tanks are properly cleaned.
 - B) The Contractor must replace the docking plugs and conduct a pressure test of each tank in the presence of the ABS inspector.
 - C) Once the test is completed, the Contractor must:
 - Pressure test the tanks;
 - Replace the plugs;
 - Test for leaks using the vacuum box method, in presence of the ABS inspector and the GC TA;
 - Close the manhole covers;
 - Make sure the tanks are ready to be filled.

For bidding purposes, the Contractor's bid must include the price for performing the above work, separately for each of the double bottom tanks #7, #8, #9 and #10.

11.2.3.3 Hull plating replacement (If required in 11.2.1.3)

For bidding purposes, the Contractor's bid must include the price for the preparation and the work specified in the following paragraphs 11.2.3.3.1 to 11.2.3.3.5 for replacement of one-half (0,5) m² of hull plating. The final cost must be adjusted, up or down, by means of PSPC 1379 process.

- 11.2.3.3.1 The Contractor must move the blocks and adequately support the vessel for the entire duration of metal working on the hull.

- 11.2.3.3.2 The Contractor must torch cut all plates mentioned, taking care not to damage the frames, the beams or the floor timber that are not to be changed, and dispose of the plates.
- 11.2.3.3.3 The Contractor must grind the edges and frames ready to be welded to the new material.
- 11.2.3.3.4 Using the “Shell expansion” drawing, the Contractor must cut the plating sections identified following the Hull inspection.
- 11.2.3.3.5 The Contractor must transport, form, adjust and weld in place the plating sections to the frames, to the satisfaction of the ABS inspector and the CCG TA . The Contractor must perform all welds following the arc welding full penetration back-step method so as to produce a welding excess of ¼ in. on the surface. The Contractor must grind the welding excess so as to obtain a rounded and smooth surface that will facilitate paint system adhesion.
- 11.2.3.4 Radiographic inspection
- 11.2.3.4.1 The Contractor’s bid must include the price for making a minimum of twelve (12) radiographic films of the subject welds; this price must include all required scaffolding and/or lifts that are required. The ABS Inspector must indicate where these films are to be taken. The Contractor must also include a unit price per film which must include all scaffolding and cranes that are required. The final cost must be adjusted up or down by PSPC 1379 Process. The unit price must be based on the two following conditions:
- a) All the required scaffolding and/or lifts are still in place, and the NDT specialist is on site; or
 - b) All the required scaffolding and/or lifts are still in place, but the NDT specialist must be called back on site for additional work, if required. In this case, this unit price must be used only for the first film, followed by the price in (a) for follow up films.
- 11.2.3.4.2 For radiographic inspection purposes, the Contractor must thoroughly clean the surfaces of the welds and adjacent base metal to allow accurate viewing of the area of interest (weld area). Discontinuities visible on the radiographic film, later defined as surface discontinuities, must be repaired by the Contractor, and the area must be re-radiographically inspected.

11.2.4 Proof of performance

11.2.4.1 Inspections

- 11.2.4.1.1 Inspection of the hull sheets by ABS and the GC AT.

11.2.4.1.2 Inspection of all hull welds, port and starboard by ABS and TA.

11.2.4.2 Tests:

11.2.4.2.1 The Contractor must perform a radiographic film by a certified non-destructive testing (NDT) inspector.

11.2.4.2.2 The Contractor must perform a pressure test in the presence of ABS and the TA on each of the tanks affected by the work

11.2.5 Deliverables

11.2.5.1 Documentation

11.2.5.1.1 The Contractor must provide a report of the inspections and tests performed.

11.2.5.1.2 The Contractor must provide a report and drawing showing areas of work.

11.2.5.1.3 The Contractor must provide a detailed report of the radiographic inspections performed.

11.2.5.1.4 The detailed report must show the exact location of each test point marked on an ANSI size E paper copy of DWG 108-H-0001_Rev8_Oct-2013 Shell Expansion. The report must also include an MS-Excel spreadsheet table identifying the test points by strake and plate number, original plate/pipe thickness, Class minimum thickness, steel thickness found, the corresponding original thickness and percent wastage.

11.2.5.2 Certification

11.2.5.2.1 Contractor must provide a copy of the certification of the welders.

11.2.5.2.2 Contractor must provide a copy of the certification of the NDT inspector.

11.3 SEA BAY, SEA CHESTS AND SEA STRAINERS

11.3.1 Identification

11.3.1.1 The Contractor must open-up, clean, prepare and coat the interior of the Sea bay, Sea Chests and main seawater strainers. The cleaning and removal of sludge must be done within the first week after drydocking.

11.3.1.2 This work must be performed in conjunction with the following tasks:

- 11.1 Cleaning the hull and applying the Inerta hull coating
- 11.2 Hull plating welding joints
- 12.4 Replacement of propulsion generators

11.3.1.3 The Contractor must engage services of an International Paint/Coating TSR, with a NACE International certification of Coating Inspector, Level 2 as a minimum, to **oversee** the coating application. The Contractor must include an allowance of \$5,000 to cover the cost of this TSR. The \$5,000 allowance must form part of the overall bid and must be adjusted by PSPC 1379 action upon receipt of the final FSR invoice supported by copies of all related documentation to verify actual expenses.

Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost must be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses

11.3.2 References

11.3.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
108-H-0022_Rev3_Oct-1998	Docking plan
108-H-0026 rev2 -April_2001	Capacity plan
5660-144-001 Rev0_Oct-2019	Docking Plan (Wartsila)
71-20-01 Rev7_Nov-1995	Arrg't sea bay & sea chests & location of passive zinc
71-20-02_ Rev3_ Feb-1986	Arrg't sea chest sterntube lubricating
71-20-03_Rev4_Fev-1986	Arrangement aft sea chest
C14-53-009-01 TANKS SURFACES	Tanks surfaces

11.3.2.2 Regulations and Standards.

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations Revision / Date	Title / Description
FSM 7.B.3	Fleet Safety Manual, section on Entry into Confined Spaces
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
NACE 6G186-2010-SG	Surface Preparation of Soluble Salt Contaminated Steel Substrates Prior to Coating
SA-2½ SSPC SP10	Near White metal blast cleaning
SSPC SP3	Power tool cleaning
SSPC Guide 15	Methods for Extraction and Analysis of Soluble Salts on Steel and other Nonporous Substrates Society for Protective Coatings (SSPC) Standards
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard
CSA W59-08(R2008) -	Welded steel construction
CSA W47.1-09,	Certification of steel fusion welding companies
Standards (SSPC)	Society for Protective Coatings Standards

11.3.2.3 Equipment data

Description	Location / Frame	Area (m ²)	Strainers
External sea chest submersible pump (port side)	Propulsion room 51-53	16.8	No
External sea chest submersible pump (center)	Propulsion room 37-39	NA	No
External sea chest, lower (port side)	Generator room 96-106	88.4	Yes
External sea chest, lower (Starboard)	Generator room 96-106	88.4	Yes
External sea chest, upper (port side)	Generator room 96-106	107.1	Yes
External sea chest, upper (Starboard)	Generator room 96-106	107.1	Yes
External sea chest, evaporator (Starboard)	Generator room 96-106	21.5	
Internal sea bay , (Center)	Generator room 96-106	227.6	No
Science sea chest	Starbord Forward hatch 133	NA	No

11.3.3 Technical Description

- 11.3.3.1 Unless otherwise specified, the Contractor must supply all materials, equipment and parts necessary to perform the work indicated.
- 11.3.3.2 The Contractor must note that the sea bay, sea chests and strainers are heavily fouled (mud).
- 11.3.3.3 Prior to the start of the work, the Contractor must remove or protect all equipment that could be damaged by the work (e.g. temperature sensor). The Contractor must reinstall this equipment at the end of the work.
- 11.3.3.4 The Contractor must retain the services of an independent NACE consultant to verify that surface preparation is in accordance with the manufacturer's specifications and instructions, as well as the storage, preparation and application of materials.

11.3.3.5 The Contractor must ensure that no grit blast or overspray of the sea bays enters the machinery spaces.

11.3.3.6 The Contractor's bid must include separate prices for the following:

- Sampling and analysis of the mud contained in the sea chests (4) and the sea bay (1).
- Material and labor to replace 52 defective threaded fasteners (M16 x 50). All fasteners must be stainless steel.
- Fifty (50) NDT ultrasonic steel thickness measurements to be taken in the area of the sea bay and sea chests as well as unit prices based on the two conditions specified below. The final cost must be adjusted, up or down, by PSPC 1379 process.
 - a) The NDT specialist is already on site; or
 - b) The NDT specialist must be called back on site for additional work, if required. In this case, this unit price must be used only for the first reading, followed by the price in (a) for follow up readings.

11.3.3.7 The Contractor's bid must include the price to supply and instal lead-free anodes: fifty-two (52) type Z-19, and forty-two (42) type Z-22; as well as unit prices to supply and instal one of each anodes' type. The final price must be adjusted, up or down, by PSPC 1379 process..

Note: the Z-22 anodes must be welded and the Z-19 anodes must be bolted. The Contractor must supply and install the required stainless steel bolts and nuts.

11.3.3.8 All steel replacement work must be dealt with using the PSPC 1379 process.

Sea Chests

11.3.3.9 The Contractor must remove the manhole covers and grates from all sea chests and sea bay for cleaning and inspection. The Contractor must abrasive blast all interior surfaces of the sea boxes and grates in accordance with SSPC-SP-10 to the satisfaction of the Chief Engineer. Grate holes must be mechanically reamed to their original diameter as required. The Contractor must replace all anodes.

- 11.3.3.10 The Contractor must inform the Chief Engineer and the ABS inspector that the sea chests are open, cleaned and ready for inspection. The total area of the sea chests is 420 square meters. All bare surfaces (420 m²) must be inspected and prepared prior to painting.
- 11.3.3.11 The Contractor and the Chief Engineer must inspect the surface preparation prior to the application of any coating and mark areas that require further preparation.
- 11.3.3.12 All marked areas must be re-inspected by the Contractor and the Chief Engineer after remedial work and prior to coating.
- 11.3.3.13 The Contractor must take steel thickness readings at locations identified by the Chief Engineer or the ABS Inspector.
- 11.3.3.14 The Contractor must paint 100% of the surfaces (420 m²).
- 11.3.3.15 All surfaces (420 m²) must be coated with two (2) separate coats of INTERGARD 264 or equivalent anti-corrosive paint of different color (5 mils dry, 6.2 mils wet each) on all internal areas of the sea chests.
- 11.3.3.16 The Contractor must take measurements of the dry film thickness between layers. The Chief Engineer must be present at the tests.
- 11.3.3.17 The Contractor must be reinstal the grids in correct order with news stainless steel fasteners, and secured them with locking devices on all fasteners. The reinstallation of grids must be done once the removal of the temporary guards and final inspection by the chief engineer is completed – with the assistance of the aerial platform operator, if necessary.

Sea Bay

- 11.3.3.18 The Contractor must remove the manhole cover (frame 96), and the drain plugs to allow drainage of the sea bay.. The Contractor must remove all extension pipes. Upon reinstallation, the Contractor must supply and install new gaskets and fasteners. The Contractor must abrasive blast all surfaces of the sea bay and extension pipes in accordance with SSPC-SP-10. Debris generated, including decaying marine species, must be collected and removed from the vessel promptly and as required.
- 11.3.3.19 After cleaning, the Contractor must inform the CCG IA and TA, as well as the ABS inspector, that the sea bay is ready for inspection.

- 11.3.3.20 The Contractor must take steel thickness readings at locations identified by the Chief Engineer or ABS Inspector.
- 11.3.3.21 All bare surfaces (approximately 230 m² including extension tubes) must be cleaned prior to paint application..
- 11.3.3.22 The Contractor must paint 100% of the surface area (approximately 230 m² including extension tubes).
- 11.3.3.23 After inspection, two (2) separate coats of INTERGARD 264 of different colors (5 mils dry ,6.2 mils wet each) must be applied to all surfaces. of the housing; the IA must witness the application of each coat.
- 11.3.3.24 The contractor must replace all anodes.
- 11.3.3.25 After the Contractor has completed inspection, anode replacement, liner repair and replacement, repair work, removal of temporary protection of zinc liners and sensors, etc., and after the final inspection by the Chief Engineer, the Contractot must properly reinstall the docking plugs, and manhole covers with new gaskets to be supplied by the Contractor .
- 11.3.3.26 When the Contractor has satisfactorily completed all work on the sea bay and sea chests and has installed the valves in the correct order, the Contractor must perform hydrostatic test on the seawater tanks must by filling tanks to the overflow vent, in the presence of the Chief Engineer and an ABS inspector. Once the work is completed, the Contractor must replace the plug and weld the safety bar over it, as originally installed.

Port and Starboard Strainers

- 11.3.3.27 Seawater main strainers must be opened for inspection and cleaned to SSPC SP 3, grate holes and strainer plate holes must be mechanically reamed to their original diameter.
- 11.3.3.28 The Contractor and Chief Engineer must inspect the surface preparation prior to the application of any coating and mark areas that require further preparation.
- 11.3.3.29 All marked areas must be re-inspected by the Contractor and chief engineer prior to coating.
- 11.3.3.30 Strainers must be coated with two separate coats of INTERGARD 264 anti-corrosion paint of different colors (5 mils dry ,6.2 mils wet each).

11.3.3.31 The Contractor and the Chief Engineer must inspect the previous coat and areas marked for further preparation between coats. All marked areas must be re-inspected by the Contractor and chief engineer prior to the application of additional coating.

11.3.3.32 The Contractor must take measurements of the dry film thickness between layers. The Chief Engineer must be present at the tests.

11.3.3.33 The Contractor must close all manhole covers with new Contractor supplied fasteners and sealed with a new 1/4" neoprene gasket (CSM)

Evaporator Sea Chest

11.3.3.34 The Contractor must inform the Chief Engineer that the sea chest for the evaporator is open, and cleaned. The Contractor must abrasive blast 100% of the surface in accordance with SSPC-SP-10 and to the satisfaction of the Chief Engineer. The evaporator sea chest must be inspected by the Chief Engineer and the ABS Inspector.

11.3.3.35 The Contractor and Chief Engineer must inspect the surface preparation prior to the application of any coating and mark areas that require further preparation.

11.3.3.36 All marked areas must be re-inspected by the Contractor and chief engineer prior to coating.

11.3.3.37 The Contractor must take steel thickness readings at locations identified by the Chief Engineer or ABS Inspector.

11.3.3.38 The Contractor must paint 100% of the surfaces following the same procedure and using the same products as those used for the potable water tanks item 16.1 The coating must be approved according to NSF 61.

11.3.3.39 Note that there is no anode in the sea chest for the evaporator.

11.3.3.40 The Contractor and the Chief Engineer must inspect the previous coat and areas marked for further preparation between coats. All marked areas must be re-inspected by the Contractor and chief engineer prior to the application of additional coating.

11.3.3.41 The Contractor must take measurements of the dry film thickness between layers. The Chief Engineer must be present at the tests.

11.3.4 Proof of performance

11.3.4.1 Inspection

- 11.3.4.1.1 It is the responsibility of the Contractor to arrange for the presence of the ABS Inspector. The Contractor must provide advance notice to ABS and TA to allow them to attend the inspection.
- 11.3.4.1.2 The NACE TSR must inspect the surface preparation and each coating application of all components, including the work environment, equipment and mixing and application processes. It is the Contractor's responsibility to have the NACE TSR present at the required times to inspect the preparation and applications. At each stage, the coating must also meet the requirements of the Chief Engineer or his delegate.
- 11.3.4.1.3 The Contractor must afford the TA/IA the opportunity for a final visual inspection of the grids, sea bays, sea chests before closing up.
- 11.3.4.1.4 At the time of re-floating and during the hydrostatic test, the Contractor must perform inspections to identify leaks and ensure that no water is leaking. Leaks must be corrected immediately, before the vessel leaves the blocks.

11.3.4.2 Tests

- 11.3.4.2.1 The Contractor must perform a hydrostatic test on the sea bay by filling it to the overflow vent to detect possible leaks.

11.3.5 Deliverables

11.3.5.1 Documentation

- 11.3.5.1.1 The Contractor must provide a “coating application report” from NACE TSR detailing the quality of surface preparation and application of coatings as completed by the Contractor.
- 11.3.5.1.2 The Contractor must submit a report to CCG detailing the work undertaken, defects, repairs made, measurements and readings taken, in PDF format, on an unprotected USB drive.
- 11.3.5.1.3 The contractor must submit a detailed report of the NDT ultrasonic thickness measurement tests performed.

11.3.5.2 Certification

- 11.3.5.2.1 The Contractor must provide a copy of the certification of the NACE TSR.
- 11.3.5.2.2 The Contractor must provide a copy of the certification of the NDT inspector.

Solicitation No. - N° of the invitation
F7049-210340/A
Client Ref. No. - N° de réf. du clientFile
F7049-210340041MD

Amd. No. - N° de la modification
No. - N° du dossier
041md. F7049-210340

Buyer ID - Id de l'acheteur
041MD
CCC No./N° CCC - FMS No./N° VME

11.3.5.2.3 The Contractor must obtain a Division III credit for the internals of the Sea Bay and Sea Chests.

11.4 FLOOR DRAINS (SIPHON)

11.4.1 Identification

The purpose of this item is to replace 40 corroded floor drains on the main deck, upper deck, boat deck and officer's deck

11.4.2 References

11.4.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
108-H-23_25	General arrangement
65-40-01_01 Rev5_Feb-1985	Arrangement of deck drains and scuppers (internal) main deck
65-40-01_02_Rev6-April-1985	Arrangement of deck drains and scuppers (internal) Upper deck
65-40-01_03_Rev5-Sept-1985	Arrangement of deck drains and scuppers (internal) Boat deck
65-40-01_04_Rev2-Fev-1985	Arrangement of deck drains and scuppers (internal) Officer deck and wheelhouse
108-555-H-3510_Rev2 May	Deck Covering Plan
108-H-4410_Rev-12_Nov-1985	Insulation plan
108-555-H-0014 Rev0_Feb-1985	Arrangement of deck drains and scuppers (internal)
108-555-H-0015_1 Rev0 Feb-1984	Fire zones - Upper, forecandle, boat, officers, bridge decks, & wheelhouse floor
108-555-H-0015_2_Rev0_ Nov-1984	Fire zones - Main deck, E.R. flat & Tank Top
002_201-10553-47_rev0	Annual Hazardous Materials Management Follow-up Martha L. Black 2022

11.4.2.2 Regulations and standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations Revision / Date	Title / Description
FSM 7.B.3	Fleet Safety Manual, section on Entry into Confined Spaces
FSM 7.B.4	Fleet Safety Manual, section on Hotworks
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
SA-2½ SSPC SP10	Near White metal blast cleaning
SSPC SP3	Power tool cleaning
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard
CSA W59-08(R2008) -	Welded steel construction
CSA W47.1-09,	Certification of steel fusion welding companies
Standards (SSPC)	Society for Protective Coatings Standards
SOR/2010-120	Marine Occupational Health and Safety Regulations
CAN/CGSB 48.9712	Qualification and Certification of Nondestructive Testing Personnel

11.4.3 Technical Description

General

- 11.4.3.1 The Contractor must furnish all tools, labour, materials and equipment necessary to perform the work described in this specification, unless otherwise is clearly stated.

- 11.4.3.2 Prior to the start of work, the Contractor must consult with the CCG IA on the potential for personnel exposure to hazardous substances such as lead and asbestos in the work area.
- 11.4.3.3 If there is a possibility of personnel exposure to hazardous substances, the Contractor must, prior to the commencement of work, take all necessary precautions in accordance with SOR/2010-120, Rule 245 (Hazard Survey).
- 11.4.3.4 The Contractor must implement safe and appropriate work procedures for working with high lead paints. This includes the use of appropriate PPE, room isolation methods, adequate ventilation with HEPA filters, and waste management and disposal.
- 11.4.3.5 Prior to the commencement of work, the Contractor must ensure that all equipment, machinery, electrical cables, decks/floors, walls and all other equipment in the work area and vicinity are adequately protected from damage and contamination during the work. All damage must be repaired at the Contractor's expense.
- 11.4.3.6 The Contractor must provide personnel to provide fire watch during welding operations. All welding work must be performed in accordance with CCG MSSF Hot Work Procedure 7.B.4.
- 11.4.3.7 During the work, the Contractor must take the necessary measures to contain dust and paint chips, preventing them from entering the vessel's interiors, equipment or ventilation system.
- 11.4.3.8 The Contractor must provide data sheets (MSDS) for paints, coatings, steel, piping, and flooring materials that are supplied by the Contractor to the CCG TA for approval prior to their use.
- 11.4.3.9 All welders must be certified to CSA W47.1.

Work requirements

- 11.4.3.10 The Contractor must replace floor drains at the following locations:

Location	Number of drains
Bathroom in cabin 404	2 drains
Bathroom in cabin 406	2 drains
Bathroom in cabins 400-401	2 drains
Bathroom in cabins 208-212	2 drains
Bathroom in cabin 213	2 drains
Bathroom in cabin 217	2 drains
Bathroom in cabins 216-222	2 drains
Bathroom in cabins 224-234	2 drains
Bathroom in cabins 240-244	2 drains
Bathroom in cabins 229-235	2 drains
Bathroom in cabins 120-124	2 drains
Bathroom in cabins 126-134	2 drains
Bathroom in cabins 129-135	2 drains
Bathroom in cabins 138-146	2 drains
Bathroom in cabins 139-147	2 drains
Bathroom in cabins 148-156	2 drains
Bathroom in cabins 149-157	2 drains
Bathroom of the cabin 165	1 drains
Officer's pantry 201	1 drains
Upper deck front entrances Local port 206	1 drains
Upper deck front entrances Starboard local 207	1 drains
Corridor in front of cabin 208	1 drains
Corridor in front of 201-203	1 drains

Notes:

- The drain in room 206 is located above a cold room (room 111). Therefore, It is necessary to dismantle, repair and reassemble the finish and insulation inside the cold room.

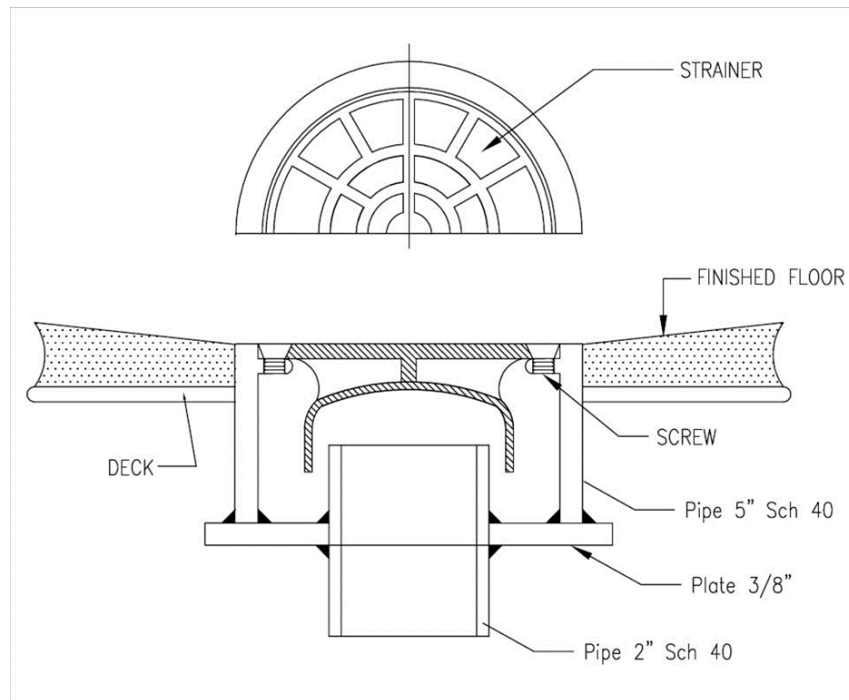
➤ The drain in room 207 is above the kitchen.

- 11.4.3.11 The Contractor must remove the existing drains from the deck.
- 11.4.3.12 The tiles in the lanes in the port and starboard entrances on the upper deck are no longer the original vinyl asbestos laden tiles.
- 11.4.3.13 The Contractor must remove all finishing material and underlayment to the deck steel in a 457 x 457 mm (18"x18") square around the drains at the locations identified.
- 11.4.3.14 The Contractor must remove the ceiling panels under drains to allow access to drains from below. The Contractor must remove any obstructions to allow access for inspection and welding.
- 11.4.3.15 The Contractor must measure the thickness of the exposed metal deck coating using an ultrasonic method. Thickness measurements must be documented and submitted to the CCG TA and IA..

For bidding purposes, the Contractor's bid must include the price for a package of 100 steel thickness readings, as well as unit price to adjust the final price, up or down, by PSPC 1379 process. The unit price must be based on the two following conditions:

- The NDT specialist is already on site; or
- The NDT specialist must be called back on site for additional work, if required. In this case, this unit price must be used only for the first reading, followed by the price in (a) for follow up readings.

- 11.4.3.16 The Contractor must fabricate, supply and install stainless steel drains in accordance with Figure 11.4.1 Floor Drain. The exact dimensions of the floor penetration must be verified prior to fabrication and adjusted to match the height of the existing composite floor underlay. Penetrations must be continuously welded to the deck structure. Note that the new drain connection must be made with Victaulic joints.



11.4.1 Floor Drain

- 11.4.3.17 The Contractor must adjust the height and manufacture each drain according to its location as the overall height of each drain is not identical.
- 11.4.3.18 For each drain, the Contractor must replace the drain pipe from the drain to the first victaulic junction.
- 11.4.3.19 The Contractor must replace some 2-1/2" diameter drain pipes with Victaulic joints.

For bidding purposes, the Contractor's bid must include the price for replacement of a total of 30 m (100 ft) of drain pipes (CSM) with 2-1/2" diameter pipes and Victaulic joints at every 0.9 m (3 ft). The bid must also

include the price for a unit of 3 m (10 ft) including the associated Victaulic joints. The final cost must be adjusted, up or down, by PSPC 1379 process.

- 11.4.3.20 All pipe connections must be continuous butt welds. Threaded pipe connections are not permitted.
- 11.4.3.21 All welds must be continuous.
- 11.4.3.22 When steel decking is replaced, the Contractor must use CWB approved welding methods.
- For bidding purposes, the Contractor's bid must include the price for replacement of one-half (0,5) m² of steel decking (labour and material). The final cost must be adjusted, up or down, by means of PSPC 1379 process.
- 11.4.3.23 The Contractor must provide EN 10204 Type 3.1 factory certificates for all materials. These factory certificates must be submitted to the CCG TA and IA prior to the start of repair work.
- 11.4.3.24 The Contractor must perform dye penetrant inspection of all welds. Inspectors performing and interpreting the results of the penetrant testing must be certified by Natural Resources Canada's (NRCan's) National NDT Certifying Agency in accordance with CAN/CGSB 48.9712, Level 2 or 3.
- 11.4.3.25 The Contractor must repair all weld defects, discovered on their applied welds, at their expense.
- 11.4.3.26 The CCG IA must be allowed to inspect the work after the drains are installed before proceeding with the rest of the work.
- 11.4.3.27 Once the work has been accepted by the CCG TA and IA, the contractor must replace the composite floor structure that was removed. The Contractor must refer to drawing 108/5.55-H-3510 for the structure and thicknesses of the underlay.
- 11.4.3.28 Prior to replacing the composite floor structure, the Contractor must clean the steel structure in accordance with SSPC SP 11.
- 11.4.3.29 The Contractor must apply concrete primer to steel.

- 11.4.3.30 The Contractor must reconstruct the composite floor covering, up to the finish floor, using materials equivalent to the original underlay shown on drawing 108/5.55-H-3510. All materials must have Type Approval from a Transport Canada recognized RO and have an equivalent fire rating for the location as shown on drawings 1.08/5.55-H-0014 and 1.08/5.55-H-0015. Materials must not contain asbestos or ceramic fibres.
- 11.4.3.31 Flooring materials must meet the flame spread and toxicity requirements set forth in Appendix 1 of the IMO 2010 FTP Code; in accordance with paragraph 7 of the 2010 FTP Code, materials tested by methods described in recognized standards equivalent to those listed in the Code are acceptable. The Contractor must submit to the CCG TA and IA technical documentation of insulation materials, including SDS sheets.
- 11.4.3.32 The fire integrity of the deck must not be impaired by the new drain penetration and flooring.
- 11.4.3.33 If necessary, the Contractor must replace the flooring in areas affected by the work with an equivalent product. The Contractor must propose the replacement product to the CCG TA and IA for approval prior to placing orders.
- For bidding purposes, the Contractor's bid must include the price for replacement of one-half (0,5) m² of flooring (labour and material). The final cost must be adjusted, up or down, by means of PSPC 1379 process.
- 11.4.3.34 The joints of the coverings must be sealed or grouted to prevent water infiltration.
- 11.4.3.35 The finished floor surface around the drains must be flush with the edges of the drains.
- 11.4.3.36 The Contractor must replace all insulation, removed to access the drains, with equivalent Type-Approved material suitable for the location.-The Contractor must reinstall all ceiling panels.
- 11.4.3.37 Contractor must remove and dispose of waste from work areas at the end of each work day.
- 11.4.3.38 Upon completion of the work, the Contractor must restore all compartments and work areas to their original clean and functional condition.

11.4.4 Proof of performance

11.4.4.1 Inspection

11.4.4.1.1 The Contractor must perform a 100% visual inspection.

11.4.4.1.2 All welds must be inspected by the ABS inspector and CCG Chief Engineer. The Contractor must provide sufficient prior notice and arrange for their presence.

11.4.4.2 Tests

11.4.4.2.1 The Contractor must perform dye penetrant inspection of all welds. ABS must be present to witness the test.

11.4.4.2.2 The Contractor must perform an ultrasonic examination of the thickness of the drainage pipe and all welded joints. CCG must be present for the test.

11.4.5 Deliverables

11.4.5.1 Documentation

11.4.5.1.1 The Contractor must submit a report to CCG detailing the work undertaken, defects, repairs made, measurements and readings taken, in a format compatible with Microsoft Office Word, on an unprotected USB drive

11.4.5.1.2 The Contractor must submit a report to CCG detailing the results of the visual inspection and dye penetrant testing of the welds. This report must be submitted prior to coating application.

11.4.5.1.3 The Contractor must submit a report to CCG detailing the results of the ultrasonic examination of the thickness of the drainage piping and all welded joints.

11.4.5.1.4 The Contractor must submit to CCG copies of the welding procedures used in the event the steel decking is to be replaced. These procedures must be submitted prior to the start of the welding repair work.

11.4.5.2 Certifications

11.4.5.2.1 The Contractor must submit to CCG the data sheets (MSDS) for paints, coatings, steel, piping, and flooring materials supplied by the Contractor prior to their use.

11.4.5.2.2 The Contractor must submit to CCG copies of EN 10204 Type 3.1 mill certificates for all materials used in steel repair work. These steel mill certificates must be submitted prior to the start of the welding repair work.

- 11.4.5.2.3 The Contractor must submit a copy of the certification of the welders prior to start of any welding work.
- 11.4.5.2.4 The Contractor must provide a copy of the certification of NDT inspector, prior to start of any NDT work.

11.5 REPLACEMENT OF FLOOR COVERINGS

11.5.1 Identification

11.5.1.1 The purpose of this Specification Work Item is to replace the floor coverings in areas specified herein; and also to repair the floating floor in room #161.

11.5.2 References

11.5.2.1 Document

Drawing/Document Number/ Revision	Title / Description
108-H-23_25_T- Rev9_ Sept_2011	General arrangement
65-40-01_01 Rev5_Feb-1985	Arrangement of deck drains and scuppers (internal) main deck
65-40-01_02_Rev6-April-1985	Arrangement of deck drains and scuppers (internal) Upper deck
108-555-H-3510 _Rev2 May-1985	Deck Covering Plan
002_201-10553-47_rev0_	HazMat_NGCC_M-L-Black_20220727

11.5.2.2 Regulation and standard

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations - Revision / Date	Title / Description
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard

11.5.2.3 Work Area Data

Location	Room Number	Floor Area (m ²)
main deck passageways		80
Upper deck passageways		80
Officers' dining room	202	37
Dry stores room	116	23
Canteen	161	8

11.5.3 Technical Description

- 11.5.3.1 The Contractor must provide material and labour to remove and replace the existing floor coverings and moldings.
- 11.5.3.2 The Contractor must note that the yellow floor tiles in rooms #116 and #161 contain asbestos and the Contractor must take the necessary measures to complete this work.
- 11.5.3.3 In room 161, the Contractor must repair part of the A60 floating floor..
- For bidding purposes, the Contractor's bid must include the price to repair 2m² of A60 floating floor, as well as unit price per each 0.5 m². The final cost must be adjusted, up or down, by PSPC 1379 process.
- 11.5.3.4 The Contractor must refer to drawing 108/5.55-H-3510 for the structure and thicknesses of the underlay. Prior to replacing the composite floor structure, the Contractor must clean the steel structure in accordance with SSPC SP 11. The Contractor must apply a concrete primer to the steel. The Contractor must reconstruct the composite floor covering using materials equivalent to the original underlay shown on drawing 108/5.55-H-3510.
- 11.5.3.5 All materials must have type approval from a Transport Canada RO and have an equivalent fire rating for the location as shown on drawings 1.08/5.55-H-0014 and 1.08/5.55-H-0015. The fire integrity of the deck must not be affected by the new flooring.
- 11.5.3.6 Materials must not contain asbestos or ceramic fibers.
- 11.5.3.7 For all surfaces, approximately 230 m², the Contractor must provide the material and labour to repair the leveling of the subfloor. The Contractor must provide and install a Dex-O-Tex underlay approved by Transport Canada, or equivalent. Installation must be in accordance with the manufacturer's instructions.

- 11.5.3.8 The underlay and Dex-O-Tex flooring must be applied in a manner that maintains the original flooring thicknesses as originally installed.
- 11.5.3.9 On all surfaces, approximately 230 m², the Contractor must supply and install a Tarkett Johnsonite IQ Granite seamless floor covering or invisible welded joint, or equivalent, and install a 100 mm (4 in) black vinyl baseboard.
- 11.5.3.10 The Contractor must refer to the general arrangement drawing to validate the surfaces and lengths of baseboards to supply and install.
- 11.5.3.11 All joints must be sealed to prevent water infiltration.

11.5.4 Proof of performance

11.5.4.1 Inspection

- 11.5.4.1.1 The IA must perform a complete visual inspection of the entire new installation.
- 11.5.4.1.2 All work must be completed to the satisfaction of the CCG TA and the Chief Engineer.

11.5.5 Deliverable

11.5.5.1 Documentation

- 11.5.5.1.1 The Contractor must submit a report to the CCG detailing the work undertaken, defects, repairs made, measurements and readings taken, in a format compatible with Microsoft Office Word, on an unprotected USB drive
- 11.5.5.1.2 The Contractor must submit to the CCG TA and IA technical documentation of materials used, including valid marine classification society type approval certificates and MSDS sheets
- 11.5.5.1.3 The Contractor must update the plans affected by the work (As-Fitted).

11.5.5.2 Certification

- 11.5.5.2.1 The Contractor must submit all components and/or equipment certifications or Type Approvals (where applicable) to CCG.

11.6 STEEL WORK - HELICOPTER HANGAR

11.6.1 Identification

11.6.1.1 The purpose of this item is for the Contractor to replace the steel of the hanger anchor to the flight deck, and the rail wells; perform steel work on the hatch cover support/gutter located in the hanger; and and repair the aluminum at the bottom of the fixed section of the hanger. The hanger is a DAF Indal Ltd. aluminum telescopic type (model 1160) with three movable sections, a fixed section, a bulkhead and a workshop.

11.6.1.2 This work includes the complete installation of the new rails and their heating cables. This work will be done in conjunction with item 17.5- Maintenance of the helicopter hanger of this specification

11.6.1.3 The Contractor must provide the services of a Canadian Maritime Engineering Ltd (CME) Field Service Representative (FSR) to supervise the work under this section of the Statement of Work. The Contractor must include an allowance of \$20,000 to cover the cost of the services to be provided by the CME FSR. The \$20,000 allowance must be part of the overall bid and must be adjusted up or down using the PWGSC 1379 form upon receipt of the final invoice from FSR supported by copies of all related documents and invoices to verify actual expenditures

Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses.

Dean Mitchell
Canadian Maritime Engineering Ltd (CME)
90 Thornhill Dr.
Dartmouth, Nova Scotia, B3B 1S3
Tel: 902-468-1888
Cel: 902-225-4342
Email: dmitchell@cmelimited.com

11.6.2 References

11.6.2.1 Documents

Drawing/Document No. <u>Revision / Date</u>	<u>Title / Description</u>
Daf Indal Telescopic aluminium helicopter hangar model-1160	Operation and maintenance manual section 1
H-3_3_Rev0 Nov-1983	Profile and deck- Hangar deck
2858-22-DE500A Rev0 Oct-22	Radoub d'écouille cargo
108-H-4410_Rev-12_Nov-1985	Insulation plan
105-555-H-2730 Rev0_Nov-84	Hatches, Hold & stores AFT
108-555-H-3800-2_Rev0_Fev-1985_	Comp arrangement Upper deck
108H-0008_RevB_Sept-1984	Boat deck plating
108-H-23_25_T- Rev9_ Sept_2011	General arrangement
18-165-001 Rev 1 - CCGS George R. Pearkes (Note 1)	Steel Renewals IWO Helicopter Hangar Tracks
002_201-10553-47_rev0_	HazMat_NGCC_M-L-Black_20220727_sign
Figure 16.3.3	Steel to be replaced (tracks)-Bottom plate
NT-2858-22-DE500A_Rev-0_Oct-2022	Radoub écouille cargo – Remplacement plaques d'acier

Note 1: This document belongs to the sister ship having the same issues with the Helicopter Hanger tracks.

11.6.2.2 Regulation and standard

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations - Revision / Date	Title / Description
FSM 7.B.4	Fleet Safety Manual, section on Hotworks
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
SA-2½ SSPC SP10	Near White metal blast cleaning
SSPC SP3	Power tool cleaning
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard
CSA W59-08(R2008) -	Welded steel construction
CSA W47.1	Certification for companies for fusion welding of steel structures
CSA W47.2	Certification for companies for fusion welding of aluminium structures
Standards (SSPC)	Society for Protective Coatings Standards
SOR/2010-120	Marine Occupational Health and Safety Regulations
TP127	Ship electrical standards
CAN/CGSB 48.9712	Qualification and Certification of Nondestructive Testing Personnel

11.6.2.3 Equipment data

Data extracted from the DAF technical file

Telescopic aluminum helicopter hangar Daf Indal model 1160 with three mobile sections, a fixed section, a partition section and a workshop

Manufactured by Daf Indal Ltd. 3570 Hawkestone Rd. Mississauga, Ontario;

Estimated **Hanger** weight **9440kg** (20767 lbs);

Estimated weight of rails **1,588** (3,500 lbs).

11.6.2.4 Government provided Materiels

11.6.2.4.1 The supports (lifting eyes) used to lift the hanger sections is provided by the vessel. These supports are inside the hanger.

11.6.2.5 Contractor provided Materiel

11.6.2.5.1 Except for the items identified above, the Contractor must furnish all materials, equipment, tools (including scaffolding and crane services), lubricants, paint products, hardware and parts necessary to perform the work indicated. All bolts, nuts, washers, screws and fasteners must be stainless steel. Among other things, the Contractor must supply the following parts: the seals between each section part # 1253-001-47, the phenolic insulating strips that separate dissimilar metals (at the anchorage of the fixed part of the hangar and between the bulkhead section and the superstructure of the vessel) and new wedges and phenolic spacers for the assembly of the rails.

11.6.2.5.2 The Contractor must also supply aluminum to replace the aluminum sections on the bottom of each side (port and starboard) of the fixe section. This aluminum must be 5086 H116 grade.

11.6.3 Technical description

General

- 11.6.3.1 All work related to the replacement of the rails must be done according to the manufacturer's recommendations described in the DAF - Telescopic Aluminium Helicopter Hangar, model 1160" and the CME FSR recommendations in that order of priority.
- 11.6.3.2 The Contractor must identify, remove and temporarily store materials and equipment that interfere with the work. Any equipment or items remaining inside the hanger during the work must be protected. Installed electrical fixtures must also be protected. The Contractor is responsible for repairing or replacing damaged items. Any items moved or removed must be reinstalled in their original location upon completion of the work.
- 11.6.3.3 The Contractor must ensure that all electrical circuits in the hangar are locked out prior to commencing work (e.g. but not limited to: lighting, track heaters, hangar drive system, curtain door open/close system, brakes, limit switches).
- 11.6.3.4 Before the beginning of the work, the Contractor must take measurements of the hanger alignment. These measurements will be used as a reference during reassembly.
- 11.6.3.5 Prior to commencement of work, the Contractor must perform a visual inspection and operational test of the hangar facility and its related equipment to determine if there are any defects. The contractor must submit to CCG TA, the written report of this inspection and test, and advise of defects, if any.
- 11.6.3.6 After completion of the work, the Contractor must restore all premises to their original functional and clean condition.

Telescopic sections and fixed section of the hanger

11.6.3.7 The three moving sections, the fixed section, the bulkhead section and the workshop must be separated, moved and stored safely by the Contractor. This is to allow for the replacement of steel in the shafts and on the deck, as well as the replacement of aluminum. and the installation of new rails. Dismantling, transportation and storage must be done in accordance with the CME FSR's recommendations to avoid stress and deformation of the sections. Prior to commencing work, the Contractor must submit the plan for moving the hangar sections, to the CCG IA, for approval.. The Contractor must ensure that the sections are secured at all times to prevent them from being blown about by the wind. The approximate dimensions of each hangar section is 6.7 m (22 ft) long x 5.18 m (17 ft) width x 6.1 m (20 ft) high, and weight of 1460 kg (3200 lbs).



Figure 16.6.1-Photo of a section of the hanger ready for lifting

11.6.3.8 The Contractor must separate the workshop section from the fixed section before they can be lifted. The Contractor must remove all components that interfere with the dismantling task from the workshop section, this includes, but is not limited to, the fire station, storage lockers attached to the workshop, storage shelves and cabinets inside the workshop, various supports including the zodiac support on top of the workshop etc.

11.6.3.9 In the workshop, the Contractor must remove all the insulation wool on the wall in the workshop to have access to the structure. At the end of the work, the Contractor must redo the insulation on the areas that have been affected by the work.

NOTE: The insulation in this area may contain asbestos; the Contractor must take the necessary measures to work with this material in accordance with applicable regulations and health guidelines.

11.6.3.10 The electrical wiring, between the sections of the hangar and from the ship to the hangar, must be disconnected by the Contractor in order to separate the sections and the shop. The Contractor must check the wiring before removing the sections to ensure that they will not be damaged. Upon reinstallation of the hangar, the Contractor must reconnect all electrical wiring to the helicopter hangar. All wiring must be insulation tested (megger) before and after reinstallation. The Contractor must submit a report of these readings to the CCG IA.

- 11.6.3.11 On the fixed section and bulkhead section, the Contractor must replace the aluminum on the bottom 30cm along the entire length of the fixed section (port and starboard) with 5086H116 aluminum. The new aluminum must be identical to the existing aluminum, including the deck mounting holes.



Figure 16.6.2- Steel and aluminum section to be replaced

- 11.6.3.12 To ensure good adhesion of the paint to the new aluminum surfaces, the Contractor must prepare the surface to obtain a surface profile of 2.0 to 3.0 mils (50-75 microns). Then all surfaces must be cleaned and degreased using an aluminum only product. The Contractor must apply the primer within six (6) hours after cleaning. The Contractor must paint the aluminum according to the following paint code: one (1) coat of Interprime 198, grey (3.0 mils per dry coat); followed by one (1) coat of Interprime 198, white (3.0 mils per dry coat); and then two (2) coats of Interlac 665, white, RAL 9003 topcoat (2.0 mils per dry coat).

Steel replacement of the rail well and on the flight deck

11.6.3.13 Prior to the start of the work, the Contractor must protect the area under which the work will take place, including the floors and walls. The Contractor must temporarily remove all ceiling tiles and accessories including lighting, speakers, detectors, ventilation grills, ventilation ducts, etc; as well as the ceiling support structure and some furniture. The Contractor must remove all insulation from under the shafts and from each side along the entire length, between frames -4 to +45. Upon re-installation, new Roxul SEAROX sl620 insulation or equivalent and the required support must be supplied and installed by the Contractor. The Contractor must refer to the 108/555-H4410 Insulation plan to identify the exact characteristics and thicknesses of the wool to be used. The fire integrity of the deck must not be affected by the new insulation.

NOTE: The insulation in this area may contain asbestos; the Contractor must take the necessary measures to work with this material in accordance with applicable regulations and health guidelines.

11.6.3.14 During the work, the Contractor must protect the electrical cables or disconnect them and coil them temporarily.

11.6.3.15 The Contractor must proceed with the replacement of the steel as described in the Poseidon Marine document document #18-165-001.

11.6.3.16 In addition to the works foreseen in the Poseidon Marine document #18-165-001, the Contractor must replace the steel plates where the fixed section of the hanger is attached to the flight deck and 30cm of the floor plate on each side of this plate (inbord/outboard), on the port and starboard sides.

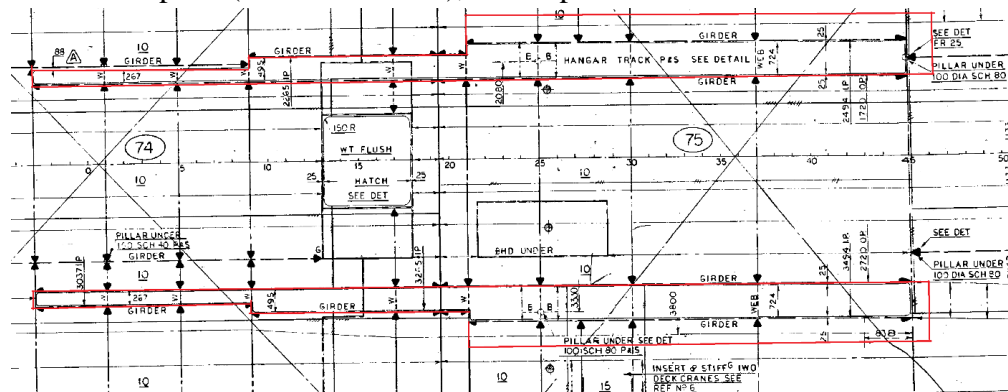


Figure 16.3.3 Steel to be replaced (tracks)

11.6.3.17 The Contractor must replace the scuppers and drains at two (2) locations as well as the drainage pipes along their entire length. Note that the piping is covered with heating cable and insulation (Armaflex). The Contractor must remove and reinstall the heating cable and must insulate the pipes with new Armaflex.

11.6.3.17.1 In the workshop area, the Contractor must replace the four (4) penetrations on the deck used for the water supply for the sink (2), the drainage for the sink and the compressed air supply. The Contractor must also replace the transit block with a Roxtec or approved equivalent.

Rails

- 11.6.3.18 The Contractor must supply and apply "Zinc Chromate" primer (or equivalent) to all aluminum surfaces, which once the rails are installed, will no longer be visible. The Contractor must follow the manufacturer's recommendations for surface preparation and application of this primer.
- 11.6.3.19 The installation of the rails must be carried out according to the recommendations of the manufacturer and under the supervision of the CME FSR by referring to the drawing 1228-7 and the measurements taken (alignment and heights) by the Contractor at the time of the dismantling of the old rails. Phenolic pads must be installed between the steel and the rail components to prevent galvanic reaction between the steel and aluminum. Rails must be installed with new aluminum shims and stainless steel fasteners supplied by CCG (GSM)..
- 11.6.3.20 Alignment measurements must be taken throughout the work using a laser to ensure proper height, alignment, parallelism and straightness of the rails to the flight deck and to each other. A final reading must be taken in the presence of the CCG IA at the completion of the rail installation and prior to continuing the work. Upon completion of the work, the hangar alignment must be checked in the presence of the CCG IA. A report of the measurements must be provided to the IA.
- 11.6.3.21 The racks must be installed on the rails using new fasteners provided by the Contractor.
- 11.6.3.22 The Contractor must install and connect the new heating wires as recommended by the manufacturer and the CME FSR, referring to drawing 1209-14. The heating cables and their retaining bars must be installed by the Contractor at the same time as the rails are installed. The heating cables must be tested for insulation before and after installation.
- 11.6.3.23 After the installation of the rails is completed, the Contractor must proceed with the reinstallation of the hangar and its components under the supervision of CME FSR.

Steel work on the hatch cover support/gutter

- 11.6.3.24 The Contractor must supply and replace the steel hatch cover support/gutter in the helicopter hanger.

11.6.3.25 The Contractor must refer to Navtech NT-2858-22-DE500A document for details on the replacement of the hatch cover support/gutter steel.

11.6.3.26 Figure 11.6-4, below, gives an overview of the work to be done.

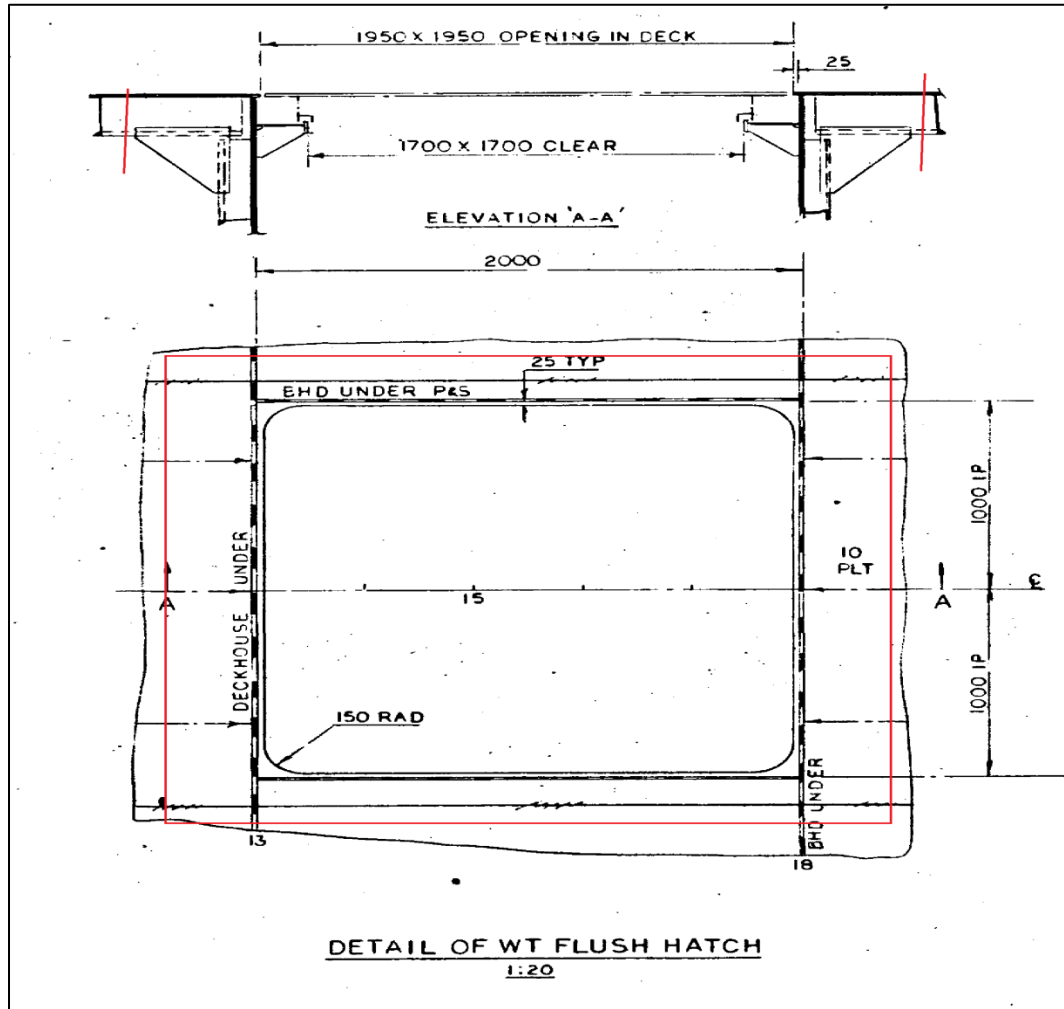


Figure 11.6-4 Watertight hatch

- 11.6.3.27 The Contractor must temporarily remove the shore power electrical panel on the FR13.



Figure 11.6.5 Shore power electrical panel

- 11.6.3.28 The Contractor must provide the vessel with a temporarily alternative power supply for the vessel during the work.
- 11.6.3.29 The Contractor is responsible for the removal and reinstallation of the panel, its components and support.
- 11.6.3.30 The Contractor must remove any items that interfere with access to perform the work. At the end of the work, the Contractor must replace all the elements that have been removed.
- 11.6.3.31 The Contractor must remove the protective sheets for the insulation in compartment 251 and in the emergency exit of the sewage compartment. At the end of the work the Contractor must supply and install new protective sheets which must be repainted in accordance with the ship's paint schedule. The Contractor must supply the paint. The Contractor must remove the insulation in the areas affected by the work in room 251, in the emergency exit of the sewage system room and in the ceiling of the aft corridor of the upper deck. Upon completion of the work the Contractor must supply and install new Roxsul Searox SL620 or approved equivalent wool.

NOTE: The insulation in this area may contain asbestos; the Contractor must take the necessary measures to work with this material in accordance with applicable regulations and health guidelines.

- 11.6.3.32 Referring to Navtech drawing # NT-2858-22-DE500A, the Contractor must cut, remove and replace with a new one, the fixed part of the hatch support/gutter and cover locking system.
- 11.6.3.33 The Contractor must adjust the size and positioning of the opening to be made. The Contractor must verify all measurements prior to commencement of work.
- 11.6.3.34 The Contractor must do paint touch-up in the areas affected by the work.
- 11.6.3.35 The Contractor must replace hatch drains and full length drain piping. Note that the piping is covered with heating cable and insulation (Armaflex). The Contractor must remove and reinstall the heating cable and must insulate the pipes with new Armaflex.

11.6.4 Proof of performance

- 11.6.4.1 Inspection
 - 11.6.4.1.1 All work performed must be completed to the satisfaction of the CME FSR, ABS Inspector and the CCG IA.
 - 11.6.4.1.2 It is the responsibility of the Contractor to inform the ABS inspector of the inspection points for steel replacement.
 - 11.6.4.1.3 A final reading of the hangar and rail alignment must be taken in the presence of the CCG IA. All rail alignment measurements taken during installation must be recorded.
- 11.6.4.2 Test
 - 11.6.4.2.1 After reinstallation of the hangar and all its components, the Contractor must check the hangar, its components and all equipment removed and reinstalled for access for proper operation in the presence of the CCG IA.
 - 11.6.4.2.2 The Contractor must demonstrate proper drainage of the rail drains in the presence of the inspection authority.

11.6.5 Deliverables

11.6.5.1 Documents

- 11.6.5.1.1 Prior to the start of work, the Contractor must provide the TA with all welding procedures to be used for this item of the SOW.
- 11.6.5.1.2 The Contractor must submit, to CCG, a copy of the CME FSR's report upon completion of the work.
- 11.6.5.1.3 The Contractor must provide a report to the CCG IA of the rail and hanger alignment measurements. Measurements must be taken during construction and upon completion of the work.
- 11.6.5.1.4 The Contractor must provide a report of the insulation tests (megger test) of the electrical cables to the CCG IA.
- 11.6.5.1.5 Prior to the end of the contract, the Contractor must submit, to CCG, a comprehensive report detailing the work undertaken, defects, repairs made, measurement, and readings taken.
- 11.6.5.1.6 All reports must be type-written and in an unprotected PDF format; one electronic copy on a USB drive, and one hard-copy must be submitted.

11.6.5.2 Certification

- 11.6.5.2.1 The Contractor must submit, to CCG, all all components and/or equipment certifications or Type Approvals (where applicable) including mill test certificates for steel and aluminium.
- 11.6.5.2.2 The Contractor must submit the following Certificates to CCG, prior to start of the related work:
 - a copy of the certification of the welders
 - a copy of the certification of the NDT specialists (for MPI and Die Penetrate testing)
- 11.6.5.2.3 The contractor must submit to CCG one (1) electronic copy and two (2) hard copies of the inspection certificates along with the original copy bearing the ABS seal.

11.7 WORK IN THE WHEELHOUSE

11.7.1 Identification

11.7.1.1 The purpose of this item is for the Contractor to perform refit work in the wheelhouse. The work consists of the complete removal of insulation on the exterior walls and ceiling, the removal of asbestos around the window frames and structural posts adjacent to the windows, installation of new insulation, replacement of six (6) existing windows with new windows (GSM), maintenance of nine (9) of existing fixed windows, installation of new finishes over the new insulation on the posts and around the window frames, replacement of wall panels and the replacement of the ceiling tiles.

11.7.1.2 This work must be performed in conjunction with the following specification work items:

- 17.2 Derrick crane – 5-Year Maintenance
- 12.4 Replacement of Propulsion Generators
- 18 Electronics works

11.7.1.3 The Contractor must ensure that all requirements specified in the general sections of this SOW are considered and applied to this specification item.

11.7.2 References

11.7.2.1 Documents

Drawing/Document Number/ Revision	Title / Description
108-555-H-0009 Rev0_July-1984	Officers and bridge deck
108-555-H-2860 Rev8_Dec-1984	Windows and sidelight schedule
108-555-H-4080_Rev0-April-1985	Ceiling plan officers deck and wheelhouse
108-555-H-3510_Rev2 May-1985	Deck covering plan
108-555H-4040-01_Rev5_Fev-1985	Linings and partitions officers deck and wheelhouse
108-H-4410_Rev-12_Nov-1985	Insulation plan
108-H-23_25_T- Rev9_Sept_2011	General arrangement
80-18_Rev-10_May-2016_	Power panel P-201 and P-202 One line diagram
80-25 Rev9 Nov-2010	Power deck plan bridge deck and wheelhouse top
80-47 Rev7_ Aug-95	Heating system deck plan
85-07 Rev11_Aug-2007	Lighting deck plan bridge deck and wheelhouse top
86-01 Rev2_Feb-1985	Wireway deck plan bridge deck and wheelhouse
86-9_01 Rev1_Mar-1995	Major electrical equipment bridge deck and wheelhouse
002_201-10553-47_rev0_HazMat	NGCC_M-L-Black_20220727_sign

11.7.2.2 Regulation and standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations - Revision / Date	Title / Description
FSM 7.B.3	Fleet Safety Manual, section on Entry into Confined Spaces
FSM 7.B.4	Fleet Safety Manual, section on Hotworks
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard
SOR/2010-120	Marine Occupational Health and Safety Regulations
TP127	Ship electrical standards

11.7.2.3 Government Supplied Materiel

The following six (6) windows, to be replaced, will be provided by CCG.

Item No.	Description	Quantity
TBD (W009)	Fixed heated window	2
TBD	Controler for heated windows	2
TBD (W007 and W008)	Sliding windows	4

11.7.2.4 Contractor Supplied Materiel

The Contractor must supply all tools, including scaffolding and crane, and materiel required to complete the work of this specification item – unless otherwise has been clearly specified.

11.7.3 Technical Description

General

11.7.3.1 Prior to the commencement of work, the Contractor must identify and photograph all items to be removed. All items to be reinstalled must be properly stored. Any loss or damage resulting from improper removal and/or storage must be replaced or repaired by the Contractor at their expense.

- 11.7.3.2 The Contractor must dismantle and store all components to be reinstalled. The following items must be retained for reinstallation: stainless steel moldings, various outlets, heated window controllers (3), wall telephones, wall lamps, window plexiglass support frames, navigation equipment and controls, retractable sunshades, various supports (binoculars, fire extinguishers, beacon supports, etc.), handrails, wooden window sills and curtain rods; suspended ceiling tiles as well as window, ceiling and wall finishes.
- 11.7.3.3 The Contractor must remove all items that may interfere with the removal of the wall panels, including the sink cabinet on the starboard side aft and the work desk on the port side aft. The Contractor must clearly mark and stow the removed items. Any loss or damage resulting from improper removal and/or storage must be replaced or repaired by the Contractor at their expense. All removed interference items, including window trim items and frames used to install plexiglass on windows, must be reused when installing new windows.
- 11.7.3.4 The Contractor must remove and dispose of all wall panels on exterior walls.
- 11.7.3.5 The Contractor must remove and store all suspended ceiling tiles, to be returned to CCG for use as spare.
- 11.7.3.6 The Contractor must remove the insulation on all exterior walls, all ceiling insulation and insulation around windows and studs.
- 11.7.3.7 The Contractor must cut and remove the six (6) windows that must be replaced which includes four (4) sliding windows and two (2) fixed heated windows. The Contractor must also service nine (9) fixed windows in the wheelhouse.
- 11.7.3.8 For the steel repair work, the Contractor must provide all new ABS approved steel plates (with mill test certificates) required for steel replacement.
- For bidding purposes, the Contractor's bid must include the price for replacing 4.65 m² (50 ft²) of steel at the exterior wheelhouse walls and approximately 15.25 m (50 ft) of angle iron separately. The bid must also include the separate unit prices per meter-square and meter, respectively, for replacement of steel and angle iron. The final cost must be adjusted, up or down, by PSPC 1379 process.

11.7.3.9 All welds must be 100% visually inspected, and NDT tested with Magnetic Particle Inspection (MPI) by a specialized technician. The result of the NDT testing must be recorded and the report be submitted to CCG..

11.7.3.10 All new steel must receive two (2) coats of marine grade primer and two (2) top coats of paint in accordance with the vessel's paint scheme. All repairs must meet IACS Quality Standard No. 47 for ship construction and repair.

11.7.3.11 The Contractor must perform Ultrasonic Testing in the Wheelhouse area.

For bidding purposes, the Contractor's bid must include the price for fifty (50) NDT ultrasonic steel thickness measurements to be taken in the area of the Wheelhouse, as well as unit prices based on the two conditions specified below. The final cost must be adjusted, up or down, by PSPC 1379 process.

- c) The NDT specialist is already on site; or
- d) The NDT specialist must be called back on site for additional work, if required. In this case, this unit price must be used only for the first reading, followed by the price in (a) for follow up readings.

11.7.3.12 There may be a need to replace the existing flooring in the Wheelhouse. If required, the Contractor must replace the existing flooring (Geflor, Model 299A0364), with same or equal, by a certified marine flooring professionals, to the satisfaction of the CCG TA and IA.

For bidding purposes, the Contractor's bid must include the price for replacing 4.65 m² (50 ft²) of wheelhouse flooring, as well as the unit price per meter-square. The final cost must be adjusted, up or down, by PSPC 1379 process.

11.7.3.13 During the removal and installation work, the Contractor must properly seal all window openings to protect the interior from the weather. The Contractor must ensure that all equipment, flooring, equipment controls, etc. are properly protected from damage by weather or the work in progress. This also includes the entire crawl space under the wheelhouse, where all electronics, cables and equipment must be properly enclosed and protected. Any damage resulting from improper protective measures must be repaired by the Contractor at their expense.

11.7.3.14 During cutting and welding, the Contractor must properly ventilate the work areas. Hot work permits must be completed and adhered to during this work.

11.7.3.15 The Contractor must power-tool the areas of new, stripped, or heat-affected steel in accordance with SSPC-SP 3, and paint them with two (2) separate coats of marine grade primer, followed by two (2) separate coats of marine white in accordance with the ships' paint specifications, and as per manufacturer's recommendations.

Removal of insulation and asbestos-containing insulation

11.7.3.16 The Contractor must provide specialized equipment and labor to completely remove the insulation and asbestos-containing insulation on the ceiling and the exterior walls of the wheelhouse, as well as the areas around the window frames and on the adjacent columns. This work must be done in accordance with current standards and applicable regulations in force.

11.7.3.17 The insulation currently in place on the exterior walls and the ceiling is CAFCO Type C Spray-On insulation of 50mm thickness on the walls and 25mm thickness over the angle/members. The total areas to be removed are approximately 44.6 m² (480ft²) for the walls and 80 m² (850 ft²) for the ceiling. This CAFCO insulation may contain traces of chrysolite asbestos on the binding compound that was sprayed on the surface. Insulation containing traces of chrysolite asbestos (Sample S0005) is also present around the window frames and on the adjacent columns. The total surface area is approximately 28.9 m² (300 ft²).

For bidding purposes, the Contractor's bid must include the price for removing and disposing of the asbestos-containing insulation, as detailed above, as well as the unit price per meter-square. The final cost must be adjusted, up or down, by PSPC 1379.

11.7.3.18 The Contractor must clean and prepare all rusted surfaces to receive paint in accordance with SSPC-SP 3, and paint those surfaces with two (2) separate coats of marine grade primer, followed by two (2) separate top coats of paint in accordance with the vessel's paint scheme.

For bidding purposes, the Contractor's bid must include the price for painting 9.3 m² (100 ft²) of surfaces, as detailed above, as well as the unit price per meter-square. The final cost must be adjusted, up or down, by PSPC 1379.

Replacement of four (4) sliding windows and two (2) corner windows

- 11.7.3.19 The Contractor must refer to Drawing No. H-2860 - Window and Sidelight Schedule - for details. The Contractor must note that there is a walkway outside the wheelhouse that may be removed for the purpose of the work. It is the responsibility of the Contractor to provide and install all scaffolding and elevators necessary for the safe and successful completion of all work described in this specification. There are also pulleys and crane cables that may interfere with this work. In conjunction with Section 17.2- Five-Year Maintenance of the Loading Mast - it is the Contractor's responsibility to effectively coordinate all work.
- 11.7.3.20 The Contractor must cut and remove the four (4) existing Beclawat sliding windows, types W007 and W008 on port and starboard sides, and the two (2) existing fixed corner windows type W009, from their current locations. The existing windows are currently welded to the superstructure of the vessel.
- 11.7.3.21 To access some windows, the Contractor must disconnect and remove the bow thruster controls, rudder angle indicator, and searchlight controls to remove the stainless steel sheathing and wooden window sills that cover the window frame bolts. This must be done on both the port and starboard sides of the bridge.
- 11.7.3.22 The Contractor must install the new windows provided by CCG (GSM) in accordance with the manufacturer's instructions, using new fasteners and an approved sealant.
- 11.7.3.23 The new W009 windows provided by CCG have heated glass and will be provided with controllers. The Contractor must provide all materials and labour to install the controllers and make the connections. The Contractor must install the controller for each window on the office panels, recessed into the panel, near the window in an accessible location. The installation must be similar to that for other heated windows. The Contractor is required to obtain the power supply for these new windows from the P201-20 electrical panel on the officer's deck and the cable to be used must be 12AWG. The junction box for the electrical connection between the two windows must be installed in the crawl space.

Maintenance of nine (9) fixed windows

- 11.7.3.24 The Contractor must perform maintenance on nine (9) fixed Beclawat windows on the bridge as identified below:

Type	Description	Quantity
W002	Fixed window 1100mm X 800mm	1
W004	Fixed window 1200mm X 1000mm	4
W006	Fixed window 1200mm X 1000mm with clear view	2
W018	Fixed window 1100mm X 1000mm	2

- 11.7.3.25 The Contractor must lock-out and disconnect all cables necessary to perform the work. The Contractor is responsible for reconnecting and testing them when reinstallation of the windows are completed.
- 11.7.3.26 For each window, the Contractor must remove the glass retainer in accordance with the manufacturer's instructions.
- 11.7.3.27 Once the frame is dismantled, the Contractor must remove each pane from its frame.
- 11.7.3.28 The Contractor must clean each window frame.
- 11.7.3.29 If steel repair work on the frames is required, its cost will be dealt with using the PSPC 1379 process. The Contractor's bid must include the unit price per each 0.5 m length of frame steel repair work.
- 11.7.3.30 The Contractor must provide all materials necessary for the reinstallation of the windows.
- 11.7.3.31 Once the maintenance of the frames is completed, the Contractor must proceed with the reinstallation of the windows and their holding frame.
- 11.7.3.32 After all glass is installed and prior to reinstallation of the insulation and window trim, each window must be hose tested to ensure that it is watertight and that there are no leaks around the sealing faces. The hose test must be witnessed and performed to the satisfaction of the ABS inspector, and the CCG TA, and IA.

Replacement of insulation for the wheelhouse ceiling and walls

- 11.7.3.33 The Contractor must supply and install a new insulation material, including the associated pins to fasten the insulation boards, on the exterior walls and on the ceilings of the wheelhouse. The new insulation must be of type ROXUL Searox SI620 with integrated vapor barrier, or approved equivalent. It must be of 51 mm (2") thickness on the walls, and 25.4 mm (1") thickness on the stiffeners. The Contractor must refer to the 108/555-H4410 Insulation plan to identify the exact characteristics and thickness of the wool to be used.
- 11.7.3.34 The Contractor must install the insulation in accordance with Transport Canada TP 11469, and the insulation manufacturer instructions. Fire integrity of the surfaces must not be affected by the new insulation.

Replacement of the wheelhouse ceiling lining panels

- 11.7.3.35 The Contractor must remove all ceiling lining panels, including the studs where the panels rest, and replace them with a new complete marine ceiling system (CSM) equivalent to the one removed, including supports and moldings. The Contractor must integrate the existing equipment and accessories such as smoke detectors, speakers, etc.
- 11.7.3.36 The maximum length of the new ceiling panels must not exceed 2.4 m (8 ft).

Replacement of wall lining panels

- 11.7.3.37 The Contractor must supply and install new Type-Approved wall panels equivalent to the existing ones. The current panels are of type PA33C50, B-15 Class 50 mm thick Wall Panels PVC/Galv 600mm x 2250mm W80 Woodgrain Color Joiners Isolamine Marine wall panel.
- 11.7.3.38 The Contractor must provide all mounting hardware, top and bottom moldings, and intermediate splice strip.
- 11.7.3.39 During the installation of the new wall panels, the Contractor must supply and install 12 new electric heaters identical to those currently in place, or equal.
- 11.7.3.40 The installation of the new heaters must be similar to the current installation; the heaters must be recessed into the walls to maximize the space for passage.
- 11.7.3.41 The Contractor must install an aluminum capping around the structural posts adjacent to the windows with the following Ayres materials:

- Panels : AYRLITE 2054
- T-section: ACP81247
- Channel deep ACP80360
- Channel mustow ACP2857/83114

11.7.3.42 Figure 11.7-1 shows an example of the final assembly for a post cladding.



Figure 11.7-1: Cladding of a post

11.7.3.43 Upon completion of the work, all of the removed controls must be reinstalled and proven functional. This must be witnessed by the CCG IA. Any control problems due to improper installation must be corrected by and at the expense of the Contractor.

11.7.3.44 The Contractor's bid must include an allowance of \$5,000 for the modification, replacement or repair of any existing wood window sills that the CCG IA determines defective and in need of repair or replacement. The bid must also include the unit price for repair or replacement of one linear meter of window sill. The actual cost must be adjusted, up or down, by PSPC 1379 process.

11.7.3.45 All interference and trim items removed must be reinstalled.

11.7.4 Proof of performance

11.7.4.1 Inspection

11.7.4.1.1 All welds must be 100% visually inspected.

11.7.4.1.2 The installed insulation must be inspected by the CCG IA before closing the ceiling and wall panels.

11.7.4.1.3 Upon completion, the windows, wall and ceiling panels, the reinstalled removed equipment and components must be inspected by the CCG IA., tested and proven functional to the satisfaction of the ABS inspector and CCG.

11.7.4.1.4 All work areas must be thoroughly cleaned at the completion of the work to the satisfaction of the CCG TA.

11.7.4.2 Tests

11.7.4.2.1 All welds must be 100% MPI tested by a certified specialist.

11.7.4.2.2 The Contractor must conduct steel thickness measurements by a certified NDT specialist.

11.7.4.2.3 All new windows must be water jet tested to ensure proper installation and watertightness to the satisfaction of the CCG IA and the ABS inspector. Any deficiencies found must be corrected by the Contractor at their expense; and retested.

11.7.4.2.4 All windows, heated window controllers, heaters, reinstalled equipment and components must be tested and proven functional to the satisfaction of the CCG IA and/or TA.

11.7.5 Deliverables

11.7.5.1 Documents

- 11.7.5.1.1 Prior to the start of work, the contractor must submit, to CCG, all the welding procedures to be used for this work item.
- 11.7.5.1.2 The Contractor must submit, to CCG, a type-written report in unprotected PDF format, of all NDT steel thickness measurements, weld inspections and MPI readings.
- 11.7.5.1.3 The Contractor must update the drawings affected by the work.
- 11.7.5.1.4 Prior to the end of the contract, the Contractor must submit, to CCG, a comprehensive report detailing the work undertaken, defects, repairs made, measurement, and readings taken, in PDF format, on an unprotected USB drive.

11.7.5.2 Certificates

- 11.7.5.2.1 The Contractor must submit the following Certificates to CCG, prior to start of the related work:
 - a copy of the certification of the welders
 - a copy of the certification of the NDT specialists (for UT and MPI)
 - a copy of the certification of the marine flooring specialist
- 11.7.5.2.2 The Contractor must submit, to CCG, all components and/or equipment certifications or Type Approvals (where applicable), including the certificates for new steel (mill test certificate), new paneling, new insulation, new floor coverings, etc.
- 11.7.5.2.3 The contractor must submit, to CCG, one (1) electronic copy and two (2) hard copies of the inspection certificates along with the original copy bearing the ABS seal.

11.8 STEEL WORK - MAIN DECK

11.8.1 Identification

The purpose of this specification item is for the Contractor to replace anchorage for the retaining bars for the wooden deck on the main deck and to replace rings (Weldness ring- rigging component) used to secure equipment on the deck.

11.8.2 References

11.8.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
002_201-10553-47_rev0_HazMat_	HazMat_NGCC_M-L- Black_20220727_sign
108-555H-0005_Rev0 March-1984	Main deck
108-H-23_25_T- Rev9_ Sept_2011	General arrangement
108-H-4410_Rev-12_Nov-1985	Insulation plan

11.8.2.2 Regulation and standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations Revision / Date	Title / Description
FSM 7.B.4	Fleet Safety Manual, section on Hotworks
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
SA-2½ SSPC SP10	Near White metal blast cleaning
SSPC SP3	Power tool cleaning
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard
CSA W59-08(R2008) -	Welded steel construction
CSA W47.1-09,	Certification of steel fusion welding companies
Standards (SSPC)	Society for Protective Coatings Standards
SOR/2010-120	Marine Occupational Health and Safety Regulations
TP127	Ship electrical standards
CAN/CGSB 48.9712	Qualification and Certification of Nondestructive Testing Personnel

11.8.2.3 Contractor Supplied Materiel

The Contractor must supply all tools, including scaffolding, cranes and man-lift, and materiel required to complete the work of this specification item – unless otherwise has been clearly specified.

11.8.3 **Technical Description**

11.8.3.1 In preparation for the work, the Contractor must open, ventilate and arrange for a Marine Chemist or other qualified person, to certify that fuel oil tanks # 3 and #4 are “safe to enter” prior to the start of the cleaning operations, and ready for Hot Work. Note: these tanks will be empty; the small amount of remaining fuel in them will be transferred to other tanks by CCG crew, prior to start of the work. It is the Contractor's responsibility to dry the tanks.

- 11.8.3.2 The Contractor must post a copy of the “Safe for Entry/Safe for Hot Work” certificates, signed by the marine chemist or other qualified person, at the entrance of each tank. A copy of these certificates must also be given to the Chief Engineer. The Contractor must ensure that these certificates are kept valid for the entire period that the tanks are open.
- 11.8.3.3 The Contractor must remove the section of the wooden deck above tanks #3 and #4. Figure 11.8-1 shows a portion of the wooden deck above tanks #3 and #4.
- 11.8.3.4 The Contractor must provide the material and labor to replace the 4 anchors used for the retaining bars of the wooden deck above tanks #3 and #4. Note that the four anchors are welded to the deck. Figure 11.8-2 shows the anchorage of one of the retaining bars.
- 11.8.3.5 The Contractor must provide material and labor to replace 5 rings (Weldness ring) and fasteners, used to secure material on the main deck. The new rings must be similar to those currently in place and must be rated for a load of 5000 kg each. The installation type must be of 'floating ring in fixed ring' . Figure 11.8-3 shows one of the rings to be replaced.



Figure 11.8-1 Wooden deck on the Main deck



Figure 111.8-2 Anchorage of a retaining bar



Figure 11.8-3 Weldness ring

- 11.8.3.6 The new rings must be supplied with a certificate.
- 11.8.3.7 For bidding purposes, the Contractor's bid must include the price to replace 6.1 m (20 ft) of steel angle (3x3 x ¼") retainer for the wooden deck, as well as the unit price per each 0.4 m (1 ft). The final cost must be adjusted, up or down, by PSPC 1379 process. The steel angles are visible around the perimeter of the wooden deck in Figure 11.8-1.

11.8.3.8 Upon completion of the work, the Contractor must touch up the paint in the areas affected by the work in accordance with the ship's paint scheme.

11.8.3.9 The Contractor must reinstall the wooden deck. The Contractor may have to make adjustments to the wood planks for the reinstallation

11.8.4 Proof of Performance

11.8.4.1 Inspection

11.8.4.1.1 The Contractor must present the Contractor-supplied materiel, to be used to complete the work, to the CCG TA and/or IA for inspection and approval.

11.8.4.1.2 The Contractor, in presence of the CCG TA and/or IA, must perform visual inspection of all welds.

11.8.4.2 Tests

11.8.4.2.1 All welds must be 100% MPI tested by a certified specialist.

11.8.4.2.2 The Contractor must perform a load test on all new rings in the presence of the CCG TA and/or IA.

11.8.5 Deliverables

11.8.5.1 Documents

11.8.5.1.1 Prior to the start of work, the contractor must submit, to CCG, all the welding procedures to be used for this specification work Item.

11.8.5.1.2 The Contractor must submit, to CCG, the report of the load tests performed on the rings.

11.8.5.1.3 The Contractor must provide CCG with all non-destructive testing (NDT) weld inspection reports.

11.8.5.1.4 Prior to the end of the contract, the Contractor must submit, to CCG, a comprehensive type-written report detailing the work undertaken, defects, repairs made, measurement, and readings taken, in PDF format, on an unprotected USB drive.

11.8.5.2 Certifications

11.8.5.2.1 The Contractor must submit, to CCG, all components and/or equipment certifications or Type Approvals (where applicable), including the certificates for new steel (mill test certificate), and new rings, etc.

11.8.5.2.2 The Contractor must submit, to CCG, the disposal certificates for the removed/disposed lubricating oil and residual and/or contaminated liquids.

11.8.5.2.3 The Contractor must submit the following Certificates to CCG, prior to start of the related work:

- a copy of the certification of the welders
- a copy of the certification of the NDT specialists (for MPI and Die Penetrate testing)
- a copy of the certificate of competency of the person taking the air samples for certifying safe entry for tanks

11.9 STEEL WORK - BOAT DECK

11.9.1 Identification

The purpose of this specification item is to replace two corroded steel plates on the boat deck in rooms 328 and 330.

11.9.2 References

11.9.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
NT-2854-22-DE500A	Radoub rooms 328 and 330 - Replacement of steel plates
108-H-23_25_T- Rev9_ Sept_2011	General arrangement
108-H-4410_Rev-12_Nov-1985	Insulation plan
108-555-H-4060_Rev0_April-1985	Ceiling plan upper deck
108H-0008_RevB_Sept-1984	Boat deck plating
108-555-H-3800-2_Rev0_Fev-1985_	Comp arrangement Upper deck R
002_201-10553-47_rev0	HazMat_NGCC_M-L- Black_20220727_sign

11.9.2.2 Regulations and Standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations Revision / Date	Title / Description
FSM 7.B.4	Fleet Safety Manual, section on Hotworks
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
SA-2½ SSPC SP10	Near White metal blast cleaning
SSPC SP3	Power tool cleaning
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard
CSA W59-08(R2008) -	Welded steel construction
CSA W47.1-09,	Certification of steel fusion welding companies
Standards (SSPC)	Society for Protective Coatings Standards
SOR/2010-120	Marine Occupational Health and Safety Regulations
TP127	Ship electrical standards
CAN/CGSB 48.9712	Qualification and Certification of Nondestructive Testing Personnel

11.9.2.3 Contractor Supplied Materiel

The Contractor must supply all tools, including scaffolding, cranes and man-lift, and materiel required to complete the work of this specification item – unless otherwise has been clearly specified.

11.9.3 **Technical Description**

11.9.3.1 The Contractor must remove all materials and equipment from rooms 328, 330 and the adjacent spaces, that may interfere with the work.

11.9.3.2 Upon completion of the work, the Contractor is responsible for reinstalling all removed equipment.

11.9.3.3 In Room 328, the Contractor must temporarily remove the MCC4 electrical panel and its base. The Contractor must remove all components that interfere with the removal of the MMC4 panel.

- 11.9.3.4 In room 316 the Contractor must temporarily remove the breathing air compressor and its holder.
- 11.9.3.5 Prior to the commencement of work, the Contractor must adequately protect all surfaces, equipment, supplies and accessories that may be damaged by the work.
- 11.9.3.6 The contractor must adequately protect all material in cabins 216, 222 and the adjacent corridor.
- 11.9.3.7 The contractor must remove the insulation wool from the ceiling.
- NOTE: The insulation in this area may contain asbestos; the Contractor must take the necessary measures to work with this material in accordance with applicable regulations and health guidelines.
- 11.9.3.8 Upon completion of the work, the contractor must supply and install a new insulation type Roxul searox SL620 or approved equivalent.
- 11.9.3.9 The Contractor must replace the two steel plates and two wall bottoms as identified on Navetech drawing 2854-22-500. The Contractor must double check all measurements before the beginning of the work.
- 11.9.3.10 All welds must be made with full penetration.
- 11.9.3.11 In room 328, the Contractor must replace the floor drain following the same procedure as described in item 11.4 of these specifications.
- 11.9.3.12 In room 328, the Contractor must replace two floor wire grommets with Roxtec grommets. One of the grommets must be relocated. See Navtech plan.
- 11.9.3.13 The Contractor must touch up the paint in all areas affected by the work in accordance with the ship's paint scheme, and paint manufacturer's recommendations.

11.9.4 Proof of Performance

- 11.9.4.1 Inspection
- 11.9.4.1.1 The Contractor must present the Contractor-supplied materiel, to be used to complete the work, to the CCG TA and/or IA for inspection and approval.
- 11.9.4.1.2 The Contractor, in presence of the CCG TA and/or IA, must perform visual inspection of all welds.

11.9.4.1.3 Prior to floor reconstruction, the CCG IA/AT must visually inspect all deck penetrations.

11.9.4.1.4 The installed insulation must be inspected by the CCG IA before application of the stainless steel sheeting, and thereafter before closing the ceiling panels.

11.9.4.2 Tests

11.9.4.2.1 All welds must be 100% MPI tested by a certified specialist.

11.9.4.2.2 The Contractor must demonstrate, to the CCG IA and/or TA, that all reinstalled equipment that were previously dismantled are functional. The Contractor must pay particular attention to the direction of rotation of the electric motors of the fans powered by the MCC4.

11.9.5 Deliverables

11.9.5.1 Documents

11.9.5.1.1 Prior to the start of work, the contractor must submit, to CCG, all the welding procedures to be used for this specification work item.

11.9.5.1.2 The Contractor must provide CCG with all non-destructive testing (NDT) weld inspection reports.

11.9.5.1.3 The Contractor must provide a report detailing the functional tests performed on the reconnected equipment.

11.9.5.1.4 Prior to the end of the contract, the Contractor must submit, to CCG, a comprehensive type-written report detailing the work undertaken, defects, repairs made, measurement, and readings taken, in PDF format, on an unprotected USB drive.

11.9.5.2 Certification

11.9.5.2.1 The Contractor must submit the following Certificates to CCG, prior to start of the related work:

- a copy of the certification of the welders
- a copy of the certification of the NDT specialists

11.9.5.2.2 The Contractor must submit, to CCG, all components and/or equipment certifications or Type Approvals (where applicable), including the certificates for new steel (EN 10204 Type 3.1 mill test certificate) prior to start of the work.

Solicitation No. - N° of the invitation
F7049-210340/A
Client Ref. No. - N° de réf. du clientFile
F7049-210340041MD

Amd. No. - N° de la modification
No. - N° du dossier
041md. F7049-210340

Buyer ID - Id de l'acheteur
041MD
CCC No./N° CCC - FMS No./N° VME

11.10 PAINTING – TWEEN DECK.

11.10.1 Identification

11.10.1.1 The objective of this specification item is for the Contractor to perform a complete abrasive blasting of the tween deck at the upper deck level from frame 12 to 1132; and apply an International compatible coating product in accordance with the ship's color scheme. This specification work item also includes the replacement of the insulation on the tween deck ceiling between frames 75 and 113 on the port side and between frames 88 and 113 on the starboard side.

11.10.1.2 The Contractor must engage the services of an independent NACE inspector (level 2) to verify that surface preparation and storage, and coating preparation and application, meet the manufacturer's minimum specifications.

11.10.2 References

11.10.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
108-H-23_25 rev 9	General arrangement
108/555-H-4410 Rev 12	Insulation plan

11.10.2.2 Regulation and standard

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations Revision / Date	Title / Description
FSM 7.B.4	Fleet Safety Manual, section on Hotworks
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
SA-2½ SSPC SP10	Near White metal blast cleaning
SSPC SP3	Power tool cleaning
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard
CSA W59-08(R2008) -	Welded steel construction
CSA W47.1-09,	Certification of steel fusion welding companies
Standards (SSPC)	Society for Protective Coatings Standards
SOR/2010-120	Marine Occupational Health and Safety Regulations
CAN/CGSB 48.9712	Qualification and Certification of Nondestructive Testing Personnel

11.10.2.3 Contractor Supplied Materiel

The Contractor must supply all tools, including scaffolding, cranes and man-lift, lighting, materiel and services required to complete the work of this specification item – unless otherwise has been clearly specified.

11.10.3 Technical Description

Preparations

11.10.3.1 The Contractor must provide and install a temporary shelter to encapsulate the tween deck. This shelter must be removed at the completion of the painting work.

11.10.3.2 The Contractor must remove all insulation from the ceilings in the tween deck between frames 75 and 113 on the port side and between frames 88 and 113 on the starboard side. The Contractor must remove all galvanized steel protection sheets over the insulation, as well as all the brackets that are used to secure the galvanized steel protection sheets.

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- 11.10.3.3 The Contractor must furnish and install new 304 stainless steel angles to support the new sheets that will replace the galvanized steel sheets. There must be a sufficient number of angles for the application.
- 11.10.3.4 The Contractor must supply and install pins to secure the new insulation.
- 11.10.3.5 The Contractor must install the insulation in accordance with Transport Canada TP 11469, and the insulation manufacturer instructions. Fire integrity of the surfaces must not be affected by the new insulation.
- 11.10.3.6 The Contractor must cover all deck machinery and equipment, including all components that could be damaged by abrasive blasting, as well as openings in the vessel, to prevent penetration of blasting debris. The Contractor must remove all protection after coating operations.
- 11.10.3.7 The Contractor must plug all scuppers, cover all deck outlets and take other necessary precautions to prevent liquids from contaminating surfaces that are being primed or painted. The Contractor must also make every effort to ensure that the preparation process or paint coat applications do not result in damage, unnecessary cleanup, or repairs. It is important to ensure that the blasts used for stripping cannot enter any area of the vessel including ventilation systems. The Contractor must remove all overspray from the vessel resulting from this work. The Contractor must remove all coverings once the coating is applied and sufficiently dry.
- 11.10.3.8 The Contractor must provide safe access to the areas covered by this specifications where the work is to be performed, including storage and mixing areas, to the extent that the NACE FSR deems such access is necessary to verify that surface preparation and coating are in accordance with the specifications, as well as the storage, preparation and application of materials.
- 11.10.3.9 The Contractor and the CCG TA must inspect the surface preparation prior to the application of any coating and mark areas that require further preparation.
- 11.10.3.10 All marked areas must be re-inspected by the Contractor and the CCG TA prior to coating application.
- 11.10.3.11 The entire surface, an area of approximately 1200 m² must be Abrasive blasted to SSPC-SP-10 standard in preparation for the application of coatings listed below. If oxidation occurs during the period between blast cleaning and coating application, the surface must be re-stripped in accordance with the surface preparation standard indicated.

- *Walls and ceilings: Two coats of Intergard264 primer on all bare surfaces, apply 125 microns of dry film per coat, and two coats of Interthane 990 (red/white on exterior walls and white on interior walls), apply 60 microns of dry film per coat.*
- *Floor: Four coats of Interbond 501, RAL3011 Apply 125microns per dry coat.*

For bidding purposes, the Contractor's bid must include separate prices for:

- *Abrasive blasting of approximately 1200 m² to SSPC-SP-10 standard, and unit price per meter square.*
- *Coating the walls and ceilings of approximately 960 m²as indicated above, and the unit price per meter square;*
- *Coating the floor of approximately 240 m²as indicated above, and the unit price per meter square.*

The final cost must be adjusted, up or down, by PSPC 1379 process.

11.10.3.12 The Contractor and the CCG IA or TA must inspect the previous coat and areas marked for further preparation between coats. All marked areas must be re-inspected by the Contractor and CCG prior to the application of any additional coatings.

11.10.3.13 Upon completion of the painting, the Contractor must supply and install new Roxul searox sl620 insulation or equivalent with marine approval, on all ceiling surfaces in the tween deck between frames 75 and 113 on the port side and between frames 88 and 113 on the starboard side. The insulation used must be Type-Approved, free of asbestos or ceramic fiber, and must be compatible with the materials already in use on the vessel. The Contractor must refer to the 108/555-H4410 Insulation Plan to identify the exact characteristics and thickness of the wool to be used.

11.10.3.14 The Contractor must install the insulation in accordance with Transport Canada TP 11469, and the insulation manufacturer instructions. Fire integrity must not be affected by the new insulation.

11.10.3.15 Following the installation of the insulation, the Contractor must supply and install 1/16" thick 304 stainless steel protection sheets on the entire surface where the wool insulation is installed.

11.10.4 **Proof of Performance**

11.10.4.1 Inspection

11.10.4.1.1 The Contractor must retain the services of an independent NACE consultant inspector level 2 to verify that surface preparation is in accordance with the manufacturer's specifications and instructions, as well as the storage, preparation and application of materials.

11.10.4.1.2 The NACE inspector must inspect the surface preparation and each coating application of all components, including the work environment, equipment and mixing and application processes. It is the Contractor's responsibility to have the NACE inspector present at the required times to inspect the preparation and applications. At each stage, the coating must also meet the requirements of the Chief Engineer or his delegate.

11.10.5 **Deliverables**

11.10.5.1 Tests

11.10.5.1.1 The NACE FSR must inspect the surface preparation and storage, and coating preparation and application.

11.10.5.1.2 The CCG IA or TA inspect the surface preparation prior to the application of any coatings, and re-inspect all areas marked for further preparations.

11.10.5.1.3 The Contractor must present the Contractor-supplied materiel, to be used to complete the work, to the CCG TA and/or IA for inspection and approval.

11.10.5.1.4 The installed insulation must be inspected by the CCG IA before application of the stainless steel sheeting, and thereafter before closing the ceiling panels.

11.10.5.1.5 Upon completion of work, the reinstalled removed equipment and components must be inspected by the CCG IA, tested and proven functional to the satisfaction of CCG.

11.10.5.1.6 Upon completion of the work, the CCG IA must inspect scuppers to be unplugged, and deck outlets to be uncovered.

11.10.5.2 Documents

11.10.5.2.1 The Contractor must prepare a report that identifies the surfaces painted, the products and volumes used, the final thickness measurements of the coatings applied, the atmospheric conditions (temperature, humidity, dew point) and the temperature at the time of paint application.

11.10.5.2.2 The Contractor must submit, to CCG, the report produced by the NACE FSR detailing the various inspections, the quality of surface preparation and application of coatings.

11.10.5.2.3 Prior to the end of the contract, the Contractor must submit, to CCG, a comprehensive type-written report detailing the work undertaken, defects, repairs made, measurement, and readings taken, in PDF format on an unprotected USB drive.

11.10.5.3 Certifications

11.10.5.3.1 The Contractor must submit, to CCG, all components and/or equipment certifications or Type Approvals (where applicable).

11.10.5.3.2 The Contractor must submit the following Certificates to CCG the credentials of the NACE FSR.

11.11 HULL THICKNESS MEASUREMENT

11.11.1 Identification

- 11.11.1.1 The purpose of this item is for the Contractor to conduct a structural inspection of the hull via thickness measurement in accordance with the requirements of the classification society ABS and in compliance with the Special Survey # 4 for general dry cargo vessels 15 years of age or older.
- 11.11.1.2 The Contractor must retain the services of a certified NDT technician to take the ultrasonic measurements. The NDT technician and the measuring devices used must have valid certification from ABS or another Transport Canada RO..
- 11.11.1.3 For bidding purposes, the Contractor's bid must include a fixed price for all work set out in this specifications work item. The Contractor's bid must also include a unit prices, for taking additional measurements, based on the following two conditions:
- a) All the required scaffolding and/or lifts are still in place, and the NDT specialist is already on site; or
 - b) All the required scaffolding and/or lifts are still in place, but the NDT specialist must be called back on site for additional work, if required. In this case, this unit price must be used only for the first reading, followed by the price in (a) for follow up readings.

11.11.2 Reference

- 11.11.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
108-555-H-0002_Rev1_Mars-1984	Framing expansion
H-2_1_Rev0_ Nov-1983	Construction sections -Fore body
H-2_2_Rev0_ Nov-1983	Construction sections- Aft body
H-2_3_Rev1_ Nov-1983 ds	Construction sections- Bulkheads
H-3_1_Rev0_ Nov-1983	Profile and decks profiles- ER flat and Tank top
H-3_2_Rev0_ Nov-1983	Profile and decks profiles- Main deck and above
H-3_3_Rev0_ Nov-1983	Profile and decks profiles-
108-555-H-0003_Rev1_Mar-1989	Tank top & double bottom
108-555H-0005_Rev0_Mars-1984	Main deck
108-555H-0006_Rev0_Mars-1984	Main W.T Bulkheads below main deck
71-50-01_Rev5_April-1985	Arrangement overboard discharges
002_201-10553-47_rev0_HazMat	HazMat_NGCC_M-L-Black_20220727_sign
part_7_e-nov07	ABS Rules

11.11.2.2 Regulation and standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in order of priority, to the work performed in this section.

Standards & Regulations Revision / Date	Title / Description
ABS Rules - Part 7	SURVEY AFTER CONSTRUCTION
CAN/CGSB 48.9712	Qualification and Certification of Non-destructive Testing Personnel

11.11.2.3 Contractor Supplied Materiel

The Contractor must supply all tools, including scaffolding, cranes and man-lift, and materiel required to complete the work of this specification item – unless otherwise has been clearly specified.

11.11.3 Technical Description

- 11.11.3.1 The Contractor must take thickness measurements in accordance with the provisions of the ABS rules. The requirements governing thickness measurement are defined in Part 7: Rules for survey after construction under section 7-3-2, Hull surveys / Vessels for unrestricted service. Thickness measurements must be taken in compliance with special survey #4 for general dry cargo vessels 15 years of age or older.
- 11.11.3.2 The Contractor must take representative readings of the condition of all ice belt strakes.
- 11.11.3.3 The Contractor must also take thickness measurements at four points on each hull penetration for overboard discharge.
- 11.11.3.4 The Contractor must supply all equipment and labor required to assist the inspector, NDT specialist and the CCG IA in gaining access to the exterior and interior portions of the vessel's hull and structure that need to be surveyed, including clearing away interference items.
- 11.11.3.5 Gas freeing and certification of tanks as safe to enter must be included in the Contractor's work, where necessary.
- 11.11.3.6 The Contractor must provide an approved work platform or lift service so that the ABS inspector can thoroughly inspect the hull and internal structure, and for the NDT specialist to conduct the ultrasonic thickness measurement.
- For bidding purposes, the Contractor 's bid must include the price for use of an approved mechanical lift, including operator, for a 30-hour period, and must specify the unit cost per hour for use of the lift and operator services to adjust the final cost, up or down, by PSPC 1379 process.
- 11.11.3.7 The Contractor must do paint touch-ups at all locations where the steel has been exposed for thickness measurement. Paint touch-ups must be compatible with the existing paint scheme and comply with the paint manufacturer's requirements. The Contractor must supply the paint.

11.11.4 Proof of Performance

11.11.4.1 Inspection

11.11.4.1.1 Prior to commencing work, the Contractor and the CCG IA must inspect and approve all scaffoldings and lifts for being safe to use.

11.11.4.2 Tests

As described within this specification.

11.11.5 Deliverables

11.11.5.1 Documents

11.11.5.1.1 Prior to commencing work, the Contractor must supply a drawing indicating thickness measurement locations to the ABS inspector and the IA for their approval.

11.11.5.1.2 The Contractor must provide the CCG IA with the proof of calibration of its ultrasonic measuring device(s).

11.11.5.1.3 The Contractor must supply the CCG with a typed copy of a structural thickness report, in PDF format, on an unprotected USB drive. For each thickness measurement, the report must indicate the following at minimum: thickness measurement location, current steel thickness, percentage steel loss and original steel thickness. Each ultrasonic shot must be identified on a structural drawing of the vessel.

11.11.5.2 Certification

11.11.5.2.1 The Contractor must provide a copy of the certification of the NDT specialist.

11.11.5.2.2 The contractor must submit, to CCG, one (1) electronic copy and two (2) hard copies of the inspection certificates along with the original copy bearing the ABS seal.

Solicitation No. - N° of the invitation
F7049-210340/A
Client Ref. No. - N° de réf. du clientFile
F7049-210340041MD

Amd. No. - N° de la modification
No. - N° du dossier
041md. F7049-210340

Buyer ID - Id de l'acheteur
041MD
CCC No./N° CCC - FMS No./N° VME

12.0 PROPULSION AND MANEUVERING SYSTEMS

12.1 NOT USED

12.2 PROPELLER SHAFT MECHANICAL SEAL

12.2.1 Identification

- 12.2.1.1 The objective of this specification work item is to inspect and test, and, if necessary, do maintenance on the mechanical seals of the propeller shafts.
- 12.2.1.2 The Contractor must provide the services of a Wartsila Field Service Representative (FSR) to perform the work under this section of the Statement of Work. The Contractor must include an allowance of \$20,000 to cover the cost of the services to be provided by the Wartsila FSR. The \$20,000 allowance must be part of the overall bid and must be adjusted up or down using the PSPC 1379 process upon receipt of the final invoice from FSR supported by copies of all related documents and invoices to verify actual expenditures.
- Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses.
- 12.2.1.3 In addition to including the cost of labour, material and equipment related to the part of work to be performed by the Contractor, the Contractor's bid must include the price for a total of 50 hours of work, by the Shipyard personnel, to assist the FSR. This price must be adjusted, up or down, by means of PSPC 1379 process based on the actual hours spent assisting the FSR. For this purpose, the Contractor must submit invoice supported by timesheets signed by the FSR, confirming actual time worked, and other related documents, if necessary.

12.2.2 References

12.2.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
H71756	GA OF 560 MOD 559.97 TYPE MD SEAL
60.10.01	Shafting arrangement and details

12.2.2.2 Regulations and standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations - Revision / Date	Title / Description
FSM 7.B.3	Fleet Safety Manual, section on Entry into Confined Spaces
FSM 7.B.4	Fleet Safety Manual, section on Hotworks
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
SA-2½ SSPC SP10	Near White metal blast cleaning
SSPC SP3	Power tool cleaning
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard
CSA W59-08(R2008) -	Welded steel construction
CSA W47.1-09, Standards (SSPC)	Certification of steel fusion welding companies Society for Protective Coatings Standards
CAN/CGSB 48.9712	Qualification and Certification of Nondestructive Testing Personnel

12.2.3 Technical Description

- 12.2.3.1 The Contractor must provide the services of a Wartsila FSR to perform the work in this section of the SOW.
- 12.2.3.2 Prior to disassembly, the Contractor must check the condition of the shaft mechanical seals. The Contractor must perform a static test on the mechanical seals.
- 12.2.3.3 The Contractor must check for leakage.
- 12.2.3.4 The Contractor must release compressed air and isolate water cooling systems and compressed air system.

- 12.2.3.5 The Contractor must disassemble the retaining rings and remove the mechanical seals.
- 12.2.3.6 The Contractor must clean the surfaces of the mechanical seals and submit them to the GC TA and ABS for inspection.
- 12.2.3.7 The Contractor must then reinstall the mechanical seals.
- 12.2.3.8 The Contractor must apply 5 bar of air pressure to the inflatable joint.
- 12.2.3.9 The Contractor must check and adjust the alignment of the components and inspect all mechanical seals.
- 12.2.3.10 If new parts are required for reinstallation, they will be provided by the Coast Guard (GSM).
- 12.2.3.11 The Contractor must check the operation of the cooling water system and the compressed air system.

12.2.4 Proof of performance

12.2.4.1 Inspection :

The Contractor must observe the following inspection Hold Points:

- 1st Hold point: Initial condition check of the mechanical seals
- 2nd Hold point: Dismantling and inspection of the components before cleaning
- 3rd Hold point: Inspection of the parts after cleaning and before installation

12.2.4.2 Dry dock testing:

- 12.2.4.2.1 The Contractor must perform a static pressure test on both mechanical seals prior to the vessel's return to the water. ABS, CCG IA/TA and the FSR must be present during this test.
- 12.2.4.2.2 The Contractor must test the shaft seals to ensure that there are no leaks prior to undocking the vessel. The Contractor must repair any leak before the vessel is afloat at no charge to CCG.

12.2.4.3 Sea trials :

12.2.4.3.1 When the vessel is afloat, the Contractor must test the seals with seawater pressure. ABS, CCG IA/TA and the FSR must be present during this test.

12.2.4.3.2 The Contractor must make sure the assembly is properly aligned.

12.2.4.3.3 During the sea trials the Contractor must ensure that there is no overheating or leaks.

12.2.4.3.4 Any abnormalities that are noted during the sea trials and are a result of the Contractor's work must be rectified by the Contractor prior to the final completion of the work at no cost to CCG.

12.2.5 Deliverables

12.2.5.1 Documents

Prior to the end of the contract, the Contractor must submit a Type-written comprehensive report detailing the work undertaken, defects, repairs made, measurements, and readings taken, in PDF on an unprotected, USB drive, to TA GC.

12.3 BOW THRUSTER – 5-YEARS INSPECTION

12.3.1 Identification

12.3.1.1 The purpose of this Work Item is for the Contractor to perform the 5-year Survey Inspection and perform the required preventive maintenance work, for the 5-year period, identified in the Bow Thruster Operation & maintenance manual. The work of this specification item must be inspected by ABS, and ABS credit be obtained. Also, for the Contractor to re-weld the stainless steel joints on the wear ring, if necessary following the inspection.

12.3.1.2 The Contractor must supply all tools, labour necessary to complete work in this section.

12.3.1.3 The Contractor must provide the services of a Wartsila FSR to perform the work, with the assistance of the shipyard, under this section of the Statement of Work. The Contractor must include an allowance of \$35,000 to cover the cost of the services to be provided by the Wartsila FSR. The \$35,000 allowance must be part of the overall bid and must be adjusted up or down using the PWGSC 1379 form upon receipt of the final invoice from FSR supported by copies of all related documents and invoices to verify actual expenditures.

Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses.

12.3.1.4 In addition to including the cost of labour, material and equipment related to the part of work to be performed by the Contractor, the Contractor's bid must include the price for a total of 100 hours of work, by the Shipyard personnel, to assist the FSR. This price must be adjusted, up or down, by means of PSPC 1379 process based on the actual hours spent assisting the FSR. For this purpose, the Contractor must submit invoice supported by timesheets signed by the FSR, confirming actual time worked, and other related documents, if necessary.

12.3.2 References

12.3.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
PAAF589818_TT-FF (DBAE628355)	Transverse Thruster system, Operation & maintenance manual

12.3.2.2 Regulations and standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations - Revision / Date	Title / Description
FSM 7.B.3	Fleet Safety Manual, section on Entry into Confined Spaces
FSM 7.B.4	Fleet Safety Manual, section on Hotworks
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
SA-2½ SSPC SP10	Near White metal blast cleaning
SSPC SP3	Power tool cleaning
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard
CSA W59-08(R2008) -	Welded steel construction
CSA W47.1-09, Standards (SSPC)	Certification of steel fusion welding companies Society for Protective Coatings Standards
CAN/CGSB 48.9712	Qualification and Certification of Nondestructive Testing Personnel

12.3.2.3 Equipment data

Equipment	Brand		Model	# Serial
Bow thruster	Wartsila		PAAF589818_TT-FT	SNL16066M4

12.3.2.4 Government Supplied Materiel

The following parts will be provided by CCG (GSM):

Item No.	Description	Quantity
N0001712	Propeller gearbox inspection set	1
R0002712	Propeller shaft seal replacement set	1
R0009017	Anode replacement set (9anodes)	1
R0003712	Input shaft seal replacement set	1
R0009017	Propeller gearbox mounting set	1

12.3.2.5 Contractor Supplied Materiel

The Contractor must supply oil, grease and assembly pastes, as well as all other parts, not listed as GSM, that are required for completion of this specification work item.

12.3.3 Technical Description

12.3.3.1 The Contractor must provide the services of a Manufacturer's (Wartsila) FSR to perform the work in this section of the SOW.

12.3.3.2 The Contractor must remove the two bow thruster tunnel grates and must reinstall them upon completion of the work. The grates and tunnel entrances must receive the same paint treatment as the vessel hull. See item 11.1 of this SOW.

12.3.3.3 The 5-year maintenance required by the manufacturer must be performed in accordance with specifications detailed in document PAAF589818_TT-FT.

12.3.3.4 The Contractor and FSR must replace the following parts during the maintenance work. These parts will be provided by the CCG (GSM):

- Gearbox top seal
- Gearbox housing O-ring
- Propeller gearbox mounting set
- Anodes

- 12.3.3.5 The oil in the lower unit must be drained and disposed ashore as per applicable Regulations. Draining of the oil is through a drain plug in the hub. The CCG IA/TA must be present for the draining of the bow thruster hub in order to obtain an oil sample for testing purposes. Upon completion of this work, the Contractor must supply and refill the bow thruster with new oil to its normal operating level. The quantity of oil required is 410 liters of Enduratex EP100.
- 12.3.3.6 The Contractor must install one (1) new Coast Guard supplied oil filter for the bow thruster. The installation of the drain plug and new gasket must be witnessed by the IA/TA.
- 12.3.3.7 The drain plug areas and the shaft seals must be surveyed for oil leaks after the unit has been refilled with new oil.
- 12.3.3.8 The Contractor must verify all clearances to be within the manufacturer's allowable limits and recommendations. These readings must be recorded and be included in the final report.
- 12.3.3.9 For bidding purposes, the Contractor's bid must include the price for 3 meters (10 ft) and the unit price per meter of stainless steel weld multiplied by 15 passes of 4.78 mm (3/16") diameter each to weld the bow thruster wear ring. The final cost must be adjusted, up or down, using the PSPC 1379 process along with the supporting disposal documentation.

12.3.4 Proof of performance

- 12.3.4.1 Inspections
- 12.3.4.1.1 All thruster components must be inspected by ABS inspector and the TA. It is the Contractor's responsibility to call the ABS inspector at the appropriate time.
- 12.3.4.1.2 The Contractor must observe the following inspection Hold Points:
- 1st Hold point: Initial condition check before dismantling
 - 2nd Hold point: Dismantling and inspection of the components
 - 3rd Hold point: Inspection of the parts before installation

12.3.4.2 Test

Dry dock testing:

12.3.4.2.1 Prior to refloating, the Contractor must conduct a functional test of the bow thruster in the presence of the FSR, ABS and the CCG.

Sea trials:

12.3.4.2.2 Once the vessel is afloat, the Contractor must conduct the bow thruster tests in the presence of the CCG IA, FSR and the ABS inspector.

12.3.5 Deliverables

12.3.5.1 Documents

12.3.5.1.1 Prior to the end of the contract, the Contractor must submit to the GC TA a comprehensive type-written report detailing the work undertaken, defects, repairs made, measurements, and readings taken, in PDF format, on an unprotected USB drive.

12.3.5.1.2 The Contractor must provide a report detailing all the tests performed, and their results.

12.3.5.1.3 The Contractor must provide copies of manifests for residual liquids that have been removed from the vessel

12.3.5.2 Certification

12.3.5.2.1 Contractor must provide a copy of the certification of the welders.

12.3.5.2.2 The Contractor must submit to CCG one (1) electronic copy and two (2) hard copies of the inspection certificates along with the original copy bearing the ABS seal.

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

12.3.5.2.4 The Contractor must submit the disposal certificates for the removed oil and residual liquids.

12.4 REPLACEMENT OF PROPULSION GENERATORS SETS

12.4.1 Identification

- 12.4.1.1 The intent of this specification is to remove the three (3) existing main propulsion generators and remove all piping, ventilation ducting, structural components, lighting, brackets, fire suppression systems and all other equipment that is located in the removal and installation path of the new Propulsion Generator Sets (PGSs).
- 12.4.1.2 The intent is to install three (3) new Wartsila W8L26 series propulsion generator sets, associated bed plates, auxiliary systems, piping, wiring and commission and test in accordance with the manufacturer's guidelines, instructions and recommendations. All items removed from the removal and installation path must then be re-installed.
- 12.4.1.3 This work must be carried out in-conjunction with the following Sections within this SOW:
- 20.1 Commissioning of the propulsion system
 - 11.1 Hull Cleaning & Coating
 - 10.3 Bilge Cleaning & Coating
 - 11.3 Sea Chest & Seabay Cleaning & Coating
- 12.4.1.4 It is the responsibility of the Contractor to ensure that all requirements specified in the General Sections are taken into consideration and applied to this specification item defined work requirements. This specification item may mention certain specific requirements from the General Sections. However, this does not exempt the Contractor from considering and including any other references from the General Sections that should also be applied and included for this specification item work. ALL requirements must be assessed and included, when applicable, for the work described in this specification item. In cases of discrepancy between content sources, the content in this specification item must take precedence.

12.4.2 References

12.4.2.1 Documents

Wartsila Project Documents	
Drawing/Document No. Revision / Date	Title / Description
DMCA00049640	Martha L Black Installation Planning Instructions (IPI)
DBAE591721	1100 Commissioning Manual
DBAE850253	Martha L Black ITP
DAAE027798	Installation of W26 Generator Sets on Resilient Mounts (ref: IPI page 2-25)
DAAF484743	DG Set General Arrangement (w/ Pipe Connections) (Ref: IPI page 2-15)
5660.EBM	3D model for use in Cadmatic eBrowser viewer
5660 installation 3D	3D model for use in AutoCAD

Wartsila Project Documents	
Drawing/Document No. Revision / Date	Title / Description
5660-101-001	General arrangement
5660-101-002	Temporary accessibility plan (Deck Cut-Outs)
	Stability Documentation
5660-152-004	Preliminary stability Calculation
5660-152-005	Inclining Experiment Procedure
	Lay Out Arrangements, Machinery Compartments
5660-106-001	Lay out arr. In Engine room
5660-740-001	Exhaust gas arrangement in ER and casing
	Class Drawings, Main Structure
5660-144-001	Docking Plan
5660-202-001	Material List
5660-209-002	Welding table
5660-220-001	Sections in Generator room
5660-223-001	Main Engine foundation
	Class Drawings, Foundation Main Equipment
5660-263-001	Foundation ME Starting Air Receivers
5660-263-002	Foundation ME Silencers
5660-263-003	Foundation FO Cooler
5660-263-005	Foundation Preheater Units
	Outfitting Machinery
5660-452-001	Travelling crane w/ Lifting Equipment in engine room

Wartsila Project Documents	
Drawing/Document No. Revision / Date	Title / Description
	Class Drawings, Piping Diagram, Ship System
5660-703-001	Fuel oil supply system
5660-711-001	Lubricating oil system
5660-720-001	Cooling systems heat balance
5660-722-001	FW cooling system
5660-731-001	Starting air piping diagram
5660-740-001	Exhaust Gas Arrangement in ER and Casing
5660-743-001	Exhaust diagram
	Basic Drawings, Electrical System
5660-85051-01	Single Line Diagram
5660-85051-03	Electrical Load Analysis - AC
	Basic Drawings, Electrical System
5660-57452-01	Ventilation and Heating – Cable Diagram
5660-60152-01	Diesel engines/ME for propulsion - Cable Diagram
5660-71152-01	Lube Oil System - Cable Diagram
5660-72252-01	FW Cooling Systems - Cable Diagram
5660-73152-01	Compressed Air Systems - Cable Diagram
5660-79252-02	IAS I/O List
5660-85052-01	Cable List, including termination details
5660-87152-02	600V Main Switchboard - Feeder Diagram
5660-87452-01	Motor and Starter List
	Basic Drawings, Auxiliary Systems
5660-574-001	Ventilation arrangement in Engine room
	Piping Material
5660-789-001	Piping Material list
	Isometric Drawings (Guidance) – Folders (Multiple Files in Each)
5660-7432-001	ISO Draw Exhaust Gas system folder
5660-7032-001	ISO Draw FO system folder
5660-7222-001	ISO Draw FW Cooling system folder
5660-7112-001	ISO Draw Lub Oil system folder
5660-7312-001	ISO Draw Starting Air system folder

Original Martha L. Black Drawings	
Drawing/Document No. Revision / Date	Title / Description
108H 23-25	General Arrangement, 3 sheets
	Lay Out Arrangements, Machinery Compartments
50-00-01	Machinery Arrangement, 2 sheets
50-00-02	Machinery Arrangement elevation looking port, 1 sheet
50-00-03	Machinery Arrangement, 2 sheets
62-10-01	Machinery Arrangement elevation, 5 sheets
63-00-01	Exhaust Piping Plan, 1 sheet
63-00-01-A	Engine exhaust system, 1 sheet
63-10-01	Arr. Diesel and boiler exhaust piping
77-05-01	Machinery and pipes modules locations, 2 sheets
	Main Structure
H-0003	Tank tops and DB
H-0004	Engine room flats
H-2_01	Construction Sections fore body
H-2_02	Construction Sections aft body
H-2_03	Construction Sections Bulkheads
H-0006	Main WT Bulkheads Below Main Deck
H-01-64	Funnel
	Stability Documentation
H-0022	Docking Plan
H-0029_01 & _02	Lines Plans Fore & Aft
	Martha L. Black Stability Book
	Piping Diagrams
74-00-01_01 & 02	Fuel Oil Service/Transfer Diagrams,
73-00-01	Lube Oil Diagram
71-10-01	Central Cooling Diagram
76-00-01	Compressed Air Diagram
76-10-01	Arrangement compressed air system i.m.s., 3 sheets
65-30-01	Diagram fresh and sanitary water systems
	Electrical System
80-01 – 80-41	Electrical System One Line and Power Deck Plans
80-02-00	Electrical Load Analysis, 21 Sheets
B0312-DELA-PW	Electrical Load Analysis (updated in 2020)
	HVAC System
62-10-01	Machinery ventilation arrangement, 5 sheets
62-00-01	Diagram machinery space ventilation

12.4.2.2 Regulations and standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations - Revision / Date	Title / Description
C.R.C., c. 1431	Canada Shipping Act 2001 - Hull Construction Regulations
C.R.C., c. 1494	Canada Shipping Act - Tackle Regulations
SOR/90-264	Canada Shipping Act – Marine Machinery Regulations
C.R.C., c. 1432	Canada Shipping Act - Hull Inspection Regulations
C.R.C., c. 1467	Canada Shipping Act – Safe Working Practices Regulations
SOR/2010-120	Maritime Occupational Health and Safety Regulations
DFO/5737	CCG Fleet Safety Manual
IACS No. 47 - Shipbuilding and Repair Quality Standard	IACS No. 47 - Shipbuilding and Repair Quality Standard
TP 127E, Transport Canada Marine Safety – Ship Electrical Standards	TP 127E, Transport Canada Marine Safety – Ship Electrical Standards
IEEE STD 45 – Recommended Practice for Shipboard Electrical Installations	IEEE STD 45 – Recommended Practice for Shipboard Electrical Installations
IEC 60092-504-electrical Installations in Ships – Part 504: Special Features – Control and Instrumentation	IEC 60092-504-electrical Installations in Ships – Part 504: Special Features – Control and Instrumentation
CSA W59-08 (R2008) - Welded Steel Construction	CSA W59-08 (R2008) - Welded Steel Construction
CSA W47.1-09 - Certification of Companies for Fusion Welding of Steel	CSA W47.1-09 - Certification of Companies for Fusion Welding of Steel
Society for Protective Coatings (SSPC) Standards	Society for Protective Coatings (SSPC) Standards
CCG Welding Specification	

12.4.2.3 Government Supplied Materiel

Refer to Wartsila Installation Planning Instructions (IPI) DMCA00049640 Section 1.5 - Wartsila scope of supply (where component details and drawings, following in subsequent subsections 2 to 9) and Section 10.8 - Component Data (automation system, Wartsila scope of supply, then followed by subsequent drawings and component datasheets)

12.4.2.4 Contractor Supplied Materiel

Unless specifically noted within this specification, the Contractor is responsible for supplying all labor, materials and equipment required to carry out the replacements of these new propulsion generator units.

12.4.3 **Technical Description**

12.4.3.1 General

12.4.3.1.1 The vessel must be re-powered by replacing the three (3) original main generator sets, based on ALCO-engines with three (3) new main generator sets based on Wartsila 8L26 diesel engines.

12.4.3.1.2 To support the new generator sets, auxiliary systems including cooling water, fuel oil, lube oil, start air, exhaust gas system and control system must be upgraded to fit the new generator sets. Main foundations must be replaced with new structures to fit the new generator sets, which will come on a common base frame.

12.4.3.1.3 Due to the scope of work needed for the CCGS Martha L. Black, it is necessary for the Coast Guard and Wartsila to ensure that the Wartsila supervisory staff are in place to monitor the Contractor's work, provide guidance on the Wartsila Installation Planning Instructions, and provide Canada with additional Quality Assurance monitoring. In order to facilitate these goals, Canada will provide the Contractor with a Wartsila Site Manager to be on site for the duration of the project under the existing Wartsila Propulsion Generator Replacement contract. The Site Manager is not considered to be one of the FSR's required in 12.4.3.1.4 below. The contract and amendments can be found at.

<https://canadabuys.canada.ca/en>

12.4.3.1.3.1 The Site Manager is hired by the CCG to attend the shipyard and provide the following assistance:

- Advice and instruction to the Contractor in regards to the information in the Wartsila IPI, Commissioning and other documents supplied in the TDP.

- Provide coordination assistance with the Contractor, the CCG TA and other main firms (ABB and Madsen) with regards to schedule development of the Commissioning for the Wartsila equipment to assist the shipyard in planning.

- Provide inspection services to CCG for the Wartsila installation package to ensure compliance with the IPI and other technical data.

- Attend daily progress meetings to be made aware of scope of daily work during installation and commissioning.

12.4.3.1.3.2 The Site Manager will begin the project attending the shipyard approximately one week per month and able to respond when not on site via email during the removal stage of the Propulsion Generator project to provide planning and guidance advice. Once the project moves to the installation and commissioning stages, the Site Manager will be attending the shipyard full time.

12.4.3.1.4 The Contractor is responsible for obtaining the services of accredited Wartsila FSRs to provide support in performing the work undertaken in this specification section in accordance with the manufacturer's specifications, drawings, instructions and these specifications. The FSR team must include the following personnel :

- Three (3) Commissioning / Controls Engineers

These engineers must be accredited by Wartsila Canada as being a person competent to perform this work. The three FSR's must be on site for a total of 6 weeks, including the dock and sea trial periods. The total cost of those services, travel and living expenses must be included as a line item in the Contractor's financial proposal.

12.4.3.1.5 Canada has provided a DNVGL Class approved design package for this project. Prior to starting work, the Contractor must physically verify all affected items and all dimensions necessary for the work. The Contractor must not deviate from the Class approved drawings except, where deviation from the Class approved package is required, the Contractor must provide the TA and ABS with all necessary engineering validation of the deviation and once approved by the TA, obtain ABS Class approval at the Contractor's expense.

12.4.3.1.6 Within 5 days of Contract Award, the Contractor must schedule a meeting with the following parties:

- ABS, who will be inspecting the work on behalf of ABS and Canada as the Delegated Statutory Inspection Program's (DSIP) Recognized Organization (RO) for the CCGS Martha L. Black;
- Wartsila Canada, who will provide the FSR technical support and project management for the Propulsion Generator Replacement;
- Technical Authority;
- Contracting Authority.

The purpose of the meeting will be to define the hold points for inspections for each party using the ITP and a tentative Commissioning Plan provided by Canada as a basis. The Contractor must include pricing for a minimum of 2 yard representatives to attend this meeting in Quebec, Qc.

- 12.4.3.1.7 Inspections must be completed by ABS (on behalf of Transport Canada), the TA and the manufacturer's representatives throughout the entire removal and installation process.
- 12.4.3.1.8 As this specification item must be carried out while the vessel is in drydock, the Contractor must make the necessary arrangements to drydock the vessel in such a way that all steps and aspects of this installation can be effectively carried out. The Contractor must reference drawings/documents:
- 5660-144-001 – Docking Plan
 - 5660-101-002 – Temporary Accessibility Plan
 - H-0022 – Martha L Black Original Docking Plan
 - Martha L. Black Trim & Stability Booklet
- The Contractor must be responsible for all deviations and any associated costs must be included in their firm pricing. This includes any design and engineering work and all ABS class approvals. .
- 12.4.3.1.9 Details in design, fabrication, installation and workmanship, not covered by the Specification and approval plans, must be in accordance with the shipbuilding standards noted above in section 12.4.2.2 of this specification item and with ABS Classification Society Rules and Regulations. The Contractor must produce final as-fitted drawings for the auxiliary systems in this specification.
- 12.4.3.1.10 All hazardous materials must be disposed of in accordance with all Federal, Provincial and Municipal regulations and certificates provided to the CG TA.
- 12.4.3.1.11 International System of Units (SI) must be used for designing and constructing of hull, machinery and equipment unless specifically stated in

this Specification. If metric materials are not available, the Contractor must submit proposed materials to the TA for approval prior to purchase.

- 12.4.3.1.12 All welding and welding inspections must be executed in accordance with the requirements of drawing 5660-209-002 - Class Approved Welding Table, Welding Procedures required and approved by ABS, or the Canadian Coast Guard Welding Specification, document IDEKME#3049715V4, the most stringent requirements must apply.
- 12.4.3.1.13 Back gouging must be carried out with arc air, where necessary. Welding earth must be arranged close to the welding point. Excessive distortion of hull structures due to welding, which does not comply with standards, must be cured by means of cold press, line heating, or spot heating, as the case may call for. Double continuous welding must be applied to all fillet joints, except for dry spaces in superstructure and deckhouse, where intermittent or one side welding may be applied, unless the specific documentation states otherwise.
- 12.4.3.1.14 Lifting lugs, staging pieces or other temporary pieces fitted to the hull structures for construction must be removed to about 10mm from the base plate and ground smooth. In critical and highly stressed areas, lifting lugs must be removed and ground smooth, in accordance with the Contractor's procedures. All installed pieces to be used for lifting must be of engineered design for the expected loads and sufficient safety factor. CCG reserves the right to keep certain lifting lugs.
- 12.4.3.1.15 The edges of structural members of the Vessel must be treated in accordance with the Contractor's standard, provided it complies with coatings specifications. All paint work must be performed in compliance with the requirements of Coast Guard's "Paints and Coatings Standard", document No. GCC MLB 2022, and with paint manufacturer's recommendations. All machinery space internal structure and bilge areas must be prepped and coated as detailed in specification– 10.3 Bilge Cleaning and Coating.
- 12.4.3.1.16 All required paint and materials must be provided by the Contractor, and be applied according to the recommendation of the paint manufacturer. Hull coatings after the completion of this specification item must be applied in accordance with specification–11.1 Hull Cleaning and Coating.
- 12.4.3.1.17 As described in the Hazardous Material Assessment documents "002_201-10553-47_rev0_HazMat_CCGS_M-L-Black_20220819_sign", there are some coatings throughout the engine room and stack area that contain high levels of lead. In order to remove and replace the exhaust piping and silencers detailed in this SOW item, a temporary insert will have to be cut in

the stack area with potentially high levels of lead coatings. The contractor must follow all provincial and federal guidelines while removing and disposing of all lead coatings as required to successfully carry out this work. All removals and disposals of lead coatings necessary in order for the Contractor to remove and re-install this insert must be included in the contractor's firm pricing for this SOW item.

12.4.3.1.18 Upon arrival of the gensets to the Contractor's facility, the Contractor must carry out unit inspections and pay close attention to necessary actions required as detailed in sections 1 and 2 of the Wartsila Installation Planning Instruction (IPI), document - DMCA00049640 IPI. The Contractor must provide and maintain effective storage of the gensets and all related parts and equipment which includes, at a minimum, a dry space maintained at minimum 10°C and maximum 70%RH. Engines must be stored with sufficient space in all directions (minimum of 3ft.) to allow regularly scheduled full inspections of the engines. In addition, the alternator anti condensation heaters must also be provided with power (600V/1300W each) for the duration until supplied by the ship's power. This storage space must be separate from the space provided in section S1.2.6 of this SOW.

12.4.3.1.19 From the time the new propulsion units arrive at the Contractor's facility until they are successfully installed on the vessel, the Contractor is responsible for all crange, forklifts, rigging, labor and all other related equipment and mechanical requirements necessary for the successful installation of the new gensets. This includes all movements around the Contractor's facility, on/off trucks, in/out of storage and on/off the vessel. These requirements also apply to the existing main engines which must be removed from the vessel and disposed of by the Contractor as per provincial and federal disposal guidelines. The Contractor must take care of the gen-sets as if they were to be preserved.

12.4.3.1.20 As noted above, all necessary details for a successful installation of the new gensets are presented in the Installation Planning Instruction (IPI), document DMCA00049640 IPI. The Contractor must follow the requirements and recommendations of this document except where superseded in this SOW.

12.4.3.2 Preparations for Removals and Disconnections

12.4.3.2.1 The Contractor is responsible for all aspects of the machinery and equipment removals and installation of the three (3) PGSS with associated auxiliary machinery including commissioning and performance trials. All manufacturer's recommendations and requirements must be followed for each stage of the removal and installation. All manufacturers' documentation must be submitted to the TA prior to contract end. The

Contractor must supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

- 12.4.3.2.2 The baseline drawings for the vessels affected machinery areas are detailed in the following documents:
- 50-00-01_01 & 2 – Machinery Arrangements
 - 50-00-03_01 & 2 – Machinery Arrangements Sectional
 - 108-H-0003 – Tank Top & Double Bottom
 - H-004 – Engine Room Flats
 - 108-H-0006 – WT Bulkheads Below Main Deck
 - 108-H-0026 – Capacity Plan
- 12.4.3.2.3 The Contractor must drain and dispose of all engine system fluids in accordance with all applicable Federal, Provincial and Municipal regulations. This includes the central cooling system of approximately 16m³ and all other oils and residue. These costs must be included in the Contractor's firm pricing for this specification item and must remain separate from the bilge disposal allowance detailed in specification– Services -S.1.2.30 of this SOW. The Contractor must include pricing for the complete removal and disposal of 12 m³ of oil between the 3 engines.
- 12.4.3.2.4 It is the responsibility of the Contractor to carry out all safe work requirements necessary in order to carry out the work detailed in this specification. This includes opening, cleaning and gas-freeing all corresponding tanks in the engine room and machinery areas as required to carry out hot work detailed in this specification. All regular tank inspections and tank watch requirements as required to carry out these installations will be the responsibility of the Contractor. The Contractor must reference document 108-H-0026 – Capacity Plan - for additional details on required tank cleaning, gas freeing and watch requirements.
- 12.4.3.2.5 Any tanks or confined spaces affected in way of hot work in this specification must be inspected and hydrostatique tested to the satisfaction of the ABS surveyor and the CCG TA.
- 12.4.3.2.6 Prior to making the cut out, an inspection of the affected area must be performed by the Contractor. Piping and electrical cables in the area to be identified and all nearby equipment to be covered and protected from hot cutting and welding work. Pipes, equipment and other installations that need to be removed while bringing the new gensets to their final position, must be identified, properly marked, temporarily removed and stored as Category B equipment. All Category B piping must have the ends tightly sealed off after disconnection to prevent contamination.
- 12.4.3.2.7 As a minimum, the following need to be temporarily removed:

- a) All floors and its supporting structure on tank top between Centre Line (CL) and 5000 mm off CL Port and Starboard from frame #71 to frame #96;
- b) All piping and cabling on tank top between CL and 5000 mm off CL Port and Starboard from frame #71 to frame #96;
- c) All piping, cabling, cable ladders, lights and other installation below engine room flat between CL and 5000 mm off CL Port and Starboard from frame #71 to frame #79;
- d) All piping, cabling, lights and other installation below engine room flat between CL and 5000 mm off CL Port and Starboard from frame #94 to frame #96;
- e) All piping, cabling etc. between engine room flat and tank top between CL and 5000 mm off CL Port and Starboard from frame #71 to frame #96;
- f) Stairs from tank top to engine room flat between of engines 1 and 2;
- g) Stairs between tank top and engine room flat between engines 2 and 3;
- h) Supply air distribution boxes between engines 1 and 2 and between engines 2 and 3;
- i) Supply air distribution ducts for distribution of air below engine room flat in front of engines;
- j) Pillars on frame #76, 1400 mm off CL Port and Starboard;
- k) The Contractor must take into consideration what temporary removals, if any, are required in way of the engine room flat structure on the starboard side, based on how the Gensets are brought into the Engine room. Impact on the main cable runs below the Starboard engine room flat must be avoided.

12.4.3.2.8 The Contractor must install temporary support posts during the refit period while the permanent pillars at frame #76 are removed to prevent sagging of the Engine Room Flat deck. The temporary support posts must only be removed to facilitate machinery movement, with additional temporary support posts used on either side of the gensets during the skidding of the gensets into their final positions.

12.4.3.2.9 The Contractor must determine whether equipment and other installations can remain on the removed section during the installation, or whether they must be fixed to the ships side above the cut and the engine room flat, and thereafter disconnected from the tank top prior to doing the cut for section removal, or temporarily removed and stored together with items listed above.

12.4.3.2.10 Piping and other installations on the tank top subject to removal, if considered beneficial, can be disconnected from their systems and remain on the tank top during the installation work. All disconnected pipe ends must then be properly blanked off to prevent ingress of water and impurities and all cables labelled, coiled together and their ends properly insulated and sealed. It is the responsibility of the Contractor to ensure that any piping or other installations removed must be properly re-installed and tested upon completion of primary work.

12.4.3.3 Temporary Hull Opening and Rigging Requirements

12.4.3.3.1 The existing generator sets' associated equipment must be removed and new main generator sets with associated equipment must be installed through temporary access cut out in the tank top structure. The ship's hull must be supported with temporary supports as shown in reference Drawing - 5660-101-002 - Temporary Accessibility Plan, sheet 2 to prevent any deformation of the vessel's hull while the Module is removed. Any deviation by the Contractor from the designed temporary supports must be engineered and approved by ABS and the CGTA after review by CCG naval architects. The Contractor must cover all costs for the engineering and approvals for any change from the supplied design.

12.4.3.3.2 The identification, removal, storage and re-installation of all interference items required for this temporary hull opening is the responsibility of the Contractor. After the installation of the new gensets are complete, the vessel must be returned to CCG in "as new" condition.

12.4.3.3.3 The Contractor must reference Drawings - 5660-101-002 - Temporary Accessibility Plan and 5660-220-001 – Sections in Engine Room - for the installation route for the generator sets. The baseline drawings for the vessels areas affected by this temporary opening are:

- H-0002 – Framing Expansion
- H-2_1-3 – Construction Sections
- H-3_1-2 – Profiles and Decks – ER and Main Deck
- 108-H-0003 – Tank Top & Double Bottom
- H-004 – Engine Room Flats
- 108-H-0005 – Main Deck
- 108-H-0006 – WT Bulkheads Below Main Deck
- 50-00-01_01 & 2 – Machinery Arrangements
- 50-00-03_01 & 2 – Machinery Arrangements Sectional

The reference drawings for the new installations are:

- 5660-106-001 – Layout Arrangement in Engine Room
- 5660.ebm – 3D model for Cadmatic e browser
- 5660 installations 3D – 3D AutoCad file

- 5660-452-001 - Travelling crane with lifting equipment in engine room
- 12.4.3.3.4 Other openings found necessary for the convenience of access, communication or ventilation for workers during the construction, must be provided in accordance with the Contractor's procedures and approved by the CGTA and ABS.
- 12.4.3.3.5 The access cut-outs must not be made parallel, but with a small angle on cutting lines to ensure easy removal and installation of the tank top section that is temporarily removed.
- 12.4.3.3.6 The Contractor is responsible to ensure the safety of personnel operating in the area of temporary openings and provisional lifting equipment, and must secure the affected areas by necessary fences, safety bars, rails, solid platforms and scaffolding during the conversion stage in accordance with the Contractor's procedures.
- 12.4.3.3.7 The estimated weight of the temporary removed tank top section including the genset fitted onto it is approximately 75-80 MT. The Contractor must ensure the lifting equipment, trailer or hydraulic jacks are rated and designed to accommodate the estimated weight with safety margins. The Contractor must engineer any final hoisting, lifting, sliding, jacking or pulling arrangements of the Module or generator sets to accommodate the Contractor's preferred methods, equipment and any Occupational Safety requirements or considerations.
- 12.4.3.3.8 The Contractor must suitably cover over/hoard in the temporary access hole when rigging operations are not being carried out in order to protect the engine room area from weather and debris and to maintain appropriate heating in the machinery areas. Any damage caused to the vessel from weather, debris or low temperatures will be repaired at the Contractor's expense. As further detailed in section Services S1.2.22, the Contractor will be fully responsible for heating the vessel and carrying out all necessary winterization requirements (Ref- S1.2.22 of this SOW).
- 12.4.3.3.9 The Contractor must support all loads from lifting or skidding of the engines either by the four lifting points on the engine, or through the mounting brackets for the resilient mounting. If the mounting brackets are used, the load must, to the extent possible, be evenly distributed between them.
- 12.4.3.3.10 The Contractor must supply a skidding frame for the engine which extends below the common base frame of the engine. The Contractor is responsible for engineering the specific methods and procedures of lifting, jacking and skidding the gensets taking into account dry dock configuration.

- 12.4.3.3.11 The engines must be skidded in position below the vessel, and lifted with hydraulic jacks or other lifting equipment. A lifting arrangement as indicated in the drawing 5660-101-002, "Temporary Accessibility Plan" must be used. The Contractor must ensure that the position of lifting lugs and the extent of the lifting frame allows for sufficient clearance through the opening, and that the spread out of the lifting chains/wires are in accordance with the requirements presented in the Installation Planning Instruction (IPI), Section 2.5.1. The cut out planned for in the engine room flat on starboard side from frame #91 - #95 must be executed prior to starting the lifting operation, see drawing No. 5660-220-001, Sections in Engine Room.
- 12.4.3.3.12 For new equipment installations, the Contractor must refer to drawing 5660-452-001 - Travelling crane with lifting equipment in engine room, the existing chain hoists must be re-used.
- 12.4.3.3.13 The existing trolley beams above the engines must be removed and new beams must be installed in accordance with the new propulsion generator's cylinder configuration and Wärtsilä recommendation regarding engine overhauling as presented in the IPI.
- 12.4.3.3.14 Lifting eyes specifically for turbocharger and charge air cooler maintenance must be fitted by the Contractor in locations according to drawing 5660-452-001 and with the guidance of the Wartsila Site Manager. The Contractor must provide a total of 12 lifting eyes with 1 tonne SWL to be supplied, installed and certified, with a unit price for adjustment for additional lifting eyes by PSPC1379 process.
- 12.4.3.3.15 The engines must be kept horizontal during all stages of the lifting operation.
- 12.4.3.3.16 If the brackets for resilient mounting are used for lifting, then the loads are to be distributed evenly on the twelve connections for the resilient mounting on the engine.
- 12.4.3.3.17 Once the engine is above tank top level, transverse skidding beams can be positioned below the engine. The engine can be skidded sideways by attaching pulleys on the shipside web frames at frame #76 and #88.
- 12.4.3.3.18 The weight of one generator set is approximately 41.5 MT. The Contractor must ensure the skidding pad eyes are rated and designed to accommodate the estimated weight with safety margins. Skidding sideways with steel on steel, the friction force will be approx. 10-20% of the engine weight.
- 12.4.3.3.19 For the cut out as shown on 5660-101-002, the Temporary Accessibility Plan, the skidding beam must be supported on the port side with temporary support going down to the dock floor.

- 12.4.3.3.20 Other equipment related to the engine replacement that must be transported in and out of the engine room can be handled by using the monorail arranged above existing engine No. 3. This monorail is dimensioned for a lifting capacity of 1 MT. Please see the Machinery Arrangement Plans as noted above for reference (50-00-01/02/03).
- 12.4.3.3.21 In case more heavy units must be lifted, necessary pad eyes and lifting arrangements must be engineered, installed and tested by the Contractor at the proper locations as required.
- 12.4.3.3.22 Removal of the funnel structure is one option for removal of structure and equipment from upper part of casing. Required lifting capacity for lifting the funnel structure located above stringer, at 4100mm above the Bridge Deck is approx. 7.5MT. The Contractor may submit alternative removal routes to CGTA for approval with engineering as required.
- 12.4.3.3.23 Temporary openings must be closed back after completion of the conversion work with full penetration welding of hull and all strength/structural members by approved CWB welding procedures. Non-destructive testing must be carried out to the weld joints by an inspector qualified to the Canadian General Standards Board (CGSB) Standard CAN/CGSB-48.9712-2014 at Level 2 or higher. The tests must include:
- All new welds must be 100% visually inspected by the weld inspector;
 - Full penetration hull, deck, and strength/structural members welds must be tested by 100% Ultrasonic by the weld inspector;
 - All other welds must be tested by 100% Magnetic Particle by the weld inspector;
 - CGTA/IA and ABS inspector must be notified 48 hours in advance of testing and given the opportunity to witness testing;
 - An NDT schedule must be submitted to CGTA/IA and ABS inspector for approval prior to cutting of temporary openings.
- 12.4.3.3.24 Preparation and painting of the jointing area must be according to the Coast Guard's "Paints and Coatings Standard", document No. GCC MLB 2022 and in accordance with the paint manufacturer's instructions. The external hull area must be prepped and coated as per specification item 11.1 Hull Cleaning and Coating - and the internals must receive, at a minimum two coats of marine grade primer with a suitable matching compartment top coat.

12.4.3.3.25 Existing equipment, such as electrical cables, lighting fixtures, signal cables and piping under deck which are cut or removed during the conversion, must be returned to original condition and tested prior to vessel commissioning.

12.4.3.3.26 The IACS recommendations “Shipbuilding and Repair Quality Standard” should be used as guideline for the inspection of the workmanship.

12.4.3.3.27 Temporary pieces, such as staging pieces or lifting lugs and their reinforcements located in a fatigue sensitive area, high stressed area or passage way must be removed without leaving notches prior to any coatings being applied.

12.4.3.4 Installations

12.4.3.4.1 Vessel baseline drawings of areas affected in way of this work are detailed in the following:

- H-2_1-3 – Construction Sections
- H-3_1-2 – Profiles and Decks – ER and Main Deck
- H-0029_01 & 2 – Construction Sections Fore and Aft
- 108-H-0023 – xx– GA’s
- 108-H-0003 – Tank Top & Double Bottom
- H-004 – Engine Room Flats
- 108-H-0005 – Main Deck
- 108-H-0006 – WT Bulkheads Below Main Deck
- 50-00-01_01 & 2 – Machinery Arrangements
- 50-00-03_01 & 2 – Machinery Arrangements Sectional
- 63-10-01 – Diesel and Boiler Exhaust Piping
- 70-06-01 - Funnel Piping

Reference drawings for the new installations:

- 5660-223-001 – Main Engine Foundation
- 5660-220-001 – Sections in Engine Room
- 5660-202-001 – Material List
- 5660-209-002 – Welding Table
- 5660-101-001 – General Arrangement
- 5660-106-001 – Layout Arrangement in Engine Room
- 5660.ebm – 3D Model for Cadmatic e Browser
- 5660 installations 3D – 3D AutoCad File
- 19-166-100 – Generator Access Platforms

12.4.3.4.2 Decks, Platforms and Supports

12.4.3.4.2.1 New inserted steel structure in engine room area must ensure structural integrity and necessary support and integration of main and auxiliary equipment foundations. The Contractor must ensure continuity of longitudinal structural elements to ensure longitudinal global strength as well as ensuring necessary access and maintenance space to equipment is maintained. The weight of the structure must be kept low, weight increase to be avoided or minimized.

12.4.3.4.2.2 Due to the removed and new installed equipment, the Contractor must design, supply and replace all existing Engine Room deck plates with new steel checkered deck plates. All new plate must be powder coated on both side, white color. The Contractor must also supply and install all new underlying supports, brackets, gratings, hand rails, ladders and stairways required. The new deck plates must be supplied by the Contractor and are to have all cut outs and access holes fitted and supported as well as being fastened securely with brass countersunk screws in place when complete. The Contractor must have the deck plates on one level above the tank top, maintain safe access to all areas of the new gensets, while leaving room for the gensets to move on the flexible vibration mounts. During installation of the deck plates around the PGSs, the Contractor must consult with the on-site Wartsila representative for acceptable distances to install deck and supports around the PGSs. The new steel, supports and brackets must be coated with 2 coats of marine grade epoxy primer prior to final installation on the vessel.

12.4.3.4.2.3 As per reference drawing 5660-220-001 - Sections in Engine Room, a recess must be arranged in the engine room flat between frames 91 and 95 to provide sufficient clearance for the turbo charger outlet on the Starboard propulsion generator.

12.4.3.4.2.4 After the installation of new deck plates, brackets and deck support system, the Contractor must fabricate and install a new catwalk system around the three main engines as detailed in the attached Poseidon Marine technical drawing package 19-166-100 – Generator Access Platforms.

12.4.3.4.3 Engine Foundations

12.4.3.4.3.1 The new gensets are delivered assembled on a common base frame for flexible mount installation on the genset foundation. Foundations for existing generators must be replaced with foundations for the new generators.

12.4.3.4.3.2 The existing foundations for the three (3) existing propulsion gensets must be removed in their entirety and ground flush to the tank top.

12.4.3.4.3.3 The Contractor must fabricate and add additional foundation structure as per the drawing 5660-223-001 - Main Engine Foundation. The Contractor must

machine the new foundations and steel chocks in way of the genset vibration mounts in accordance with the Document DAAE027798 – Installation of the Wartsila 26 Generator Sets.

12.4.3.4.4 Auxiliary Equipment Foundations

12.4.3.4.4.1 Baseline vessel drawings of the affected areas:

- 108-H-0023 – 25 – GA's
- 50-00-01_01 & 2 – Machinery Arrangements
- 50-00-03_01 & 2 – Machinery Arrangements Sectional
- 63-10-01 – Diesel and Boiler Exhaust Piping
- 70-06-01 - Funnel Piping

12.4.3.4.4.2 The Contractor must reference documents 5660-106-001 –Machinery Arrangement for the fabrication and installation of the new auxiliary foundations.

12.4.3.4.4.3 The Contractor must remove the existing foundations for the engine control panels, motor control cabinets for redundant machinery and proceed to fabricate and install the following:

- New starting air vessels, 2 pieces, reference IPI, Section 5.4.1, located on engine room flat, on starboard side. Foundation for existing starting air vessels must be modified, see drawing 5660-263-001, “Foundation ME Starting Air Receivers”;
- New starting air compressors, 2 pieces, reference IPI, Section 5.4.2, located on tank top, starboard side (existing foundations must be adapted to fit the new compressors);
- Fuel oil cooler, 1 piece, reference IPI, Section 3.4.1, located on tank top, inboard of the starboard Propulsion Generator. The foundation must be arranged with a drip tray. See drawing 5660-263-003, “Foundation Fuel Oil Cooler”;
- CO2 bottles for fire extinguishing inside generator housings, 3 pieces, reference IPI, Section 2.8, drawing DMCA00001389, located adjacent to generators. The foundation must be designed, supplied and installed by the Contractor (already included in item 10.1.3.4.1 of this SOW);
- Preheating units for the new engines, 3 pieces, reference IPI, Section 6.4.2, located on tank top in the area of the new engines, see drawing 5660-263-005, “Foundation Preheater Units”
- New fixed points and supports for exhaust piping and silencer (9 pieces of silencers), please reference to section 8.5 of the IPI and drawing 5660-263-002, “Foundation ME Silencers”. Attachment points for anchoring vibration mounts must be designed, supplied and installed by the Contractor.

12.4.3.4.4.4 The Contractor must design, supply and install new foundations for all electronic boxes, motor starters and power units noted to be mounted.

12.4.3.4.4.5 All new foundations and disturbed areas in way of the foundations must be primed and painted in accordance with the vessel's paint scheme and further detailed in specification 10.3 – Bilge Cleaning and Coating.

12.4.3.4.4.6 The Fuel Oil Cooler and Preheater Unit foundations require additional stiffeners to be installed under the tank top (in the double bottom tanks) in way of the new foundations. The Contractor must comply with the General Notes for Confined Spaces when performing this work.

12.4.3.4.5 Engine Room Ventilation System

12.4.3.4.5.1 The current ER ventilation arrangement is detailed as per the following vessel original drawings:

- 70-06-01 1-3 – Funnels
- 50-00-03_01 & 2 – Machinery Arrangements Sectional
- 62-10-01 1-4 – Machinery Space Ventilation

12.4.3.4.5.2 The existing ventilation system for the engine room must be maintained to the maximum possible extent. The following must be removed from the system:

- a) Silencer at the air inlets, 2 pieces;
- b) Fire damper at the inlet, 2 pieces
- c) Existing two (2) ventilation fans with flexible mounts;
- d) Starters for existing engine room supply fans, two (2) pieces;
- e) Transition duct from supply fans to main ducting.
- f) Parts of duct leading below the engine room flat in front of the main engines to facilitate the removal of the original gensets and installation of the new gensets.

12.4.3.4.5.3 As per document 5660-574-001 – Ventilation in Engine Spaces - the Contractor must re-build the engine room ventilation system.

12.4.3.4.5.4 The following GSM must be installed by the Contractor:

- GSM: Air supply fans, Ø 1000 mm, axial type, 68.000 m³/h, frequency controlled, two (2) pieces, reference IPI, Section 7.4.1 and drawing DBAF355755 “Air Supply Fan and Silencer on page 7-6 of the IPI;
- GSM: Frequency control units for the ventilation fans, two (2) pieces, reference IPI, Section 10.8.7 and drawing DMCA00014866 “Fan Control” on page 10-78 of the IPI;

- GSM: Engine room pressure control units, two (2) pieces, reference IPI, Section 10.8.5 and drawing DMCA00011541 “Pressure sensor” on page 10.70 of the IPI;
- GSM: Flexible supports for air supply fan, four (4) pieces, reference IPI, Section 7.4.3;
- GSM: Silencers, Inner diameter Ø 1000 mm, two (2) pieces , reference IPI, Section 7.4.4;
- GSM: Fire dampers, 1000x1000 mm, two (2) pcs, ref. IPI, Section 7.4.5;

12.4.3.4.5.5 As referenced in document 5660-574-001 – Ventilation in Engine Spaces - suction air ducts, wire screens and ventilation louvres are to be designed, fabricated and installed by the Contractor. The Contractor must engineer, design, supply and install the surrounding structure above the Officer Deck level.

12.4.3.4.5.6 The new ventilation fans must be installed on top of the duct transition above the boat deck. Flexible mounts and necessary counter flanges are delivered together with the fans for installation by the Contractor. The Contractor must design and install a new mounting ring to support the ventilation fans.

12.4.3.4.5.7 The new fans must be provided with frequency control based on the actual pressure in engine room, and with possibility for manual override. Control of ventilation fan speed must be provided by control unit sensing the actual pressure in engine room and the reference pressure in open air.

12.4.3.4.5.8 Tube for pressure reference must be drawn from the pressure control unit to a position in open air, protected from water ingress and physical damage, the final location to be determined by the Wartsila FSR and the CCG TA.

12.4.3.4.5.9 The fan speed control system must allow for manual setting of requested overpressure and manual setting of fan speed. Fan controllers are to be tied in to fire alarm system as per originally set up.

12.4.3.4.5.10 New suction air ducting must be installed between flexible mounts on top of the new fans and the officer’s deck according to the design presented in drawing 5660-574-001, “Ventilation in Engine Spaces”. The duct must be painted on internal and external surfaces. If painting is difficult to access, galvanized pipe must be used.

12.4.3.4.5.11 The penetration through the officer’s deck must be modified to a square penetration according to the dimensions of the mounting flanges of the new fire dampers, ref. IPI, Section 7.4.5.

12.4.3.4.5.12 Ducting for air distribution in the engine room must be modified above engine room flat in front of center main genset, to provide space for the exhaust outlet from the new genset. For reference refer to drawing 5660-574-001 - Ventilation in Engine Spaces. In addition to the new sections of machinery space ductwork already detailed in the specification and attached drawings to be fabricated and installed as part of the new Propulsion Generator installations, the Contractor must also include an allowance of \$30,000.00 in their pricing for the complete fabrication of new ductwork in the machinery areas to replace existing sections that may be determined to be in poor condition by the TA on site after being temporarily removed as interference items. This allowance will only cover the fabrication of these sections deemed to be in poor condition as all temporary interference removals and installations must already be included in the Contractor's firm pricing for the Propulsion Generator installations. All fabrication must be carried out by certified sheet metal professionals with class approved materials as per the existing ductwork arrangement as detailed in ships drawings 62-10-01 (Sheets 1-6). The final cost will be adjusted by PWGSC 1379 based on final invoicing from the fabrication company.

12.4.3.4.5.13 Air supply ducts must be coated and insulated by Contractor supplied 50 mm insulation and lined according to current, Class approved standards.

12.4.3.4.6 Propulsion Generators

12.4.3.4.6.1 The current ER layout is detailed as per the following vessel original drawings:

- 50-00-01_01 & 2 – Machinery Arrangements
- 50-00-03_01 & 2 – Machinery Arrangements Sectional
- 108-H-0023 – 25 – GA's

12.4.3.4.6.2 The existing three (3) main Gensets must be removed and the Contractor must install three (3) GSM Wartsila Gensets through the temporary access hole as detailed above in section 12.4.3.3 – Temporary Hull Opening and Rigging Requirements - of this specification item. The Contractor must also reference the Wartsila IPI Manual for more specific unit information and installation details.

12.4.3.4.6.3 After the removals of the existing units are complete and prior to the installation of the new gensets, the Contractor must proceed to clean, prep and coat the mechanical space bilge areas as detailed in specification– 10.3- Bilge Cleaning & Coating to the satisfaction of the CG TA.

12.4.3.4.6.4 Hold Point - It is the responsibility of the Contractor to cover and protect all of the vessel's equipment, parts and spares in the engine room and machinery areas from any potential damage during this installation. Any damage caused

to the vessel will be corrected at the Contractor's expense. The Contractor must make every effort to isolate the cyclo converter room and transformer room from the Engine room while steelwork and painting is ongoing. If any amount of dust/dirt/debris enters the Transformers, all electrical components and structures in the Transformer Room must be cleaned by a professional company trained to do so at the Contractor's expense before commissioning commences. Inspections must be carried out by the CGTA and CE and the Contractor must receive approvals to proceed.

12.4.3.4.6.5 The engine and alternator are installed on a common base frame which the Contractor must mount using the flexible mounts on the foundation, reference drawing 5660-223-001 - ME Foundation. Prior to mounting, foundations must be made flat per document DAAE027798 - - Installation of WÄRTSILÄ 26 generating sets in the IPI.

12.4.3.4.7 Piping

12.4.3.4.7.1 The Contractor is responsible for all necessary piping, electrical and automation systems to be connected to the engines. All connections between engine and piping must be through flexible pipe connections provided by Wärtsilä, reference IPI Section 2.7.1, and noted in the Table 11-1 below.

Table 11-1 – GSM Pipe Connections

Code	Pipe Connection	Connection Size	Qty/Engine	Drawing Reference
101	Fuel inlet	DN32/PN40	1	DBAA841528
102	Fuel outlet	DN32/PN40	1	DBAA841528
103	Leak fuel drain, clean fuel	OD22	1	DAAB761468
104	Leak fuel drain, dirty fuel	OD22	1	DAAB761468
104	Leak fuel drain, dirty fuel	OD22	1	DAAB761468
213	Lube oil from separator and filling	DN40/PN40	1	DAAB740705
214	Lube oil to separator and drain	DN50/PN40	1	DAAB740705
301	Starting air inlet	DN40/PN40	1	DAAF034374
401	HT-water inlet	DN80/PN16	1	DAAB761661
402	HT-water outlet	DN80/PN16	1	DAAB761661
404	HT-water air vent	OD12	1	DAAB761457

Code	Pipe Connection	Connection Size	Qty/Engine	Drawing Reference
404	HT-water air vent	OD12	1	DAAB761457
406	Water from preheater to HT-circuit	DN80/PN16	1	DAAB761661
451	LT-water inlet	DN100/PN16	1	DAAB761664
452	LT-water outlet	DN80/PN16	1	DAAB761661
454	LT-water air vent	OD10	1	DAAB761452
483	LT water air vent	OD10	1	DAAB761452
607	Condensate after air cooler	OD8	1	DAAB761446
701	Crankcase air vent	DN80/PN16	1	DAAB740720

12.4.3.4.7.2 All fabricated piping must be seamless pipe and chemically pickled following the procedures in the IPI. After installation of piping, each of the systems must be flushed in their entirety following procedures in IPI 9.10 Cleaning and Flushing Instructions to a minimum of ISO 4406 class 21/19/16 (NAS 1638 class 10) cleanliness for all piping systems other than fuel and oil which are specified in sections below.

12.4.3.4.7.3A Wartsila Bill of Materials is attached with each Auxiliary System P&ID/Diagram in the TDP, various indicated components are GSM supplied (i.e. those specifically indicated on the BOM as being supplied by Wartsila). The supply of all other BOM listed items are CFM.

12.4.3.4.7.4 In addition to the fabrication and installation of new piping as detailed in the following sections of this specification item (A – E) and supporting documents, the Contractor must also modify some existing piping. As detailed and highlighted in the Wartsila 3D models, a significant portion of the existing engine room piping must be modified by the Contractor after removal for the installation of the new gen sets, and prior to re-installation on the vessel, in order to properly tie into the new units.

12.4.3.4.8 Fuel Oil System

12.4.3.4.8.1 The Contractor must modify the fuel oil treatment and service system according to the requirements of the new engines.

12.4.3.4.8.2 On completion, the system must be inspected and tested in accordance with the requirements of applicable ABS rules, with the presence of class surveyor.

12.4.3.4.8.3 The Contractor must use the following documentation as reference:

- 5660-106-001 Machinery Arrangement
- 5660-703-001 Fuel Oil Service Diagram – including list of new valves and list of components removed/added
- 5660-7032-001 Fuel oil system – isometric drawings
- 5660-789-001 Piping material list
- DMCA00049640 Installation Planning Instructions (IPI), Section 3 “Fuel Oil System” and section 9 “Piping Arrangements
- DAAF484743 DG Set GA with Pipe connection drawing

12.4.3.4.8.4 All piping less than 2” diameter has not been included in the 3D model, the Piping Materials List or the Isometric drawings. The Contractor must supply, design and install all piping of less than 2” in diameter accordance with system diagrams. The Contractor must include an allowance of \$20,000.00 to cover the design, material supply, pickling and installation of all fuel oil piping less than 2”. This includes any flushing, purging, testing of these small pipes and supports/brackets as required.

12.4.3.4.8.5 This allowance must be tracked between Canada and yard representatives based on actual yard labour timesheets and material invoice costs. The total cost will be adjusted by PSPC 1379 process based on final material invoices and direct labour associated with this work as agreed upon by the CG TA and the yard representatives.

12.4.3.4.8.6 The existing fuel oil purifiers meet the requirement of the new propulsion genset, and their arrangement, functionality and system connections must remain unaffected by the refit operation.

12.4.3.4.8.7 The fuel oil feed and circulation system must be converted according to principles presented in drawing 5660-703-001 - Fuel oil supply system.

12.4.3.4.8.8 The baseline for the system modifications are presented in the following documents:

- 5660-106-001 - Layout Arrangement in Engine Room
- 74-00-01-01 & 02 - Fuel Oil Service Diagrams

12.4.3.4.8.9 The Contractor must remove the following installations:

- a) Existing fuel oil supply piping between the fuel oil supply header and the main engines, No pipe references in existing diagram.
- b) Existing fuel oil return piping from the engines and all the way to the day tank, No pipe references in existing diagram.
- c) Existing fuel oil flowmeters arranged in the supply and return lines to each engine, no identification tag.

NOTE - It is the responsibility of the Contractor to clean up and dispose of any oil leakage or spillage that occurs during the removal/installation of piping or any part of the gen set system. The Contractor must clean up and dispose of any fuel or oil spillage or leakage of any kind that occurs in a timely fashion, so not to delay work, and as per provincial and federal guidelines.

12.4.3.4.8.10 The Contractor must install the following:

- a) GSM W8L26 Gen set with built on:
 - a. fuel injection pumps
 - b. injection valves
 - c. engine driven fuel feed pump
 - d. duplex fine filter
 - e. pressure relief valve in the outlet pipe
- b) Flexible pipe connections (noted in Table 11-1) (GSM);
- c) One (1) new fuel oil cooler, equipment ID 703.008.010 (GSM);
- d) Six (6) new fuel oil flowmeters, component ID FO33 (GSM);
- e) New Contractor supplied fuel oil supply piping from the fuel oil supply header to the new engines;
- f) New Contractor supplied fuel oil return piping from the new engines to the fuel oil day tank;
- g) New Contractor supplied Clean fuel leak piping;
- h) New Contractor supplied Dirty fuel leak piping.

12.4.3.4.8.11 Fuel oil supply piping to the fuel oil supply to the new engines must be connected to the existing fuel oil supply line, no pipe tag number, leading to the front of the engines along the cut out in engine room flat.

12.4.3.4.8.12 Fuel oil return lines from each engine must be joined together to a common return line leading through the new fuel oil cooler (equipment ID 703.008.010) and back to the fuel oil day tank.

12.4.3.4.8.13 All connections between engine and piping must be through flexible pipe connections provided by Owner, please refer IPI, Section 2.7.1. and Table 11-1.

12.4.3.4.8.14 Fuel oil flowmeters (component ID FO33), with a bypass arrangement, must be installed in the supply and return line to each engine. This new arrangement must be made with 32mm pipe to match the new Wartsila design.

12.4.3.4.8.15 Clean leakage fuel oil pipeline from the clean fuel drain on the new engines must be installed and connected to the fuel drains tank.

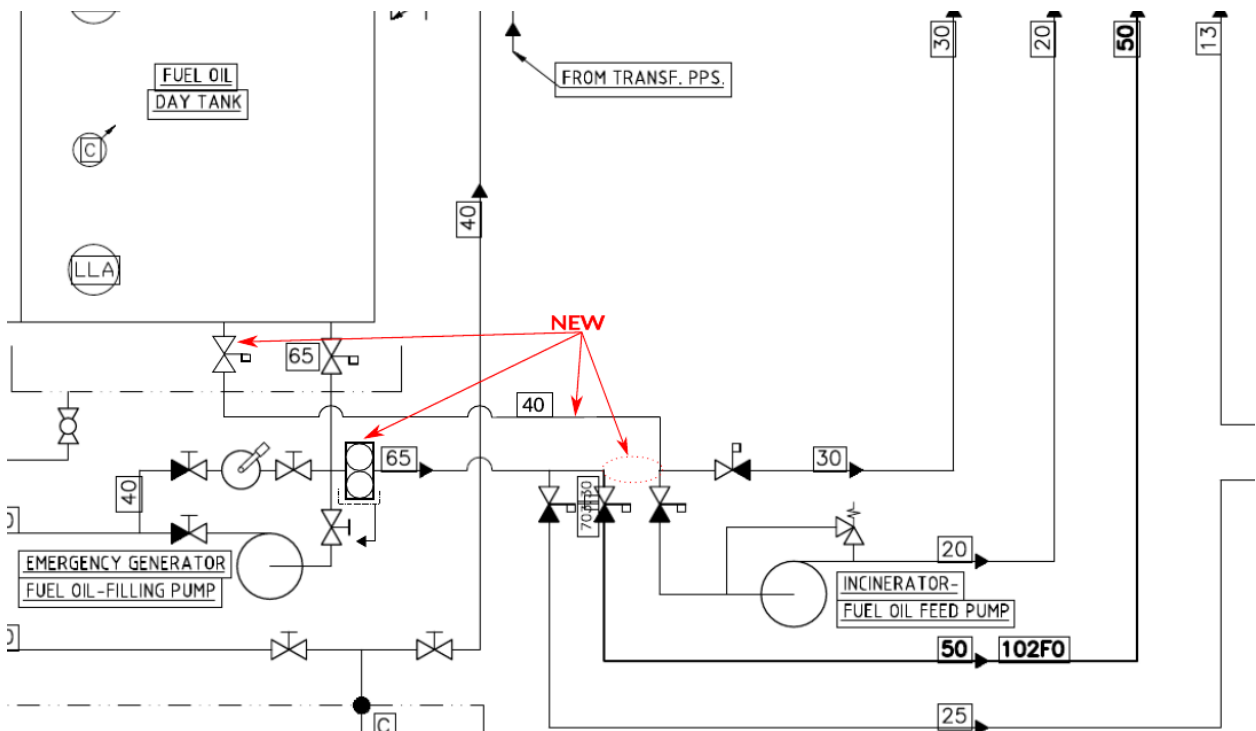
12.4.3.4.8.16 Dirty fuel drain pipes from the engines dirty drain connections on the engines must be installed leading to the sludge tank in separator room. Pipe can be joined before entering the sludge tank. Connection to tank must be through non-return valve.

Table 12-2 GSM Fuel System Components

Item	Model	Quantity	Drawing
Fuel Oil Cooler	KS12-ACV-413	1	KS12-ACV-13B Rev D
Fuel Oil Meters	Kral OMP32	6	
Fitting List for Fuel Supply System			5660-703-001

12.4.3.4.8.17 The Contractor must make further modifications to the fuel oil supply piping at the day tank in addition to those specified above – these drawings are not shown in the 3D model, the Piping Materials List or the Isometric drawings. The Contractor must use the fuel oil piping allowance as detailed above in section 3.4.7.4 of this specification to cover the design, material, fabrication and installation of the fuel oil piping for this additional work. All fittings must be welded or flanged with gaskets suitable for fuel oil. All piping must be flushed as per the IPI to meet ISO 4406 class 15/13/10 (NAS 1638 class 4) cleanliness.

Schematic changes are included in DWG 5660-703-001_Add'l_Mods and highlighted in red below.



DWG 5660-703-001_Add'l_Mods

12.4.3.4.8.18 The Contractor must isolate the boiler and incinerator fuel supplies from the propulsion generator and auxiliary generator supply, and install a new day tank supply for the boiler and incinerator - pipe to be 40mm, schedule 40, seamless pipe. A new, leak-free penetration with flange must be made into the day tank, and a new CSM quick-close gate valve must be installed (Young & Cunningham DN40 Bronze Quick-close Gate valve flanged, or fully certified marine grade equivalent). The penetration and valve location must permit access to and operation of the valve - final location to be agreed upon by CGTA. The valve hydraulics must be tee'd into the tubing for the existing day tank isolation quick-close valve. The piping must tie into the existing boiler and incinerator piping. Contractor must supply and install new brass tags at the quick-closing valves: "F/O Supply fr Day Tk to Gen's" "F/O Supply fr Day Tk to Incin & Blr's" in English and French. Quick-close valves must be commissioned per manufacturer instructions and/or CGTA and proven operational after modifications. Modifications to the day tank are to be completed prior to obtaining survey credit per SOW item: 15.1 FUEL OIL, HELICOPTERE FUEL OIL, AND OILY WATER TANK SURVEY.

12.4.3.4.8.19 The Contractor must supply and install a duplex fuel oil strainer (Eaton Model 53 BTX 2 ½" flanged supplied with three (3) 100 mesh stainless steel baskets - one (1) is a spare - or fully certified marine grade

equivalent) at the day tank propulsion/auxiliary generator fuel oil supply. Contractor must mount the strainer on a suitable seat with a save-all around (if not fitted in existing save-all). Strainer location must be accessible for operation/cleaning - final location to be agreed upon by CGTA.

12.4.3.4.9 Lube Oil System

12.4.3.4.9.1 The Contractor must modify the lube oil treatment and service system according to the requirements of the new engines.

12.4.3.4.9.2 On completion, the system must be inspected and tested in accordance with the requirements of ABS class rules, in the presence of class surveyor.

12.4.3.4.9.3 The Contractor must use the following documentation for reference:

- 5660-711-001 - Lube Oil Diagram including list of new valves and list of components removed/added (CFM)
- 5660-7112-001 - Lubricating oil system – isometric drawings
- 5660-789-001 - Piping material list
- DMCA00049640 - Installation Planning Instructions” (IPI), Sections 4 Lubrication oil and Crankcase Ventilation System & 9 – Piping Arrangements
- DAAF484743 - DG Set GA with Pipe connection drawing

12.4.3.4.9.4 The current arrangement is referenced in

- 73-00-01- Lube Oil Diagram
- 5660-106-001 – Engine Room Arrangement

12.4.3.4.9.5 All piping less than 2” diameter has not been included in the 3D model, the Piping Materials List or the Isometric drawings. The Contractor must supply, design and install all piping of less than 2” diameter in accordance with system diagrams. The Contractor must include an allowance of \$5,000 to cover the design, material supply, pickling and installation of all lube oil piping less than 2”. This includes any flushing, purging, testing of these small pipes and supports/brackets as required to meet ISO 4406 class 18/16/13 (NAS 1638 class 7) cleanliness.

12.4.3.4.9.6 This allowance must be tracked between the Canada and the yard representatives based on actual yard labor timesheets and material invoice costs. The total cost will be adjusted with PSPC 1379 process based on final material invoices and direct labor associated with this work as agreed upon by the CG TA and the yard representatives.

12.4.3.4.9.7 Presently there are installed one (1) lube oil purifier serving the three (3) main gensets. The Contractor must leave this purifier in place and must make it functional with the new system.

12.4.3.4.9.8 Existing pipe lines without pipe tagging must be connected to the new gensets as shown in drawing No. 5660-711-001, "Lube oil diagram".

12.4.3.4.9.9 All connections between engine and piping must be through flexible pipe connections (GSM), please refer to IPI, Section 2.7.1. and Table 11-1 (presented in item 12.4.3.4.7.1).

12.4.3.4.9.10 For information about oil quality, please refer IPI, Section 4.2.1. The Contractor is responsible for the supply and installation of new engine oil into the new propulsion generators. The Contractor must provide approximately 1,800L of oil per generator unit.

12.4.3.4.9.11 The Contractor must convert the lubricating oil system according to principles presented in drawing No. 5660-711-001, "Lube oil diagram".

12.4.3.4.9.12 The following equipment will have been removed together with the existing engines:

- a) Lube oil coolers, three (3) pcs
- b) Pre-lubrication pumps, three (3) pcs
- c) Hand pumps, three (3) pcs

12.4.3.4.9.13 The discharge lines leading from pre-lubrication pumps to waste oil tank must be blanked off in the engine room close to the engines for future use.

12.4.3.4.9.14 The new GSM engines, please ref IPI, Section 2.8, will be delivered with built on:

- a) engine driven lubricating oil pump
- b) electric motor driven pre-lubrication pump
- c) lubrication oil cooler
- d) thermostatic valve
- e) automatic filter
- f) centrifugal filter
- g) pressure control valve
- h) wet sump

12.4.3.4.9.15 A branch connection with closing valve (valve reference 711.02, 711.05 and 711.08 in the drawing No. 5660-711-001, "Lube oil system") followed by a blank flange must be arranged in the separator suction line from each engine to allow from emptying of the engine by portable pump or suction hose from truck.

12.4.3.4.9.16 The engine crankcase ventilation must be connected to existing piping. The lower end of the piping must be slightly shortened and a new Contractor supplied condensate trap, built according to the recommendations in IPI, section 4.3.2 must be installed in each crankcase ventilation pipe line. Reference drawing 5660-711-001– Fitting List for Lubrication Oil System for further detail.

12.4.3.4.10 Cooling System

12.4.3.4.10.1 The Contractor must modify the central cooling system according to the requirements of the new gensets. The sea water system must remain unchanged.

12.4.3.4.10.2 On completion, the system must be inspected and tested in accordance with the requirements of ABS class rules, in the presence of class surveyor.

12.4.3.4.10.3 The Contractor must use the following documentation for reference:

- 5660-106-001 - Machinery Arrangement
- 5660-720-001 - Cooling Systems Heat Balance
- 5660-722-001 - Central Cooling Diagram” including list of new valves and list of components removed/added (CFM)
- 5660-7222-001 - FW cooling system” – isometric drawings
- 5660-789-001 - Piping material list
- DMCA00049640 - Installation Planning Instructions” (IPI), Sections 6 “Cooling Water System and 9 –“Piping Arrangement”
- DAAF484743- DG Set GA with Pipe connection drawing

12.4.3.4.10.4 The heat rejection data for the redesigned cooling water system is presented in drawing No. 5660-720-001, “Cooling Systems Heat Balance”.

12.4.3.4.10.5 All piping less than 2” diameter has not been included in the 3D model, the Piping Materials List or the Isometric drawings. The Contractor must supply, design and install all piping of less than 2” diameter in accordance with system diagrams. The Contractor must include an allowance of \$25,000 to cover the design, material supply, pickling and installation of all cooling water piping less than 2”, including vent tubing. This includes any flushing, purging, testing of these small pipes and supports/brackets as required.

12.4.3.4.10.6 This allowance must be tracked between Canada and yard representatives based on actual yard labor timesheets and material invoice costs. The total cost will be adjusted with PSPC1379 process based on final

material invoices and direct labor associated with this work as agreed upon by the CG TA and the yard representatives.

12.4.3.4.10.7 New plates must be added to the existing central coolers, equipment identification Tag Number 722.001.010 and 722.001.020. Existing plates must be cleaned within 24 hours of draining, per Sondex Operation and Maintenance Manual with care to preserve gaskets, prior to reuse as directed by FSR. New plates, gaskets and necessary spare parts and instructions will be GSM, please refer to the IPI, Section 6.4.

12.4.3.4.10.8 Flow control valves after the cooling water pumps must be re-tuned to secure the flow rate specified for each pump in drawing 5660-722-001, "Central Cooling Diagram".

12.4.3.4.10.9 The Contractor must convert the fresh water cooling system according to principles presented in drawing No. 5660-722-001, "Central Cooling Diagram."

12.4.3.4.10.10 The current vessel baseline arrangement is referenced in:

- 5660-106-001 – Engine Room Layout
- 71-10-01 – Central Cooling Diagram

12.4.3.4.10.11 The Contractor must remove the following from the existing gensets:

- a) Lube oil coolers, three (3) pcs
- b) Main LT temperature control valve
- c) Heat recovery temperature control valve
- d) Common cooling water pipes
- e) All cooling water piping leading to engines
- f) All cooling water piping between engines and common return pipe

12.4.3.4.10.12 The following equipment must be installed and connected to the system:

- a) GSM W8L26 gensets, ref IPI, Section 6.1, with built on:
 - 1) engine driven HT circulating pump
 - 2) engine driven LT circulating pump
 - 3) HT thermostatic valve of self-actuating type for controlling the outlet temperature from the engine
 - 4) charge air cooler
- b) GSM One (1) Fuel Oil Cooler, tag No. 703.008.010, refer to IPI, section 3.4.1.
- c) GSM Three (3) new engine preheaters units, tag No. 722.011.010, 722.011.020 and 722.011.030, refer to IPI, section 6.4.4.
- d) GSM One (1) HT temperature control valve, valve ID 722.64, refer to IPI, section 6.4.2.

- e) GSM Three (3) LT electronic temperature control valves, valve ID 722.13, 722.29 and 722.45, in the LT circuit for each engine refer to IPI, section 6.4.1.
- f) GSM Two sets of replacement Plates for Central Coolers.

12.4.3.4.10.13 Fresh water cooling system outside the engine room and outboard of the engines on port side and aft in the engine room must remain unaffected by the conversion.

12.4.3.4.10.14 Existing pipe between cooling water system expansion tank and the suction side of cooling water pumps must remain unaffected by the conversion to the position in front of engine room at the elevation of engine room flat, where a new pipe must be installed to the suction side of pumps in the redesigned LT and HT cooling circuits.

12.4.3.4.10.15 Existing alternators must be disconnected from the electric machinery cooling water circuit, and the new alternators adapted to the system. New piping must be arranged between the alternator cooling connections and the closing valves.

12.4.3.4.10.16 The fresh water cooling circuit connected to the Electric Machinery C.W. Pumps must be re-tuned to ensure the water flow stated for the components in drawing No. 5660-722-001, "Central Cooling Diagram" is obtained through all existing components and the new alternators.

12.4.3.4.10.17 Fresh water pipes in front of the heat exchanger must not be rebuilt as these are required to use the existing LT control valve.

12.4.3.4.10.18 The cooling water supply to the new engines must be branched off from the new common cooling water pipe.

12.4.3.4.10.19 The cooling water system for the new engines must be arranged as a mixing system, where the LT circuit is connected to the central cooling water system, and the common external HT cooling water system is exchanging water with the LT system.

12.4.3.4.10.20 Temperature control in the common external HT system is maintained by one (1) temperature control valve (valve tag 722.64), refer to IPI, Section 6.4.2.

12.4.3.4.10.21 Hot water supply to the water makers must be arranged from the hot side of the engines common external HT system according to the central cooling diagram.

12.4.3.4.10.22 One (1) preheating unit must be integrated in the HT cooling circuit of each engine, total of three (3) units. Each preheater unit comprises one (1) electrical heating element, one (1) electrically driven circulation pump and one (1) control cabinet.

12.4.3.4.10.23 De-aeration units (2 pieces) must be Contractor supplied and installed in the common return lines from the engines, one in the HT circuit and one in the LT circuit. Please see IPI, Section 6.3.3 and drawing No. V60D0343, “Recommended cooling water circuit deaerator” on page 6-11.

12.4.3.4.10.24 Bleed pipes must be arranged between the deaeration units and vent pipe connections on the engines and the cooling water system expansion tank according to the recommendations in the IPI section 6.3.3. The pipes must be provided with orifices and closing valve as specified in the system diagram and the valve list following the diagram.

12.4.3.4.10.25 As noted in the initial Section 3.4.7 – Piping introduction, all connection between engines and piping must be through flexible pipe connections (GSM), please refer to IPI, Section 2.7.1. and Table 11-1.

12.4.3.4.10.26 The cooling water piping to the fuel oil cooler must be branched off the common cooling water return line and the return piping must be connected to the common return water line, with an added flow regulating valve to regulate the water flow into the fuel oil cooler and common return water line.

Table 12-4: GSM Cooling Components

Item	Model	Quantity	Drawing
Temperature control valve (LT)	04GGSDBS32EBBCA-AA	3	04GGS_1
Thermostatic valve	5BRDB17007-00-AZA	1	DMCA00014835
Plates for Central Cooler		2 sets	DMCA00014831
Preheating Unit	KVE8-30	3	33968_KVE8W-30
Fitting List for FW Cooling System			5660-722-001

12.4.3.4.11 Compressed Air System

12.4.3.4.11.1 The Contractor must modify the compressed air system according to the requirements of the new engines.

12.4.3.4.11.2 On completion, the system must be inspected and tested in accordance with the requirements of applicable ABS class rules, in the presence of class surveyor.

12.4.3.4.11.3 The Contractor must use the following documentation as reference:

- 5660-106-001 - Machinery Arrangement
- 5660-731-001 - Start air diagram” including list of new valves and list of components removed/added (CFM)
- 5660-7312-001 - Starting air system” – isometric drawings
- 5660-789-001 - Piping material list
- DMCA00049640 - Installation Planning Instructions” (IPI), Sections 5, “Compressed Air System” and 9, “Piping Arrangements”
- DAAF446589 - DG Set GA with Pipe connection drawing

12.4.3.4.11.4 The existing baseline reference drawings are:

- 5660-106-001 - Layout Arrangement in Engine Room
- 76-00-01 - Compressed Air Diagram

12.4.3.4.11.5 The following items must be removed:

- a) Starting air compressors, two (2) pieces
- b) Starting air receivers, two (2) pieces
- c) Pipelines between starting air compressor and receivers
- d) Pipelines between starting air receivers and pressure reduction stations

12.4.3.4.11.6 The following equipment must be installed and connected to the system, refer to IPI, Section 1.5:

- a) GSM W8L26, refer to IPI, Section 10.4.1, with built on pneumatic starting arrangement;
- b) GSM Two (2) starting air receivers, tag No 731.010.010 and 731.010.020, capacity 900 l each @ 30,0 bar, refer to IPI, Section 5.4.1;
- c) GSM Two (2) starting air compressors, tag No 731.001.010 and 731.001.020, capacity 55,0 m3/h each @ 30,0 bar, refer to IPI, Section 5.4.2;
- d) GSM Two (2) sets of valves, including pressure reducers, for pressure reduction stations, 30-17.6 bar, refer to IPI, Section 5.4 and valve list following drawing No 5660-731-001, “Start air diagram”;

12.4.3.4.11.7 The Contractor must convert the starting air system and then new engines connected to the system according to principles presented in drawing No. 5659-731-001, “Start air diagram”. Necessary flexible pipe connections are provided by Wartsila, please refer to IPI, Section 2.7.1 and Table 11-1.

12.4.3.4.11.8 All piping less than 2” diameter has not been included in the 3D model, the Piping Materials List or the Isometric drawings. The Contractor must supply, design and install all piping of less than 2” diameter in accordance with system diagrams. The Contractor must include an allowance of \$50,000.00 to cover the design, material supply, pickling and installation of all compressed air piping less than 2”. This includes any flushing, purging, testing of these small pipes and supports/brackets as required.

12.4.3.4.11.9 This allowance must be tracked between Canada and the yard representatives based on actual yard labour timesheets and material invoice costs. The total cost will be adjusted with PSPC 1379 process based on final material invoices and direct labour associated with this work as agreed upon by the CG TA and the yard representatives.

12.4.3.4.11.10 Two (2) sets of valves for pressure reduction station, 30-17.6 bar, must be installed in the starting air supply to the existing auxiliary generator and other existing equipment.

Table 12-5: GSM Compressed Air System Components

Item	Model	Quantity	Drawing
Starting Air Vessels	900L/DN50	2	Db_30752
Starting air compressor unit	HL2/77-90-105	2	G02-0157
Air Filter	FIG34	3	DAAB726284
Pressure Reduction Valve	Niezkodka Typ 71.2 1-1/2" 600RF	2	07-2-2-KO38-A112L-K-001
Safety Valve	Type 30.1 BG II, Head C	1	030-1-2-025wd-A112L-A112L-C-001
Glove Valve	1.5”	4	GD89-01
Strainer	1.5” Class 600	2	F9A000PJ0A8040
Fitting List for Starting Air Piping			5660-731-001

12.4.3.4.12 Exhaust System

12.4.3.4.12.1 The Contractor must replace the exhaust piping system according to the requirements of the new engines.

12.4.3.4.12.2 The Contractor must use the following document references:

- 5660-263-002 - Foundation ME Silencers
- 5660-740-001 - Exhaust Gas Arrangement in ER and Casing
- 5660-743-001 - Exhaust piping system” including list of components removed/added (Valves CFM)
- 5660-7432-001 - Exhaust pipe system” – isometric drawings
- 5660-789-001 - Piping material list
- DMCA00049640 Installation Planning Instructions” (IPI), Section 8 - Exhaust Gas System
- DAAF484743 - Pipe connection drawing
- DBAE702029 - Technical Offer Specification (in IPI)

12.4.3.4.12.3 The entire existing main engine exhaust piping system must be replaced. The Contractor must reference the existing baseline vessel drawings:

- 63-10-01 – Diesel and Boiler Exhaust
- 70-06-01 – Funnel Piping
- 50-00-03 1 & 2 – Machinery Arrangements Sectional

12.4.3.4.12.4 Following components of the system must be removed:

- a) Existing main engine exhaust silencers (3 pieces);
- b) Existing main engine exhaust piping and mounting arrangements.

12.4.3.4.12.5 Following components must be installed, refer to IPI, Section 8:

- a) GSM - Three (3) exhaust gas bellows for turbo charger outlets, one per engine, refer to IPI, section 8.4.2.
- b) GSM - Twelve (12) exhaust gas bellows for installation in the exhaust lines, four (4) bellows in each pipe line, refer to IPI, section 8., Document DSCA00255833.
- c) GSM - Three (3) sets of Wärtsilä Compact Silencer System, each system consist of three (3) separate silencer units, refer to IPI, sections 8.4.3 to 8.4.5.
- d) GSM - New set of flexible support and suspensions, refer to IPI, section 8.4.6, Document DSCA00255833.

12.4.3.4.12.6 The exhaust gas piping system must be engineered, designed and modified by the Contractor according to the principles presented in drawing No. 5660-743-001, Exhaust Diagram System, and the drawing 5660-740-001, Exhaust Gas Arrangement in ER and Casing. The Contractor is responsible for re-routing or modifying the Auxiliary Generator, Boiler and all other exhaust piping in the engine room stack as required to suitably accommodate the new

propulsion generator exhaust piping system. All engineering and design work must be carried out by a certified Naval Arch./Engineer.

12.4.3.4.12.7 All piping less than 2” diameter has not been included in the 3D model, the Piping Materials List or the Isometric drawings. The Contractor must supply, design and install all piping of less than 2” diameter in accordance with system diagrams. The Contractor must include an allowance of \$5,000 to cover the design, material supply, pickling and installation of all exhaust piping less than 2”. This includes any flushing, purging, testing of these small pipes and supports/brackets as required.

12.4.3.4.12.8 This allowance must be tracked between Canada and the yard representatives based on actual yard labor timesheets and material invoice costs. The total cost will be adjusted with PSPC 1379 process based on final material invoices and direct labor associated with this work as agreed upon by the CG TA and the yard representatives.

12.4.3.4.12.9 The Contractor must supply and install new Corten steel pipes as required between the top of the funnel and the engines turbo charger outlets. Please pay attention to the installation instructions included in IPI, Section 8.3.

12.4.3.4.12.10 Drain pots must be arranged in the exhaust pipes according to drawings. The piping must be arranged with connection for back pressure measurement and with sampling point for gaseous emissions according to IPI, Section 8.2.2. and 8.2.4.

12.4.3.4.12.11 After all new piping has been installed, the Contractor must supply and install all new insulation on the entire exhaust piping with a doubled padded, flexible insulation system as per the following:

- The inner pad must be fabricated using stainless steel mesh and 2” Morgan Thermal Ceramic FireMaster Marine Blanket Insulation
- The outer pad must be fabricated using stainless steel mesh on the inside and Auburn Manufacturing Silicone Cloth, AMI-TUF, Style SGL 1700 Grey as the outside finish. The insulation must be 2” Morgan Thermal Ceramic FireMaster Marine Blanket
- Blanket layers must be arranged to overlap seams where possible.
- All Standard Specifications for the Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service-ASTM Designation: C 1695-10 must be followed
- The most recent version of the Specification Guidelines for the use of Soft Cover Insulation on Exhaust Systems must be followed

12.4.3.4.12.12 Supports and suspensions for the existing and new piping and components must be renewed and installed new according to the provided documentation, refer to IPI, section 8.4.5. All fasteners and gaskets required in the exhaust rebuild, and not supplied as GSM, must be new. Material for Bolts is

ANSI/ASTM A193-79A GR B16 and suitable for high temperature operations, such as exhaust. Material for Hex HSF Nuts is ANSI/ASTM A194-79A GR7. Exhaust gaskets are asbestos-free with a solid insert of galvanized iron mesh, NBR/NR binders, rolled-on graphite layer for anti-stick.

12.4.3.4.12.13 Foundations for the new silencers must be built according to the drawing 5660-263-002, “Foundation ME Silencers.”

12.4.3.4.12.14 Necessary structure for supporting the exhaust stack must be engineered, designed, supplied and installed in place by the Contractor. New fixed points and supports for exhaust piping and silencer (9 pcs of silencers) must be installed, please ref document DSCA00255833, “Technical Offer Specification” and dwg 5660-263-002, “Foundation ME Silencers”. Final attachment points for anchoring vibration mounts must be arranged and confirmed on site by the Contractor.

Table 12-6: GSM Exhaust System Components

Item	Model	Quantity	Drawing
Exhaust Gas Bellows	NS350	3	DAAB761852
Exhaust Gas Bellows	SBF	12	
Compact Silencer System		3	DBAE624944
Flexible Support System		3	
Fitting List for Exhaust Piping			5660-743-001

Note: Only new bolts/fasteners are provided for the new GSM supplied sections (silencers/bellows). The Contractor must supply and install all remaining new bolts and fasteners required for the new exhaust piping systems.

12.4.3.4.13 Automation and Instrumentation

12.4.3.4.13.1 The Contractor must update and expand the existing control and instrumentation Automation system to allow for new I/Os. Spare points will be used and banks of Analog/digital signal cards may be added.

12.4.3.4.13.2 The information related to I/Os are detailed and specified in the following documents:

- 5660-79252-02-IAS I/O list
- 5660-85052-01-Cable list, including termination details

- 5660-87452-01 Motor and Starter List
- DMCA00038739-Block InterConnection Diagram
- DMCA00044133 and DMCA00044134 -MODBUS Serial List
- DMCA00049640-Installation Planning Instructions” (IPI), Section 10 - Automation System
- 80-05 to 80-16-Electrical System One Line (existing document)
- 80-02 – Electrical Load Analysis

12.4.3.4.13.3 The engines are equipped with a distributed, built-on engine management system. The main control cabinet handles all strategic functionality such as engine start, stop, and speed control and engine safety. It communicates with Main Switch Board (MSB)/ Power Management System (PMS) and IAS. Refer to IPI section 10 for more details.

12.4.3.4.13.4 The main interface with the ships alarm and monitoring system is a bus communication through which all measured values, alarm and status indication are transmitted. For details see drawing DMCA00044133 - “Modbus List”. One (1) communication box for each engine to be installed to assist communication between the main control cabinet and existing ship alarm system.

12.4.3.4.13.5 The existing MSB/PMS is interfaced to new gensets via hardwired signals to the new control I/Os.

12.4.3.4.13.6 One (1) power unit for each engine operates at 120VAC and 24VDC. The 120VAC is taken from existing 120VAC power distribution board in Engine Room. The 24VDC is taken from existing 24VDC Engine UPS.

12.4.3.4.13.7 One (1) communication box for each engine is fed by 24VDC. It is taken from existing 24VDC Engine UPS.

12.4.3.4.14 Electrical Distribution System

12.4.3.4.14.1 Some of the major items that must be replaced and cabling/connection which must be modified by Contractor are listed below. This list is non-exhaustive. Further details can be found in the respective electrical documents (An overview showing the equipment below, except item l, is provided on DMCA00038739-Block InterConnection Diagram on page 10-17 of the IPI).

- a) Wärtsilä 8L26 (3 units)
- b) Starting air compressor, 600VAC (2 units)
- c) Preheating unit, 600VAC (3 units)
- d) Engine Pre-lubricating oil pump, 600VAC (3 units)
- e) Engine Turning Gear, 600VAC (3 units)
- f) Generator Lube Oil pump, 600VAC (6 units)

- g) Power Unit 120VAC + 24VDC (3 units)
- h) Starter for starting air compressor, (2 units)
- i) Starter for Engine turning gear (3 units)
- j) Starter for Generator lube oil pumps (3 units)
- k) LT electronic thermostatic valves (for arctic operations) in the LT circuit for each engine, 120VAC (3 units)
- l) Central cooler valve, 120VAC (1 unit)
- m) Communication Box, 24VDC
- n) Engine Room Ventilation fans, 600V (2 unit)
- o) Frequency drive for Engine Room Ventilation fans (2 Units)

12.4.3.4.14.2 The main switchboard will be fed by three Wärtsilä 8L26 diesel generator sets (2100kW, 600V, 60Hz). Refer to IPI, document No.: DMCA00049640.

12.4.3.4.14.3 Following the installation of the new engines the electrical equipment serving existing gensets must either be replaced or modified to meet the requirement for the new gensets and associated equipment.

12.4.3.4.14.4 The MCC No.1, MCC No.2, MCC No.3, MCC No.4, Port and Stbd Vital MCCs are responsible for the power supply of 600V/60Hz new electrical equipment.

12.4.3.4.14.5 120VAC must be supplied from existing 120VAC power distribution board in Engine room and 24VDC must be supplied from existing Engine UPS.

12.4.3.4.14.6 The two (2) existing Starting air compressors must be replaced. The two (2) new starting air compressors must be fed by the same feeders located at Port and Stbd Vital MCCs. Refer to IPI section 5.4.2.

12.4.3.4.14.7 The existing three (3) pre-lube oil pumps will be replaced by three (3) sets of new engine pre-lube oil pumps, and the power must be supplied from MCC No.3. Refer to IPI section 4.

12.4.3.4.14.8 Three (3) new engine preheaters units must be fed from MCC No.1 and No.2. Refer to IPI section 6.

12.4.3.4.14.9 Three (3) pcs of LT electronic thermostatic valves in the LT circuit and one (1) Central cooler valve must be provided 120VAC power which is from existing 120VAC power distribution board in Engine room. Refer to IPI section 6.

12.4.3.4.14.10 Three (3) turning gears for new Gensets must be added and fed from Port Vital and Stbd Vital MCCs. Refer to IPI section 10.8

12.4.3.4.14.11 Two (2) bearing pre-lube pumps for each alternator (total six (6) pumps) must be added. The power must be supplied from MCC No.3. One starter is supplied per pump set of two.

12.4.3.4.14.12 Two (2) ventilation fans frequency converters and fan for engine room which must be connected to MCC No.4 to replace the old supply fans in the engine room.

12.4.3.4.14.13 Some existing MCC feeder/breaker with starters must be modified to feeder/breaker to connect with the local starters (GSM). Refer to drawing 5660-85051-01 Electrical AC System - Single Line Diagram (updated with new consumers) and 5660-87152-02 600V_Main Switchboard-feeder for details. The Contractor must include an allowance of \$40,000.00 for the circuit breaker parts and components required to rebuild or reconfigure the various MCC breakers in this section. All labor required to perform these modifications must be separately provided and costed. The actual amount will be adjusted up or down via PWGSC 1379 action based on final invoice.

12.4.3.4.14.14 The Contractor must install new feeder circuit breakers and relevant cables must be replaced. Detailed information regarding the extent of changes can be found in the following documents:

- 5660-85051-01 - Electrical AC System - Single Line Diagram.
- 5660-85051-03 - Electrical Load analysis - AC (for new consumers)
- 5660-57452-01 - Ventilation System – Cable Diagram
- 5660-60152-01 - Diesel engines/ME for propulsion - Cable Diagram
- 5660-71152-01 - Lube Oil System - Cable Diagram
- 5660-72252-01 - FW Cooling Systems - Cable Diagram
- 5660-73152-01 - Compressed Air Systems - Cable Diagram
- 5660-85052-01 - Cable list, including termination details
- 5660-87152-02 - 600V Main Switchboard - Feeder Diagram
- 5660-87452-01 - Motor and Starter List
- 80-05 to 80-16 - Electrical One Line (existing document)
- 80-02 - Electrical Load Analysis (existing document)
- DMCA00049640 - Installation Planning Instructions (IPI)

12.4.3.4.14.15 The Contractor is provided the following non-exhaustive list of system modifications for the Electrical Distribution System. All redundant wiring for the following systems must be removed and the Contractor must supply and install new wiring as indicated below. The length of cables noted in the 5660-85052-01 Cable List are estimates based on a sister ship, the Contractor must confirm all cable lengths once the Contractor has determined final placement of equipment and routing of the cables. For bidding purposes, the Contractor must include pricing for the supply and installation of all listed cabling lengths plus an additional 20 percent to account for any additional lengths

deemed necessary on site. The Contractor must supply and install all material required to mount the GSM electrical boxes.

- a) Wärtsilä 8L26 (3 units):
- 1) Mounting of three (3) new Power Unit boxes with 120v and 24VDC power supplies;
 - 2) Mounting of three (3) new Wartsila Communication Boxes with 120v and 24VDC power supplies;
 - 3) Replacement of all generator cables, including armoured main power cables (note cable schedule only states screened) , preheater and control cables to Main Switchboard and Power Management System;
 - 4) Run new power supply cables to Engine Controls and Communication Boxes;
 - 5) Run new communication cables from Gensets to Communication Boxes and Alarm and Monitoring System;
 - 6) Run new cables to ECR Console Mimic Panel;
 - 7) Run new cables to Woodward Communication Box in the Engine Room and AVR in Main Switchboard.
- b) Starting air compressor, 600VAC (2 units):
- 1) Mounting of two (2) new starter boxes for the air compressors;
 - 2) Run new power cables from new compressors to starter panels on MCC's;
 - 3) Run new control cables from compressor to starter panel on MCC's.
- d) Preheating unit, 600VAC (3 units):
- 1) Replace the existing breaker current trips;
 - 2) Modify the breaker buckets for the new preheater control configuration;
 - 3) Run new power cables to each of the new Preheating units. Generator #1 and #2 preheaters are from MCC1, Generator #3 is from MCC2;
 - 4) Run new control cables from main engines to Preheating units.
- e) Engine Pre-lubricating oil pump, 600VAC (3 units):

- 1) Mount three (3) new Pre-lubricating pump starter boxes and emergency shutdown;
 - 2) Run new power and control cables from engines to starter and shutdown;
 - 3) Run all new power cables, all Generators are from MCC3.
- f) Engine Turning Gear, 600VAC (3 units):
- 1) Modify the breaker buckets for the new equipment configuration with three (3) new locally mounted starter boxes;
 - 2) Run new power cables to each of the new Engine Turning Gear starters, Generator #1 and #2 from the Port Vital MCC and Generator #3 from the Stbd Vital MCC, and from the starters to the Engine Turning Gears.
- g) Generator Lube Oil pump, 600VAC (6 units)
- 1) Mount three (3) new Pre-lubricating pump starter boxes;
 - 2) Run new power and control cables from generators to starter;
 - 3) Run new power cables from Generator Lube Oil Pump starters to MCC3.
- h) LT electronic thermostatic valves (for arctic operations) in the LT circuit for each engine, 120VAC (3 units):
- 1) Run new power cables from 120V panel to thermostatic valves;
 - 2) Run new control cables from engines to LT thermostatic valves.
- i) Central cooler valve, 120VAC (1 unit)
- 1) Run new power cables from 120V Power Supply to thermostatic valve controller;
 - 2) Run new control cables from engines and Central Cooler thermostatic valve to thermostatic valve controller.
- j) Engine Room Ventilation fans, 600V (2 units)
- 1) Two (2) VFD displays to be mounted in the control room;
 - 2) Two (2) VFDs to be mounted in the engine room above Port Main Engine at the Engine Room Flat;
 - 3) Mount new pressure control sensors and shutdowns and proceed to run cables to the VFDs and the ECR Console Mimic Panel;

- 4) Run new power cables from MCC4 to the VFDs;
 - 5) Run new power cables from the VFDs to the fans;
 - 6) Run new communication cables from the VFDs to the Alarm and Monitoring System.
- k) Mount and install CO2 bottles and piping for each of the generators per DMCA00001389 in the IPI.

12.4.3.4.15 Electrical Cable Installation

12.4.3.4.15.1 The Contractor must install all cables according to TP127E and in compliance with the requirements of ABS.

12.4.3.4.15.2 Systems which are disturbed must be tested before and after the conversion (fire detection, Public Address, lighting, emergency lighting and engine room alarm system) to confirm operation. The Contractor is responsible to isolate, tag, remove, store and reinstall all electrical components removed for this specification. The Contractor must confirm all systems with shut downs are functioning upon re-installation.

12.4.3.4.15.3 Before any electrical works are started, all lock out and tag out procedures to ensure that power distribution is switched off must be followed.

12.4.3.4.15.4 Properly sized, certified marine approved cables must be supplied by the Contractor and installed for all new electrical equipment, including all power cables. Details of the cable sizes are specified in the following documents:

- 5660-85051-01 - Electrical AC System - Single Line Diagram.
- 5660-57452-01 - Ventilation System - Cable Diagram
- 5660-60152-01 - Diesel engines/ME for propulsion - Cable Diagram
- 5660-71152-01 - Lube Oil System - Cable Diagram
- 5660-72252-01 - FW Cooling Systems - Cable Diagram
- 5660-73152-01 - Compressed Air Systems - Cable Diagram
- 5660-85052-01 - Cable list, including termination details
- 5660-87152-02 - 600V Main Switchboard - Feeder Diagram
- 5660-87452-01 – Motor and Starter List

12.4.3.4.15.5 In general, cables running in group must be fixed on steel hangers or trays and fastened as per ABS guidelines. Cable trays on weather deck to be of stainless steel. Section G3.5 of this specification must be followed with regards to cable terminations, cable marking and termination labels.

12.4.3.4.15.6 The Contractor must follow existing cable routing wherever possible. The Contractor must provide and include the cost for the supply, installation, packing and testing of ten (10) new S8x4, welded, complete Roxtec transit

kits (Complete with frame, blocks, wedge kit, stay plate, lubricant etc.) as part of this specification item. The Contractor must also provide a unit price per transit for adjustment purposes. The actual value will be adjusted by PSPC 1379 process based on the final installation requirements.

12.4.3.4.15.7 The Contractor must make necessary modifications to the lighting in engine room and casing to ensure proper light for safe operation, inspection, service and maintenance of all installations in the area is maintained after the conversion.

12.4.3.4.15.8 After all of the electrical installations are complete, the Contractor is responsible for carrying out all additional testing requirements and supplying all equipment, including load banks, necessary for testing the new system per DBAE591721 - 1100 Commissioning Manual. All testing and commissioning must be carried out under the supervision of the FSR and to the satisfaction of the CG TA.

12.4.3.4.15.9 The Contractor must supply all labor, equipment and materials required for load testing including cabling, connections and hardware (i.e. Belleville washers) needed to connect a suitable load bank (2 Mega Watt Resistive) to the load side of the Propulsion Breaker. The Contractor must provide certified technicians to run all cabling and to remove the existing propulsion transformer leads from the propulsion breaker, connect the load bank to the breaker and return the propulsion transformer connections upon completion. The technicians must adjust the propulsion breaker instantaneous, long time, and slow time settings to match the load bank characteristics & return to "as found" settings once testing is completed. All rigging, crange and labour required to successfully complete these testing requirements are the responsibility of the Contractor and must be included in their pricing. This load bank requirement is based on a 7 day, continuous, testing period including 1 day for set up and 1 day for tear down.

12.4.4 Proof of performance

12.4.4.1 Inspection

12.4.4.1.1 Inspection, tests and trials of the Vessel, including the hull, machinery, equipment and outfits must be carried out by the Contractor in the presence of ABS, and the TA, throughout the construction period of the Vessel. The Contractor's inspection, tests and trial plans must comply with the requirements of ABS Rules and Regulations, the Wartsila IPI and Commissioning Plan.

12.4.4.1.2 The TA must be advised in advance of all inspections, tests and trials of the Vessel.

- 12.4.4.1.3 The Contractor must submit for approval to the TA and ABS the detailed schedule of the Inspection and Test Plan within 21 days of contract award, using document DBAE850253 – Martha L Black ITP as a basis.
- 12.4.4.1.4 Wärtsilä will have technical advisory personnel on site to provide technical assistance during the pre-commissioning, testing and commissioning of the equipment. Before start-up of any equipment, the Wärtsilä personnel will inspect the correctness of installation to ensure the safe start-up of the equipment. The Wärtsilä personnel will work in close cooperation with the Contractor and in liaison with the Owner's personnel prior to the start-up of the installation.
- 12.4.4.2 Tests
- 12.4.4.2.1 Radiographic test, ultrasonic test or magnetic particle inspection for welds must be carried out in compliance with the requirements of the Classification Society and as detailed in this specification. The location and number of non-destructive testing (NDT) must be in compliance with the requirements of the Classification Society, or the CCG Welding Standard, whichever is more stringent. The NDT plan must be prepared by the Contractor and submitted to the TA and ABS for approval prior to starting removals. The TA must be notified when testing is complete. The inspectors must be qualified to the Canadian General Standards Board (CGSB) Standard CAN/CGSB-48.9712-2014 (Qualification and Certification of Non-Destructive Testing Personnel), at Level 2 or higher.
- 12.4.4.2.2 As detailed in Section 21.2 – Inclining Experiment– of this SOW, an Inclining Experiment must be performed after the conversion in accordance with Section 21.1 – Commissioning of the propulsion system - of this SOW.
- 12.4.4.2.3 When the Vessels conversion is completed, sea trials must be carried out by the Contractor in accordance with the sea trial procedure, in order to demonstrate the full functionality of the newly installed system.
- Reference document - DBAE850253 Martha L Black ITP
- 12.4.4.2.4 Sea Trial Plans must be prepared by the Contractor and must be submitted to the TA for approval, at least three weeks before the sea trials. The measurements must be conducted at defined conditions in terms of weather, draught and trim in accordance with the SNAME Guide for Sea Trials. These conditions must be recorded.
- 12.4.4.2.5 Any hull/propeller condition variation to the one recorded as stated in the previous paragraph (due to Owner's works during conversion process) must be recorded and noted prior to sea trials (for example hull polishing or painting).

12.4.4.2.6 The Contractor must confirm the fuel oil grade and quality to be used in the new Gensets with Wartsila and the TA, and the fuel must be analyzed prior to use in engines and report provided to the TA.

12.4.4.2.7 If any basic faults are found during the trials, the Contractor is obliged to repeat the trials in case of necessity within a reasonable period of time.

12.4.4.3 Commissioning

12.4.4.3.1 The Contractor must perform the Commissioning in accordance with the Wartsila Commissioning Plan, and section 21.1 – Commissioning of the propulsion system - of this specification.

12.4.5 Deliverables

12.4.5.1 Documents

12.4.5.1.1 The temporary openings in the hull must be inspected using Non-destructive testing on all weld joints of the vessel structure. The Contractor must deliver a report to the TA with the results of the NDT testing prior to the application of any hull coatings.

12.4.5.1.2 The Contractor must provide the TA and Wartsila Site Manager with a copy of the fuel analysis report for approval prior to the loading of fuel aboard the vessel.

12.4.5.1.3 Contractor must prepare a binder for the documentation of all Tests, Trials and Inspection Records performed pertaining to the installation of the propulsion generators. The binder must be indexed for each test, trial and inspection performed and any alterations / repairs made prior to the acceptance of this item. The records must include all relevant documentation, test procedures, associated test sheets, including shop test data, and test, trial and inspection data and observation results.

12.4.5.1.4 All original records of the test, trial and inspections must be signed by ABS, Contractor and where necessary by the sub-Contractor and FSR who witnessed the tests.

12.4.5.1.5 The Contractor must generate new “As-Fitted” drawings affected by the installation of the new propulsion generator system. At a minimum, this includes all ship’s drawings detailed in section 12.4.2.3 – Drawings – of this specification item. These drawings must be provided in both electronic and hardcopy format. Electronic copies must be supplied in AutoCAD 2017 format – or later edition. Final versions for the drawings must be delivered to the TA and ABS. Copies of all ABS approved drawings must be delivered to the TA prior to completion of the contract. These drawings

include, but are not limited to, all machinery space arrangements, mechanical deck layout drawings and all electrical and piping related drawings/documentation.

12.4.5.1.6 All drawings must be standard ANSI paper size and must be in, at minimum, AutoCAD 2017 DWG format, and conform to the CCG National CAD Standard [MECTS-#2860606- v1-National_CAD_Standards.

12.4.5.1.7 All electronic versions of drawings must be given a name such that the user does not have to open the drawing to establish the purpose of the drawing.

12.4.5.1.8 Copies of all disposal certificates detailing disposal of the oil are to be supplied to the TA.

12.4.5.1.9 The Contractor must supply a report indicating the cleanliness results after the oil system flushing process and present to the TA prior to the final system connections being made.

12.4.5.2 Certification

12.4.5.2.1 All original Class approval certificates for all system components supplied by the Contractor must be submitted to the TA prior to the acceptance of this item.

12.4.5.2.2 All original Class and mill certificates for all steel used must be submitted to the TA prior to the start of work on this specification item.

12.4.5.2.3 The Contractor must supply the following certification to the TA prior to the start of work on this specification item:

- CWB certification
- Certification of the Marine Chemist
- Certification for any technician conducting NDT testing.

12.4.5.3 Spares

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

12.5 INTEGRATION AND CALIBRATION OF THE PROPLUSION GENERATORS TO THE CYCLO-CONVERTER, ANNUAL MAINTENANCE OF THE CYCLO-CONVERTER AND INSTALLATION OF 3 AVR'S

12.5.1 Identification

12.5.1.1 The objective of this work item is to provide specialized labor to integrate the new propulsion generators to the cyclo-converter, to perform the annual maintenance of the ABB cyclo-converter and to replace the three (3) voltage regulators for the propulsion generators.

12.5.1.2 The Contractor must provide the services of an ABB FSR to perform the work under this section of the SOW. The Contractor must include an allowance of \$200,000 to cover the cost of the services to be provided by the ABB FSR. The \$200,000 allowance must be part of the overall offer and must be adjusted up or down using the PWGSC 1379 form upon receipt of the final invoice from the FSR supported by copies of all related documents and invoices to verify actual expenditures.

Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses.

12.5.2 References

12.5.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
Documents for Automatic Voltage Regulators (AVR)	
G-44-18-01-ES-021-R00	Excitation and protection diagram 52-G1 (Starboard)
G-44-18-01-ES-031-R00	Excitation and protection Diagram 52-G2 (center)
G-44-18-01-ES-041-R00	Excitation and protection diagram 52-G3 (Port)
G-44-18-01-ES-041-R00	Interconnect diagram- Excitation system
1VAP428711-DB_PPW_PPD	Voltage Sensing Transformer
Documents for Cyclo-converter	
3BHS 118671 ZAB E01 Rev. B	ACS6000C maintenance
Documents for integration of new propulsion generators to the cyclo-converter	
3AFV6106125	Dock Trial Test Specification for CCGS T1100
3AFV6106242	Sea Trial Specification for CCGS T1100 Rev A

12.5.2.2 Regulations and standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations Revision / Date	Title / Description
FSM 7.B.3	Fleet Safety Manual, section on Entry into Confined Spaces
FSM 7.B.4	Fleet Safety Manual, section on Hot Works
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard
SOR/2010-120	Marine Occupational Health and Safety Regulations
TP127	Ship electrical standards

12.5.2.3 Equipment data:

Brand	Model	#Series / Share	Arrangement
Cyclo-converter			
ABB	ASC6000		Martha Black
AVR			
ABB	Unitrol 1020	3BHE030579R003	

12.5.2.4 Government Supplied Materiel

The three (3) AVRs and the annual maintenance kits needed for this section will be provided by CCG.

Item No.	Description	Quantity
3BHE030579R003	AVR Unitrol 1200	3
ASC6000C	Annual Maintenance kit	3

12.5.2.5 Contractor Supplied Materiel

In addition to the voltage transformer, listed below, the Contractor must supply all tools and materiel required to complete the work of this specification item – unless otherwise has been clearly specified.

Item No.	Description	Quantity
1VAP428711-DB_PPW_PPD	Voltage Transformer	3

12.5.3 Technical Description

12.5.3.1 The FSR must perform the following three (3) tasks: the annual maintenance of the cyclo-converter, the integration of the new propulsion generators to the cyclo-converter and the installation of the three (3) AVRs of the propulsion generators.

12.5.3.2 The annual maintenance work of the cyclo-converter consists of:

- Inspection of the control power supply and voltage quality;
- Inspection of the sequence of closing and opening times of the DC circuit breaker relays;
- Inspection of the main contact of the DC circuit breaker for wear;
- Inspection and measurement of the RC circuit of the phase module and the pulse transformer;
- Inspection and measurement of the RC circuit of the excitation unit and the pulse transformer;

- Inspection of the cooling fans;
- Replacement of the ION compound and filter;
- Inspection of the cooling pump, pump seals and heat exchanger;
- Inspection and measurement of current and voltage transducers;
- Inspection and measurement of fiber optic connections;
- Verification of the tightness of the supply and control connections;
- Replacement of the cooling fan filter;
- Performing functional tests.

12.5.3.3 Figures 12.5-1 and 12.5-2 show the AVR's to be removed and the place where the new AVR's must be installed.

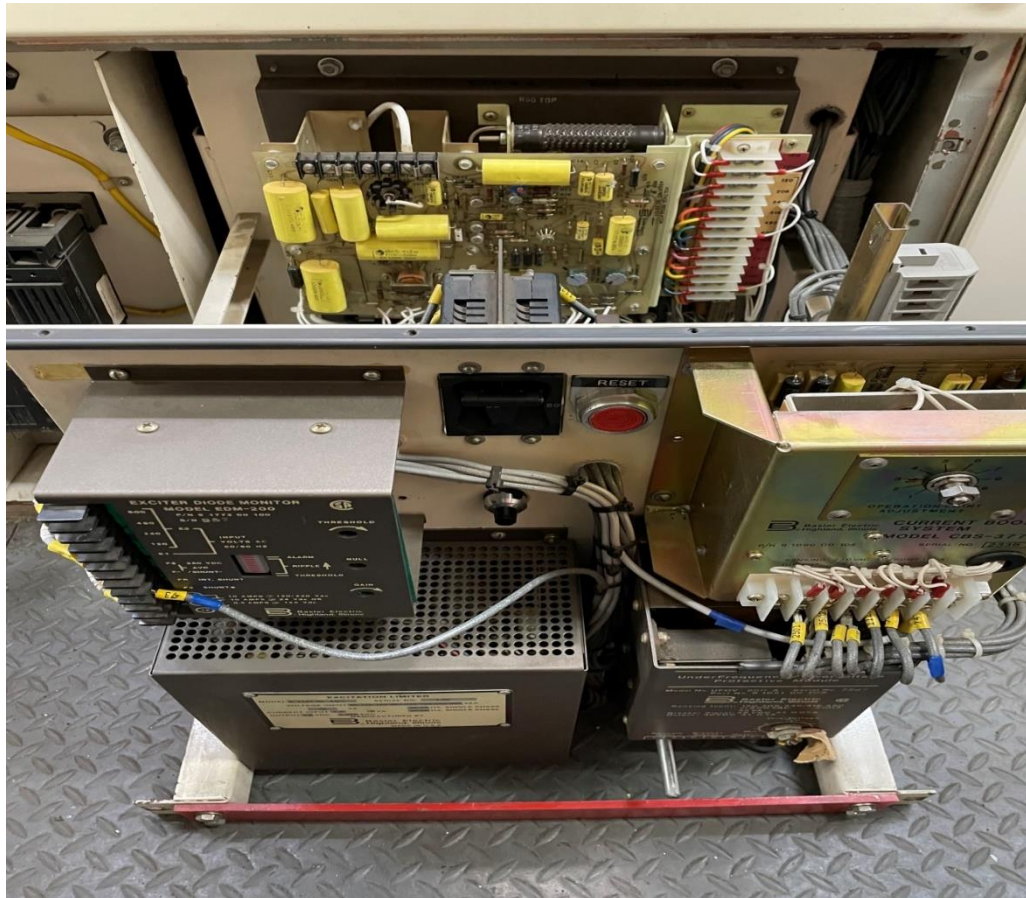


Figure 12.5.1 AVR



Figure 12.5.2 AVR

12.5.3.4 The work to replace the three (3) AVR's of the propulsion generators consists of:

- Removal of the three (3) old AVR's and their accessories (in the MCC transformer room);
- Installation of the three (3) new AVR's;
- Connection of the installed new AVR's;
- Installation of the cabling that connects the AVR's to the Easy gen system.

12.5.3.5 The Contractor must provide the 3 voltage sensing transformers for the reference signal # 1VAP428711-DB_PPW_PPD.

12.5.3.6 The Contractor must provide all materials, wiring, parts and specialized equipment to accomplish the required tasks.

12.5.3.7 . The Contractor and FSR must refer to document 3AFV6106125 and 3AFV6106242 to perform this task during the dockside trials.

12.5.4 Proof of performance

12.5.4.1 Inspection

12.5.4.1.1 Inspection points must be discussed with the ABS inspector prior to the start of the work. It is the Contractor's responsibility to arrange for presence of the ABS inspector at the appropriate time.

12.5.4.1.2 The Contractor must observe the following inspection Hold Points:

- 1st Hold point: Identification and removal of old components
- 2nd Hold point: Installation and test of the new component

12.5.4.2 Tests

12.5.4.2.1 The Contractor must conduct dockside and sea trials in the presence and to the satisfaction of the ABS inspector and GCC.

12.5.4.2.2 The FSR and ABS inspector must be present during the sea trials to do the final calibration of the system.

12.5.4.3 The FSR must be present during start-up and sea trials.

12.5.5 Deliverables

12.5.5.1 Documents

12.5.5.1.1 The Contractor must provide the CCG IA and TA with a copy of the FSR's reports and must update and submit to CCG all documents relating to the installation of the new AVRs.

12.5.5.1.2 The Contractor must update all plans affected by the work.

12.5.5.1.3 Prior to the end of the contract, the Contractor must submit to the CCG a comprehensive type-written report detailing the work undertaken, defects, repairs made, measurements, and readings taken, in PDF format, on an unprotected USB drive. This report must also include the following :

- All maintenance performed on the cyclo-converter.
- The new calibration data of the cyclo-converter, as well as the dockside and sea trials performed.

12.5.5.2 Certification

12.5.5.2.1 The Contractor must submit to CCG one (1) electronic copy and two (2) hard copies of the inspection certificates along with the original copy bearing the ABS seal.

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

12.6 INSTALLATION OF PREMAGNETIZATION TRANSFORMERS

12.6.1 Identification

12.6.1.1 The objective of this specification work item is for the Contractor to provide labor and materiel to install two pre-magnetization transformers, and to provide specialized labour to perform their connection and start-up. The installation must be witnessed and accepted by ABS; and ABS credit must be obtained.

12.6.1.2 The Contractor must provide the services of an ABB FSR to perform the connection, test the system, participate in the start-up and sea trials, and to provide supervision of the work under this section. The Contractor must include an allowance of \$40,000 to cover the cost of the services to be provided by the ABB FSR. The \$40,000 allowance must be part of the overall offer and must be adjusted up or down using the PWGSC 1379 form upon receipt of the final invoice from the FSR supported by copies of all related documents and invoices to verify actual expenses.

Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses.

12.6.2 References

12.6.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
14120190126tu01	Wiring diagram - Stand-alone premag transformer
NT-2858-22-DE501A	Navtech- Installation des transformateur de pré-magnetisation
108-H-23_25_T- Rev9_ Sept_2011	General arrangement

12.6.2.2 Regulations and standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations - Revision / Date	Title / Description
FSM 7.B.3	Fleet Safety Manual, section on Entry into Confined Spaces
FSM 7.B.4	Fleet Safety Manual, section on Hotworks
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard
SOR/2010-120	Marine Occupational Health and Safety Regulations
TP127	Ship electrical standards

12.6.2.3 Equipment data

Brand	Model	Series	Arrangement
ABB	25KA Transformer 612-600V/ 60Hz (Custom made)		14120190126

12.6.3 Technical Description

- 12.6.3.1 Referring to the Navtech drawing no. NT-2858-22-DE501A, the Contractor must provide the required materiel and labor to install and connect the new pre-magnetizing transformers.
- 12.6.3.2 Referring to the Navtech drawing no. NT-2858-22-DE501A, the Contractor must provide the required materiel and labor to install a maintenance platform around the pre-magnetization transformers.
- 12.6.3.3 The installation is to be done in the propulsion motor room, on the watertight bulkhead of frame 54, on the starboard side, and above the starboard harmonic filter, figure 12.6-1.

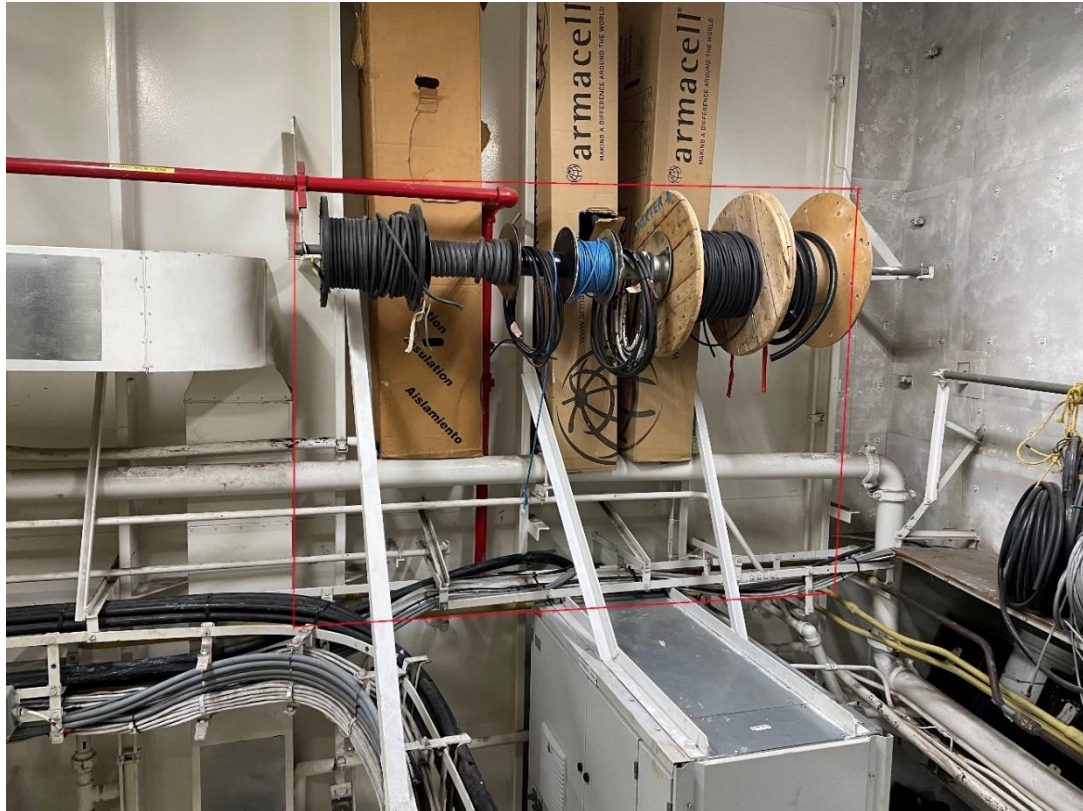
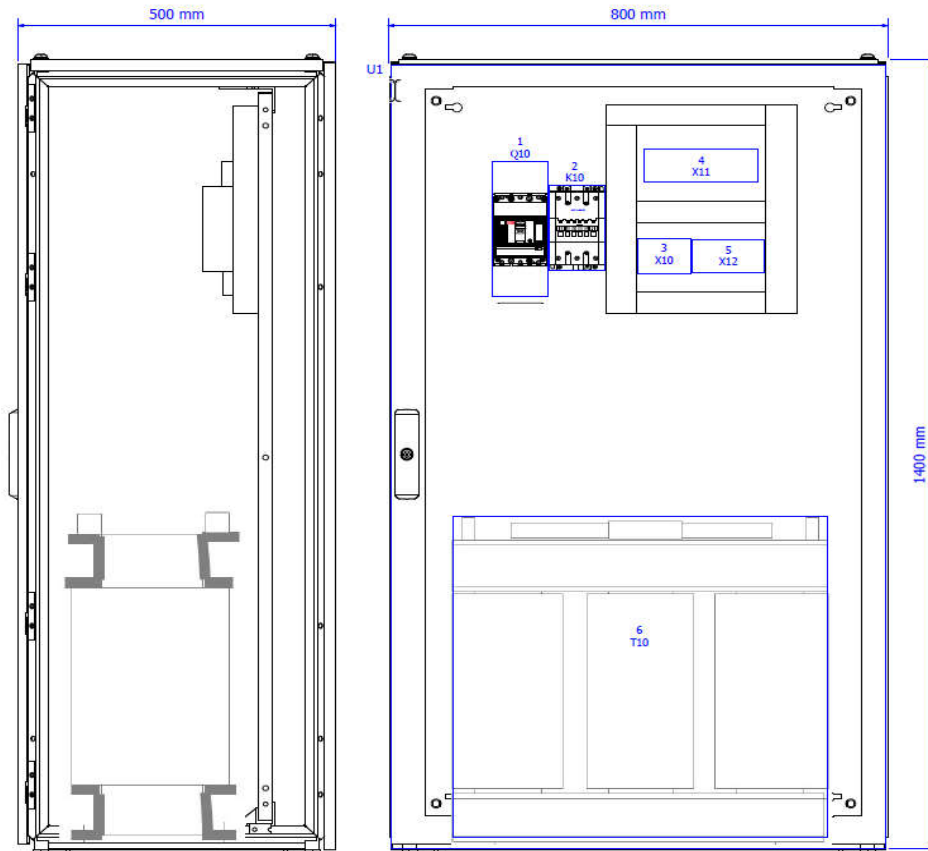


Figure 12.6-1: Installation location of the pre-magnetizing transformers

12.6.3.4 Each pre-magnetization transformer has a length of 800 mm, a width of 500 mm, a height of 1400 mm and a weight of 350 kg.



12.6.3.5 The Contractor must remove the electric cables rack currently in place. The Contractor must reinstall this rack elsewhere in the propulsion engine room. Exact location to be determined.

12.6.3.6 The Contractor must provide materials and labor to complete the installation according to the applicable Class-approved plan. Note: the electrical plan is approved by DNV-GL, and the installation drawing is ABS approved.

12.6.3.7 The Contractor must provide cable supports, and must provide for opening and closing a bulkhead transist (Roxtec) for electrical wiring.

12.6.3.8 The Contractor must provide all material and the services of the ABB FSR to make the connection. Referring to the general arrangement plan, it is the Contractor's responsibility to determine the length of cable required for the installation.

12.6.3.9 For the connection plan and the type of cable, the Contractor must refer to the wiring diagram document number 14120190126tu01.

12.6.4 Proof of performance

12.6.4.1 Inspection

12.6.4.1.1 Inspection points must be discussed with the ABS inspector prior to the start of work. It is the Contractor's responsibility to call the ABS inspector at the appropriate time.

12.6.4.1.2 The Contractor must observe the following inspection Hold Points:

- 1st Hold point: Installation of the platform and transformer
- 2nd Hold point: Connection of the transformer

Tests

12.6.4.1.3 The FSR must perform functional tests and the system start-up. ABS and GCC must be present to witness all tests.

12.6.4.1.4 The FSR must demonstrate the performance of the pre-magnetization transformers during the start-up of the propulsion transformers.

12.6.4.2 Sea Trials

The FSR must be present during the sea trials to do the final calibration of the system.

12.6.5 Deliverables

12.6.5.1 Documents

12.6.5.1.1 The Contractor must provide CCG with a copy of the FSR's reports and must update all documents pertaining to the installation of the new pre-magnetization transformers.

12.6.5.1.2 The Contractor must update all related drawings.

12.6.5.1.3 Prior to the end of the contract, the Contractor must submit to CCG a comprehensive type-written report detailing the work undertaken, defects, repairs made, measurements, and readings taken, in PDF format, on an unprotected USB drive.

12.6.5.2 Certification

12.6.5.2.1 The Contractor must provide a copy of the certification of the welders.

12.6.5.2.2 The Contractor must submit to CCG one (1) electronic copy and two (2) hard copies of the inspection certificates along with the original copy bearing the ABS seal.

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

13.0 POWER GENERATION SYSTEM

13.1 INSPECTION OF THE CATERPILLAR C32 AUXILIARY GENERATOR

13.1.1 Identification

- 13.1.1.1 The objective of this item is to perform the manufacturer's recommended maintenance on a Caterpillar C32 generator, as detailed herein.
- 13.1.1.2 For this Specification Item, the Work must be performed by a fully accredited Caterpillar Technical Service Representative (TSR) familiar with the operation, service and maintenance of the CAT-C32 engines.
- 13.1.1.3 For the bidding purposes, the bid must include an allowance of \$30,000 to cover the cost of services of the Caterpillar TSR for execution of the work in this section.

Reasonable cost of travel and living expenses must be billed at cost without overhead or profit. The \$30,000 allowance must form part of the overall bid and must be adjusted, up or down, by PSPC 1379 process upon receipt of the final TSR invoice supported by copies of all related documentation to verify actual expenses.

- 13.1.1.4 The bid must also include price for a total of 50 hours of work, by the Shipyard personnel, assisting this "Contractor". This price must be adjusted up or down by means of PSPC 1379 process based on actual hours spent assisting the TSR. For this purpose, the submitted invoice must be supported by timesheets signed by the TSR, confirming the actual time worked, and other related documents, if necessary.

13.1.2 References

- 13.1.2.1 Document

Drawing/Document No. Revision / Date	Title / Description
Sebu 904203-00	Operation & Maintenance Manual C32 MARINE
63.00.01, Rev 3 (Mar. 1, 1986)	Engine Exhaust System

- 13.1.2.2 Regulations and Standards

All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section.

Standards & Regulations – Revision / Date	Title / Description
C.R.C., c. 1431	Canada Shipping Act 2001 - Hull Construction Regulations
C.R.C., c. 1494	Canada Shipping Act - Tackle Regulations
SOR/90-264	Canada Shipping Act – Marine Machinery Regulations
C.R.C., c. 1432	Canada Shipping Act - Hull Inspection Regulations
C.R.C., c. 1467	Canada Shipping Act – Safe Working Practices Regulations
SOR/2010-120	Maritime Occupational Health and Safety Regulations
DFO/5737	CCG Fleet Safety Manual
IACS No. 47 - Shipbuilding and Repair Quality Standard	IACS No. 47 - Shipbuilding and Repair Quality Standard
TP 127E, Transport Canada Marine Safety – Ship Electrical Standards	TP 127E, Transport Canada Marine Safety – Ship Electrical Standards
IEEE STD 45 – Recommended Practice for Shipboard Electrical Installations	IEEE STD 45 – Recommended Practice for Shipboard Electrical Installations

13.1.2.3 Equipment Data

Equipment	Brand	Model	Arrangement
Generator	Caterpillar	C32	522-3604

13.1.2.4 Government Supplied Materiel

The following items, required for this maintenance, will be provided by the CCG:

Item No.	Description	Quantity
20R3319	ARM A UI ROC	12
20R8517	BARS GP	24
8S9191	BOULON	12
0R5513	CORE	1
20R0503	CORE	2
20R3319	CORE	12
20R8517	CORE	24
0R5513	ENS. NOYAU - HUILE	1
2901935	ELEMENT A-F	2
1R0755	FILTER A	2
1R1808	FILTERUR AS-LU	2
5713903	GASKET KIT	2
20R0503	CULASSE GP	2
3561367	INJECTION GP	12
4850150	2NS. JOINT	1
5268491	2NS. JOINT	1
5270778	2NS. JOINT	1
2481394	KIT DE JOINT S	12
2N2766	ÉCROU DE BLOCAGE	24
225-3100	PLATE-SPACER	2
6I4953	REGULATEUR	1
6I4955	REGULATEUR	2
3S9643	JOINT	2
2W0482	GOUJON	24

13.1.3 Technical description

13.1.3.1 The Contractor must provide the services of a certified Caterpillar TSR to perform the manufacturer's recommended 10000H maintenance, ref. code SMCS 7595-020-TE

13.1.3.2 This maintenance must combine the 250H, 500H, 1000H, 2000H and 500H maintenance plus the 10,000H maintenance which consists mainly of the replacement of the cylinder heads (top overhaul), supplied by CCG, and the inspection and cleaning of the oil cooler, main heat exchanger, intercooler and the replacement of the injectors.

13.1.4 Proof of performance

13.1.4.1 Inspection

13.1.4.1.1 During this maintenance, the ABS inspector may check certain components of the generator. The inspection points must be discussed with the ABS inspector prior to the start of the work. The Contractor must notify and arrange for the ABS inspector to be present on site at the appropriate time.

13.1.4.1.2 The Contractor must provide the CCG IA with a 2-days advanced notice of completion of all work specified herein in order to allow for the coordination of a visual Installation Check (IC) to ensure conformity with this specification. The Contractor is responsible for any necessary corrections.

13.1.4.2 Tests

13.1.4.2.1 Following the maintenance, the generator must be put under load for a significant period of time, depending on the load but not less than two (2) hours, in order to verify its proper functioning. The largest hotel load that the ship can be subjected to must be used for this test. All operating data must be recorded and included in the final report.

13.1.4.2.2 The Contractor must perform the applicable tests while witnessed by CCG TA/IA and ABS, and prove the system operational.

13.1.5 Deliverables

13.1.5.1 Reports & Documentation

13.1.5.1.1 The Contractor must provide the CCG with a copy of the maintenance reports. The report must include a record of all parts used and the TSR certification.

13.1.5.1.2 The report must include all observations, data from initial inspection, record of work performed and data collected during the work, final commissioning data and a record of adjustments, repairs and measurements performed.

13.1.5.2 Certifications

13.1.5.2.1 The contractor must submit to CCG one (1) electronic copy and two (2) hard copies of the inspection certificates along with the original copy bearing the ABS seal.

NOTE: Final acceptance will be based on FSR and ABS certification.

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

13.2 REPLACEMENT OF THE EXHAUST SILENCER OF THE AUXILIARY GENERATOR

13.2.1 Identification

- 13.2.1.1 The purpose of this item is for the Contractor to provide the labor and materials to replace the Caterpillar C32 auxiliary generator muffler with a new similar muffler. See Figure 13.2.1.
- 13.2.1.2 This work must be done in conjunction with the Specification Work Item **12.4 Replacement of Propulsion Generators.**



Figure 13.2.1 Auxiliary generator silencer

13.2.2 References

- 13.2.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
63-00-01, Rev. 3 (1986-03-01)	Engine exhaust system
63.10.01, Rev1 (1986-03-06)	Arrangement diesels and boilers exhaust piping
SM2SA-8-EIEO	CHAMBERED SPARK ARRESTING SILENCERS
001_201-10553-47, Rev0 (Note 1)	Rapp_MCA_Martha-L-Black_
002_201-10553-47, Rev0	HazMat_NGCC_M-L-Black
Intertherm 50	Technical data sheet
Interzinc22	Technical data sheet

Note 1: This document (Report or Survey) is from WSP Hazardous Material Management company.

13.2.2.2 Regulations and Standards

All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section.

Standards & Regulations – Revision / Date	Title / Description
ASTM A106-2021	Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A105-2010	Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A193-2020	Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

13.2.2.3 Equipment Data

Equipment	Brand	Model	# Size
Critical Grade Spark Arrestor Straight Through Silencer	SMS silencers	SM2SA-8-EIEO	8''

13.2.2.4 Government Supplied Materiel

The Coast Guard will provide the new muffler.

13.2.2.5 Contractor Supplied Materiel

The contractor must provide a new exhaust bellow as describe in section 13.2.3.9, as well as all components necessary for the installation. This includes, but is not limited to, bolts, anti-seize compounds for the bolts, gaskets, insulation blankets at the junctions between the new muffler and the existing piping and paint. All components supplied must be designed for use on an exhaust system and must be designed for high temperature (more than 450 Celsius).

13.2.3 Technical description

- 13.2.3.1 The Contractor must supply all labor, materials, tools and equipment necessary to perform the work of replacing the auxiliary generator muffler.
- 13.2.3.2 The Contractor must remove from the work area any item that may interfere with the removal of the existing muffler, including exhaust system components, floors, ladders, handrails, etc.
- 13.2.3.3 The Contractor must disassemble, remove and dispose of the old muffler.
- 13.2.3.4 Note that samples were taken from the muffler insulation material to determine if it contains asbestos. Refer to documents 002_201-10553-47_rev0 and 001_201-10553-47_rev0, listed in 13.2.2.2, samples #15A, 15B and 15C.
- 13.2.3.5 After removing the old muffler, the Contractor must clean the flanges in preparation for the installation of the new muffler.
- 13.2.3.6 In the event that modification or repair is required, the material used for modification must be ASTM A106 or ASME SA 106, SCH. 40. All flanges must be forged steel conforming to ASTM A105 or ASME SA 105, with pressure ratings of ASME B16.5-2020 class #150.
- 13.2.3.7 The Contractor must apply one coat of Interzinc 22 primer and one coat of Intertherm 50, or equivalent, as recommended by the paint manufacturer, on all new steel surfaces.
- 13.2.3.8 The Contractor must install, in place, the new muffler provided by the Coast Guard.

- 13.2.3.9 The Contractor must supply and install a new exhaust bellows. The new bellows must be custom made to fit the new installation. Refer to Figure 13.2.3.9 showing the existing bellows currently installed.
- 13.2.3.10 The Contractor must provide new bolts required for reassembly. The bolts must be designed for this purpose and must be designed for high temperature. He must also supply the high temperature anti-seize compound required for the reassembly of the bolts.
- 13.2.3.11 The Contractor must supply and install new gaskets for the muffler and adapter flanges. Gaskets supplied must be graphite laminate rated for a temperature of 450 degrees Celsius or higher; KLINGER Graphite Laminate SLS or equivalent.
- 13.2.3.12 The Contractor must supply and install a new cover for the adapter and the flanges.
- 13.2.3.13 At the end of the work, the Contractor must reassemble all the components that he had removed in 13.2.3.2
- 13.2.3.14 The Contractor must provide material and labor to repair any paint that has been disturbed by the work following the process outlined in GCC MLB 2022 - Refit Paint Specification
- 13.2.3.15 The Contractor must remove and dispose of waste materials from work areas
- 13.2.3.16 Upon completion of the work, The Contractor must restore all compartments and work areas to their original condition



Figure 13.2.1 Existing Bellows

13.2.4 Proof of performance

13.2.4.1 Inspection

- 13.2.4.1.1 The Contractor must arrange for CCG inspection of all Contractor supplied materiel, and obtain CCG's approval before their installation.
- 13.2.4.1.2 The Contractor must provide the CCG IA with 2-days advanced notice of completion of all work specified herein in order to allow for the coordination of a visual Installation Check (IC) to ensure conformity with this specification. The Contractor is responsible for any necessary corrections.

13.2.4.2 Tests

- 13.2.4.2.1 The Contractor must operate the auxiliary generator under load and inspect the work and the absence of exhaust leakage in the presence of the CCG IA.
- 13.2.4.2.2 The Contractor must undertake to rectify defects and deficiencies in the Contractor's installation or repair work, as soon as practicable. The Contractor is responsible to schedule such repairs at its own risk and cost.
- 13.2.4.2.3 The Contractor must reschedule unsatisfactory inspections/tests after the required repairs have been completed.

13.2.5 Deliverables

13.2.5.1 Documentation

13.2.5.1.1 The Contractor must submit the list and technical data sheets of the Contractor supplied materiel, and obtain CCG's approval before their installation.

13.2.5.1.2 The Contractor must provide the related test report.

13.2.5.1.3 The Contractor must provide a record of all parts used.

13.2.5.2 Certifications

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

Solicitation No. - N° of the invitation
F7049-210340/A
Client Ref. No. - N° de réf. du clientFile
F7049-210340041MD

Amd. No. - N° de la modification
No. - N° du dossier
041md. F7049-210340

Buyer ID - Id de l'acheteur
041MD
CCC No./N° CCC - FMS No./N° VME

14.0 NOT USED

15.0 **AUXILIARY SYSTEMS**

15.1 **DIESEL FUEL, HELICOPTER FUEL AND OILY WATER TANKS**

15.1.1 **Identification**

15.1.1.1 The purpose of this Specification Work Item is for the Contractor to open, clean and prepare the diesel, aviation and other tanks, listed in 15.1.2.3, for inspection and survey by an ABS inspector in order to obtain the ABS credit for the tanks' survey.

15.1.1.2 All tanks in this item must be pressure tested.

15.1.1.3 Upon completion of the work, the tanks must be returned to a state of operational readiness. .

15.1.2 **References**

15.1.2.1 Document

Drawing/Document No. Revision / Date	Title / Description
108-H-0026 rev2 -April_2001	Capacity plan
108-H-0022_Rev3_Oct-1998	Docking Plan
108-H-0013_Rev0_June-1984	Tank Testing Plan
C14-53-009-01	Tanks surfaces
5660-144-001 Rev0_Oct-2019	Docking Plan

15.1.2.2 Regulations and Standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations - Revision / Date	Title / Description
CSA 2001, CRC ch. 1432	Hull Inspection Regulations
FSM 7.B.4	Fleet Safety Manual, section on Hotworks
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations
DFO 5737	Fleet Safety and Security Manual

15.1.2.3 Equipment Data:

All tanks marked with an asterisk (*) are equipped with a docking plug.

Tanks	Location Frame	Capacity (m³)	Surface area (m²)
*F.O No. 1 port	163-175	55.4	268.3
*F.O No. 2 starboard	163-175	55.4	268.3
*F.O No. 3 port	152-163	117.7	386.0
*F.O No. 4 starboard	152-163	111.7	386.0
* F.O No. 5 port	106-121	118.6	409.7
* F.O No. 6 starboard	106-121	118.6	409.7
* Double bottom F.O No. 7 Port	106-126	51.8	354.2
*Double bottom F.O No. 8 starboard	110-126	41.5	282.2
*Double Bottom F.O No. 9 Port	70-96	79.7	533.0
*Double Bottom F.O No. 10 starboard	70-96	79.7	533.0
*Overflow tank.	106-110	8.5	78.7
Fuel oil leak	94-96	1.9	25.5
Sludge Tank.	55-64	1.6	Not available
Dirty oil tank	30-37	6.5	60.0
Oily water tank STBD	30-37	6.5	60.0
Helicopter fuel tank	5-11	22.8	56.0
*Lower Stabilization Fuel Cells (Flume)	117-126	116.3	492.5
*Higher stabilization fuel rese- tions (Flume)	117-126	118.3	516.5
FO Day Res.	64-70	27.8	147.2
FO Decantation Tank	57-64	32.5	161.5
Emergency Generator Tank	67-69	1.9	13.8

15.1.2.4 Types of fuel stored in the tanks

15.1.2.4.1 The diesel fuel tanks contained diesel of the following types: Arctic; and/or Marine 3GP 11D; and/or Arctic 3GP 11C; and/or Marine Diesel; According to international standard ISO8217: 2005 (F).

15.1.2.4.2 The helicopter fuel tank contains Jet A-1 aviation fuel.

15.1.3 Technical Description

Pumping and emptying of tanks:

- 15.1.3.1 Prior to the start of the work, the amount of fuel in the tanks will be reduced to the minimum by the Vessel's crew and distributed in such a way as to facilitate the work in the specifications.
- 15.1.3.2 Upon arrival at the Contractor's facility, the Contractor, jointly with CCG IA, must document all fuel tanks soundings onboard. The Contractor must remove the vessel's remaining fuel onboard, store the fuel and return it onboard after completion of the fuel tank inspections and survey work..
- 15.1.3.3 The storage facilities, provided by the Contractor, must be clean and uncontaminated. The storage facilities must be inspected and approved satisfactory to CCG TA prior to fuel transfer.
- 15.1.3.4 For bidding purposes, the Contractor's bid must include the price to pump and store the fuel ashore and then pump back on board the vessel fifty (50) m³ of diesel fuel; as well as the unit price for each five (5) m³ to adjust the final cost, up or down, by PSPC 1379 process.
- 15.1.3.5 The Contractor must drain and dispose the fuel drained from the helicopter fuel tank in accordance to the applicable environmental regulations. This fuel must not be stored. The estimated amount of fuel remaining in this tank is five (5) m³.
- 15.1.3.6 For draining the fuel tanks and transfer of fuel, the Contractor must empty all tanks to the bottom through their suction lines. The Contractor must contact the CCG TA regarding the sequence of fuel transfer from the vessel while the vessel is resting on the blocks.
- 15.1.3.7 The Contractor must remove the docking plugs to drain the fuel and the residue remaining in the tanks. The Contractor must use a portable pump for emptying the tanks that do not have a docking plug. The Contractor must dispose of this residue on land in accordance with the applicable environmental regulations.
- For bidding purposes, the Contractor's bid must include the price for the removal and disposal of approximately six (6) m³ of fuel residue and dirt from all tanks. The Contractor's bid must also include a unit price for the removal and disposal of one (1) m³ of fuel residue and dirt. The final cost must be adjusted, up or down, by PSPC 1379 process.

Opening and cleaning of tanks

- 15.1.3.8 The Contractor must remove equipment restricting access to manholes and replace it upon completion of the work.

- 15.1.3.9 The Contractor must open manhole covers on designated tanks in a sequence of work determined by the CCG TA.
- 15.1.3.10 The Contractor must open all tanks, ventilate and arrange for a Marine Chemist or other qualified person, to certify that each tank is “safe to enter” prior to the start of the cleaning operations, and ready for Hot Work.
- Note: The cost of subjecting the double-bottom tanks # 7, #8, #9, and #10 to gas-free certification is addressed in Specification Work Item 11.2.3.2.3. This cost should not be included in this section again.**
- 15.1.3.11 The Contractor must post a copy of the “Safe for Entry/Safe for Hot Work” certificates, signed by the marine chemist or other qualified person, at the entrance of each tank. A copy of these certificates must also be given to the Chief Engineer. The Contractor must ensure that these certificates are kept valid for the entire period that the tanks are open.
- 15.1.3.12 The Contractor must clean all other tanks, those without manholes, with non-woven rags to remove all dirt and debris.
- 15.1.3.13 The Contractor must empty, wash and vent diesel fuel, helicopter fuel and oily water tanks, and submit them for inspection by the attending ABS surveyor for a survey credit.
- 15.1.3.14 The Contractor must ensure that all limber holes in each tank are free and clear. The Contractor must inspect the tanks for obstructions at the bottom of all sounding pipes and tank suction.
- 15.1.3.15 Upon completion of work, all fuel tanks must be returned to their sounding levels as they were upon arrival at the Contractor’s facility.

Tank inspection

- 15.1.3.16 All of these tanks must be inspected by the CCG TA and the ABS inspector, to allow for their certification. It is the Contractor's responsibility to inform the ABS inspector and the CCG TA when the tanks are ready for inspection.
- 15.1.3.17 During these inspections, any defects noted by the inspectors or the Contractor must be repaired by the Contractor, including re-coating of any identified missing primer coating.
- The Cost for such repairs, if any required, will be dealt with by using the PSPC 1379 process.
- 15.1.3.18 Upon completion of the cleaning and ABS survey, the Contractor must close up all tanks, install back all drain plugs and perform a vacuum box leak test on each plug, and reseal the manhole covers.

- 15.1.3.19 The Contractor must reseal the manhole covers using new gaskets, washers and nuts supplied by the Contractor. Manhole cover gaskets must be made of nitrile. The Contractor must check all manhole cover studs and replace defective studs.
- 15.1.3.20 The Contractor's bid must include the unit price for the replacement (supply and installation) of a manhole stud to determine the final cost using the PSPC 1379 process.

Tank Tests

- 15.1.3.21 The Contractor must pressure test each tank for leaks in the presence of the ABS inspector. For bidding purposes, the Contractor's bid must include the unit price for each additional test to be performed, if required.
- 15.1.3.22 For bidding purposes, the Contractor's bid must include the price to perform a hydrostatic water test on the #10 double bottom tank. The price must include the cost of disposing of the residual water, in accordance to the applicable environmental regulations, following the test.
- 15.1.3.23 Upon completion of the work, the Contractor must completely dry the tanks. No water must remain in the tanks.
- 15.1.3.24 The Contractor must plug the overflow lines prior to hydrostatic testing and then unplug them after testing.

Notes:

- The overflow for the emergency generator tank and the day tank will flow into the settling tank
- the overflow from all other tanks flows into the overflow tank

15.1.4 Proof of performance

15.1.4.1 Inspections

- 15.1.4.1.1 All tanks must be inspected by the ABS and CCG IA after cleaning
- 15.1.4.1.2 All tanks must be inspected by the CCG IA before final closure.

15.1.4.2 Tests

- 15.1.4.2.1 The Contractor must perform gas free test on each tank.
- 15.1.4.2.2 The Contractor must perform a pressure test on each tank.
- 15.1.4.2.3 The Contractor must perform a vacuum box leak test on each docking plug

15.1.5 Deliverables

15.1.5.1 Documentation

- 15.1.5.1.1 The Contractor must submit a copy of the ABS inspection evidence to the CCG Technical Authority.
- 15.1.5.1.2 The Contractor must provide the CCG Technical Authority with a report, detailing the work undertaken, defects, repairs made, measurements and readings taken, in recent Microsoft Office Word format, on a usb drive.
- 15.1.5.1.3 The Contractor must submit, to CCG, a manifest of all fuel drained, transferred, stored, disposed of and returned to the vessel's tanks; as well as all contaminated washing fluids.

15.1.5.2 Certificates

- 15.1.5.2.1 For each tank, the Contractor must submit, to CCG, a copy of the "Safe for Entry/Safe for Hot Work" certificates, signed by the marine chemist or other qualified person..
- 15.1.5.2.2 The Contractor must submit a copy of the certificate of competency of the person taking the air samples for certifying safe entry to CCG prior to start of the work on any tank.
- 15.1.5.2.3 The Contractor must submit, to CCG, the disposal certificates for the removed/disposed fuel and residual sludge and/or liquids.
- 15.1.5.2.4 The contractor must submit, to CCG, one (1) electronic copy and two (2) hard copies of the inspection certificates along with the original copy bearing the ABS seal.
- 15.1.5.2.5 The Contractor must submit a copy of the certification of the welders prior to start of any welding work.

15.2 LUBRICATING OIL TANKS - CLEANING AND INSPECTION

15.2.1 Identification

15.2.1.1 The purpose of this item is to open, clean and prepare the lube oil storage tank and the purified oil tank in order to obtain a certificate of inspection and ABS credit for tank survey from the ABS inspector.

15.2.1.2 All tanks in this item must be pressure tested

15.2.2 References

15.2.2.1 Documents :

Drawing/Document No. Revision / Date	Title / Description
108-H-0026 rev2 -April_2001	Capacity plan
108-H-0022_Rev3_Oct-1998	Docking Plan
108-H-0013_Rev0_June-1984	Tank Testing Plan
C14-53-009-01	Tanks surfaces
5660-144-001 Rev0_Oct-2019	Docking Plan
108-H-23_25_T- Rev9_ Sept_2011	General arrangement

15.2.2.2 Regulations and Standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations - Revision / Date	Title / Description
CSA 2001, CRC ch. 1432	Hull Inspection Regulations
FSM 7.B.4	Fleet Safety Manual, section on Hotworks
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations
DFO 5737	Fleet Safety and Security Manual

15.2.2.3 Equipment data

Tanks	Location Frame	Capacity (m ³)	Surface area (m ²)
Lub. Oil Storage	97-106	20.5	123.5
Lub. Oil Renovating	54-27	14.8	118.5

15.2.3 Technical Description

- 15.2.3.1 Before starting the work, the amount of lubricating oil in the tanks will be reduced to the minimum by the CCG crew.
- 15.2.3.2 Upon arrival at the Contractor's facility, the Contractor, jointly with CCG IA, must document the amount of lubricating oil remained in the tank. The Contractor must remove the remaining oil, store the oil ashore and return it onboard after completion of the tanks' inspections and survey work
- 15.2.3.3 The storage facilities, provided by the Contractor, must be clean and uncontaminated. The storage facilities must be inspected and approved satisfactory to CCG TA prior to the transfer of the lubricating oil.
- 15.2.3.4 For bidding purposes, the Contractor's bid must include the price for pumping and storing ashore and then pumping aboard the vessel five (5) m³ of lubricating oil; as well as the unit price for each cubic meter to adjust the final cost, up or down, by PSPC 1379 process.
- 15.2.3.5 The Contractor must empty the tanks completely using the tank supply and/or discharge lines.
- 15.2.3.6 The Contractor must open the manhole cover of each tank, complete the draining using a portable pump and then vent it.

- 15.2.3.7 The Contractor must open all tanks, ventilate and arrange for a Marine Chemist or other qualified person, to certify that each tank is “safe to enter” prior to the start of the cleaning operations, and ready for Hot Work.
- 15.2.3.8 The Contractor must post a copy of the “Safe for Entry/Safe for Hot Work” certificates, signed by the marine chemist or other qualified person at the entrance of each tank. A copy of the certificates must be given to the Chief Engineer. The Contractor must ensure that these certificates are kept valid for the entire period that the tanks are open.
- 15.2.3.9 The Contractor must dry and clean all surfaces of the tanks with a non-woven rag to permit ABS inspection.
- 15.2.3.10 Following this inspection, any deficiencies noted by the ABS inspector or the Contractor must be repaired by the Contractor.
- The Cost for such repairs, if any required, will be dealt with by using the PSPC 1379 process.
- 15.2.3.11 Upon completion of the cleaning and ABS survey, the Contractor must close up all tanks, install back all drain plugs, and reseal the manhole covers.
- 15.2.3.12 The Contractor must reseal the manhole cover using new gaskets, washers and nuts supplied by the Contractor. Manhole cover gaskets must be made of nitrile. The Contractor must check all manhole cover studs and replace defective studs.
- 15.2.3.13 The Contractor’s bid must include the unit price for the replacement (supply and installation) of a manhole stud to determine the final cost using the PSPC 1379 process
- 15.2.3.14 The Contractor must pressure test each tank in the presence of the ABS inspector. For bidding purposes, the Contractor’s bid must include the unit price for each additional test to be performed, if required.
- 15.2.3.15 The Contractor must plug the overflow lines prior to pressure testing and then unplug them after testing.
- 15.2.3.16 Upon completion of the work, the Contractor must completely dry the tanks. No water must remain in the tanks.
- 15.2.3.17 Upon completion of work, the tanks must be returned to their sounding levels as they were upon arrival at the Contractor’s facility.

15.2.4 Proof of performance

- 15.2.4.1 Inspections

- 15.2.4.1.1 The ABS inspector and the CCG TA must perform Inspection of lubricating oil tanks after cleaning.
- 15.2.4.1.2 The ABS inspector and the CCG TA must perform a final inspection of the tanks prior to their closure.
- 15.2.4.2 Tests
 - 15.2.4.2.1 The Contractor must perform gas free test on each tank.
 - 15.2.4.2.2 The Contractor must perform the pressure test on both tanks.

15.2.5 Deliverables

- 15.2.5.1 Documentation
 - 15.2.5.1.1 The Contractor must submit a copy of the ABS inspection evidence to the CCG Technical Authority.
 - 15.2.5.1.2 The Contractor must provide the CCG Technical Authority with a report, detailing the work undertaken, defects, repairs made, measurements and readings taken, in recent Microsoft Office Word format, on a flash drive.
 - 15.2.5.1.3 The Contractor must submit to CCG a manifest of all oil drained, transferred, stored, disposed of and returned to the tanks; as well as all contaminated washing fluids.
- 15.2.5.2 Certificate
 - 15.2.5.2.1 For each tank, the Contractor must submit to CCG a copy of the “Safe for Entry/Safe for Hot Work” certificates, signed by the marine chemist or other qualified person.
 - 15.2.5.2.2 The Contractor must submit a copy of the certificate of competency of the person taking the air samples for certifying safe entry to CCG prior to start of the work on any tank.
 - 15.2.5.2.3 The Contractor must submit, to CCG, the disposal certificates for the removed/disposed lubricating oil and residual and/or contaminated liquids.
 - 15.2.5.2.4 The contractor must submit, to CCG, one (1) electronic copy and two (2) hard copies of the inspection certificates along with the original copy bearing the ABS seal.
 - 15.2.5.2.5 The Contractor must submit a copy of the certification of the welders prior to start of any welding work, if required.

15.3 BALLAST TANKS AND COFFERDAMS - CLEANING, INSPECTION AND PAINTING

15.3.1 Identification

- 15.3.1.1 The purpose of this item is to open and clean the ballast tanks and cofferdams in order to have them inspected by the ABS inspector, for certification and if necessary, repair and/or repaint them.
- 15.3.1.2 The Contractor must perform a pressure test in the presence of the ABS inspector for all tanks in this specification item. .

15.3.2 References

15.3.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
108-H-0026 rev2 -April_2001	Capacity plan
108-H-0022_Rev3_Oct-1998	Docking Plan
108-H-0013_Rev0_June-1984	Tank Testing Plan
C14-53-009-01	Tanks surfaces
5660-144-001 Rev0_Oct-2019	Docking Plan

15.3.2.2 Regulation and standard

Standards & Regulations Revision / Date	Title / Description
FSM 7.B.3	Fleet Safety Manual, section on Entry into Confined Spaces
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
NACE 6G186-2010-SG	Surface Preparation of Soluble Salt Contaminated Steel Substrates Prior to Coating
SA-2½ SSPC SP10	Near White metal blast cleaning
SSPC SP3	Power tool cleaning
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations

15.3.2.3 Equipment data

Tanks	Location Frame	Capacity (Metric tons)	Area(m²)	% of Loose paint
Forepeak	Fore to 175	85,5	771.7	50
Aft peak	1 - 13	112	416.9	20
Double bottom after (#3) Port	54-70	43.5 Oily water	329.6	5
Double bottom after (#4) Stbd	54-70	43.4	329.6	5
Double bottom #2 Port	126-152	49.9	405.5	40
Double bottom #2 Stbd	126-152	49.9	405.5	40
FWD Wing Port	163-175	43.4	342.2	30
FWD Wing Stbd	163-175	43.4	342.2	30
AFT Wing Port	152-163	51.4	385.1	30
AFT Wing Stbd	152-163	51.4	385.1	30
VOID #1 Port Outboard	117-126	Not available	228.2	10
VOID #1 Stbd Outboard	117-126	No available	228.2	10
VOID #2 Port Outboard	106-117	Not available	285.0	10
VOID #2 Stbd Outboard	106-117	Not available	285.0	10
VOID Double bottom Port	102-106	Not available	59.7	10
VOID Double bottom Stbd	102-106	Not available	71.7	10
VOID #3 Port Outboard	54-70	Not available	188.9	10
VOID #3 Stbd Outboard	54-70	Not available	188.9	10
VOID #4 Port Outboard	30-54	Not available	279.8	10
VOID #4 Stbd Outboard	30-54	Not available	279.8	10
VOID #5 Port Outboard	13-30	Not available	285.8	10
VOID #5 Stbd Outboard	13-30	Not available	285.8	10
VOID Aft	11-13	Not available	Not available	10
Cofferdam, Helicopter Fuel Tank	5-13	Not available	Not available	10
Port Echo Sounder Compartment	126-130	Not available	Not available	10
Stbd Echo Sounder Compartment	126-130	Not available	Not available	10

Tanks	Location Frame	Capacity (Metric tons)	Area(m ²)	% of Loose paint
Fore Center Piping Tunnel	102-163	Not available	Not available	10
Aft Center Piping Tunnel	51-94	Not available	Not available	10
Port lateral double bottom VOID	53-54	Not available	Not available	10
Stbd Cofferdam for centreboard trunk transducer	123-126	Not available	Not available	25

15.3.3 Technical Description

15.3.3.1 Preparation, cleaning and inspection

15.3.3.1.1 The Contractor must take into account that the tanks covered by these specifications are ballast water tanks. Prior to docking the vessel, the CCG crew will empty the tanks as much as possible.

15.3.3.1.2 Once the vessel is securely moored, the Contractor must remove the docking plugs to drain these tanks.

15.3.3.1.3 The Contractor must identify and label the removed docking plugs, and return them to the Chief Engineer for safekeeping. Lost or damaged plugs, while in Contractor's custody, must be replaced by the Contractor at their expense.

15.3.3.1.4 The Contractor must drain the remaining liquid in the tanks and dispose them in accordance with the applicable regulations.

The Contractor's bid must include the price for the drainage and disposal of approximately one (1) metric ton of water and debris from the ballast tanks and one (1) metric ton of water and debris from the cofferdams. The final cost will be adjusted using the PSPC 1379 process.

15.3.3.1.5 The Contractor must open all manhole covers, adequately ventilate the tanks, and arrange for a Marine Chemist or other qualified person, to certify that each tank is "safe to enter" prior to the start of the cleaning operations, and ready for Hot Work. The Contractor must post a copy of the "Safe for Entry/Safe for Hot Work" certificates, signed by the marine chemist or other qualified person, at the entrance of each tank. A copy of each certificate must be also be submitted to the Chief Engineer. The Contractor must ensure that these certificates are kept valid for the entire period that the entire period these tanks are open.

15.3.3.1.6 The Contractor must clean all tanks and inspect all sounding pipes. Any foreign materials from the sounding pipes must be removed. Sludge and debris from the

tanks must be disposed of in accordance with Federal, Provincial and Municipal regulations in effect.

15.3.3.1.7 The Contractor must strip tank's surfaces to SSP-SP3 standard to remove all rust and loose paint and wash each of the tanks and dead spaces identified in these specifications. The estimated area to be treated is described in the table in Section 15.4.2.4 for each tank and cofferdam.

The Contractor's bid must include the unit price per meter square of surface preparation to SSP-SP3 standard to adjust the final cost of tanks' surface preparation, up or down, by PSPC 1379 process.

15.3.3.1.8 The Contractor must clean the ballast tanks and cofferdams by high pressure hydraulic blasting (7500 psi minimum), then by hand, remove all rust and dirt and dry them out prior to inspection.

15.3.3.1.9 For bidding purposes, the Contractor's bid must include a separate price for complete abrasive blasting, to SSPC-SP10 standard, and cleaning in preparation for painting for each of the following tanks: the Forepeak tank, the Double Bottom #2 port tank and the Double Bottom #2 starboard tank. If GCC decide to go with SSPC-10 for these tanks, this surface preparation will replace the preparation in 15.4.3.1.7.

15.3.3.1.10 The ABS Inspector and the CCG Technical Authority must inspect each tank and cofferdam after it has been cleaned. The Contractor is required to notify the ABS Inspector and the CCG TA as soon as the work is ready for inspection.

15.3.3.2 Paint

15.3.3.2.1 All paints must be applied in accordance with the manufacturer's instructions and recommendations.

15.3.3.2.2 The Contractor must ensure the interior of the tanks are clean and completely dry before painting begins.

15.3.3.2.3 In each ballast tank and cofferdam, after the inspection and all corrective actions are completed, the Contractor must apply two (2) coats of Intershield 300 paint primer, compatible with the vessel's paint system, with a dry film thickness of 150 microns per coat.

15.3.3.2.4 In each cofferdam, once the inspection and all corrective actions have been completed, the Contractor must provide all coverings and accessories and must apply two (2) coats of Intershield 300 paint, compatible with the vessel's paint system, with a dry film thickness of 150 microns per coat.

15.3.3.2.5 For bidding purposes, the Contractor's bid must include:

- a) a separate optional price for the complete repainting of each of the following tanks: the Forepeak tank, the Double Bottom #2 port tank and the Double Bottom #2 starboard tank. The price must include the application of 2 coats

of Intershield 300 primer, compatible with the vessel's paint system, with a dry film thickness of 150 microns per coat.

- b) the unit price per meter square to apply two (2) coats of paint, as specified in 15.4.3.2.3 and 4, to adjust the final cost of tanks' surface coating, up or down, by PSPC 1379 process.

15.3.3.3 Closing, testing and certification

15.3.3.3.1 The chief engineer must verify the quality of the work, especially between each layer of paint, and before the final closing of the manholes.

15.3.3.3.2 Upon completion of all work, the Contractor must:

- instal back all removed docking plugs using Contractor supplied rubber gaskets in the presence of the CCG IA/TA
- Close the manhole covers using contractor supplied new gaskets, washers and nuts. The Contractor must apply a coat of anti-seize compound to the threads of all fasteners. Gaskets must be of the same material and thickness as the existing gaskets.

15.3.3.3.3 For bidding purposes, the Contractor's bid must include the price to repair 50 manhole cover studs, as well as unit price per stud. The final cost must be adjusted, up or down, using PSPC1379 process.

15.3.3.3.4 The Contractor must pressure test each tank and cofferdam for leaks, in the presence of the ABS inspector and the CCG TA, after obtaining the ABS survey credit for the inspection of each tank.

15.3.3.3.5 The Contractor must blank all connections to the tanks and is responsible for supplying, fitting and subsequent removal of blanks for the pressure test.

15.3.3.3.6 For bidding purposes, the Contractor's bid must include:

- a) one total price for performing the tasks listed below:
- Preparation for pneumatic pressure test
 - Pneumatic pressure test of all the tanks/spaces listed in 15.4.2.3
 - Restoration of the tank/space to service condition after the test including the removal of blanking flanges
- b) a unit price for an additional pressure test for one tank – to adjust the final cost, up or down, by PSPC 1379 process.

15.3.3.3.7 Once pressure testing is complete, the Contractor must remove the docking plugs to drain the tanks (if necessary).

- 15.3.3.3.8 The Contractor must reinstall the docking plugs, supply and install new gaskets, and demonstrate the tightness of the docking plugs by a vacuum box test in the presence of the Chief Engineer.
- 15.3.3.3.9 The Contractor must refill all ballast tanks to the arrival condition level prior to undocking the vessel.
- 15.3.3.3.10 The Contractor to supply Fresh Water only from a Municipal water supply for refilling the ballast tanks.

15.3.4 Proof of performance

15.3.4.1 Inspections

- 15.3.4.1.1 The Contractor must allow the IA/TA the opportunity to examine all tank internals prior to closing each tank.
- 15.3.4.1.2 Inspections by the ABS inspector and TA must demonstrate that all surfaces of each tank and cofferdam are in good condition and covered with an adequate and uniform protective coating.
- 15.3.4.1.3 All work must be to the satisfaction of the ABS; any defects must be repaired by the Contractor at their expense.

15.3.4.2 Tests

- 15.3.4.2.1 The Contractor must perform gas free test on each tank/space.
- 15.3.4.2.2 Pressure tests, conducted by the Contractor and witnessed by ABS and CCG IA must demonstrate that all tanks and cofferdams described in this specification are watertight.
- 15.3.4.2.3 Vacuum box test, in the presence of CCG the Chief Engineer, must prove tightness of the docking plugs.

15.3.5 Deliverables

15.3.5.1 Documentation

- 15.3.5.1.1 The Contractor must submit, to CCG, an electronic copy, on a flash drive and in recent Microsoft Office Word format, a type-written report detailing all work undertaken, defects, repairs made, and detailed results of all tests performed. This report must include, but not be limited to, inspection reports, dry film thickness measurements and condition monitoring data during coating application, etc.
- 15.3.5.1.2 The Contractor must submit, to CCG, the record of the ballast water that were filled in the tanks after work completion.

15.3.5.2 Certification

- 15.3.5.2.1 For each tank, the Contractor must submit to CCG a copy of the “Safe for Entry/Safe for Hot Work” certificates, signed by the marine chemist or other qualified person.
- 15.3.5.2.2 The Contractor must submit a copy of the certificate of competency of the person taking the air samples for certifying safe entry to CCG prior to start of the work on any tank.
- 15.3.5.2.3 The contractor must submit, to CCG, one (1) electronic copy and two (2) hard copies of the inspection certificates along with the original copy bearing the ABS seal.

15.4 BREATHING AIR COMPRESSOR - ANNUAL MAINTENANCE

15.4.1 Identification

The Contractor must provide materiel, tools and labour to perform annual inspection, maintenance and annual certification by an authorized person of the breathing air system and its compressor, used to fill breathing air cylinders.

15.4.2 References

15.4.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
108-H-23_25_T- Rev9_ Sept_2011	General arrangement
Bauer Compressor	Operator manual's

15.4.2.2 Regulations and Standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations - Revision / Date	Title / Description
CAN/CSA-Z180.1-00	Compressed Breathing Air and Systems

15.4.2.3 Equipment data :

Brand	Model	Year	CFM	Pressure
JORDAIR-BAUER	K100-3EH	1996	5.8	5000 psi

15.4.2.4 Contractor Supplied Materiel

Unless otherwise specified, the Contractor must furnish all materials, equipment and parts, including but not limited to those listed below, to perform the work of this Specification Item – unless otherwise is clearly stated.

Item No.	Description	Quantity
LP96	CF2000 SYN Compressor Oil Food Grade	1 Gal.
X22249	Bauer 059183 Filter cartridge	1
BAU-N-70	Oil filter	1
BAU-N-2726	Coalester filter, micron 50	2

15.4.3 **Technical Description**

The Contractor must provide parts, oil and labor to perform the following work:

- Change the oil and oil filter with products compatible with the compressor.
- Change the air filter cartridges.
- Check the operation of the drains.
- Adjust the system to the required cylinder pressure.
- Provide two filter cartridges and a spare coalescer cartridge compatible with the compressor. During the work, use the cartridges, oil and filter already on board the vessel. New cartridges will be returned to the vessel and kept in reserve.

15.4.4 **Proof of performance**

15.4.4.1 Tests

15.4.4.1.1 The Contractor must fill a breathing air cylinder after maintenance is performed to verify proper operation of the compressor. The CCG IA or TA must be present for this test.

15.4.4.1.2 Following maintenance of the compressor, the Contractor must provide parts and labor to perform an air analysis in accordance with Z180. All costs for the air test, as well as any fees related to the certification of the compressor, must be included.

15.4.5 Deliverables

15.4.5.1 Document

15.4.5.2 The Contractor must submit, to CCG, the air analysis report and certificate upon receipt.

15.4.5.3 The Contractor must submit, to CCG, a detailed maintenance report, type-written and in unprotected PDF format, describing all work undertaken, the verification, lubrication, adjustment, calibration, defects, repairs made and parts replaced.

15.5 EXHAUST PIPE REPLACEMENT (OPTIONAL)

15.5.1 Identification

The purpose of this work item is for the Contractor to perform the inspection of exposed exhaust piping after insulation removal, repair and/or e replace the exhaust piping and exhaust components for both boilers, the auxiliary generator and the incinerator.

This work must be done in conjunction with the following specification work items:

- **Item 12.4 Replacement of Propulsion Generators**
- **Item 13.2 replacement of the auxiliary generator silencer**

15.5.2 References

15.5.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
63-00-01-Rev 3- March-1986	Engine exhaust systems
63-10-01 Rev1-1986-03-06	Arrangement diesels and boilers exhaust piping
63-00-01-A Rev 4- March-1986	Engine exhaust systems
50-00-02	Machinery arrangement
H-01-64	Funnel
108-H-23_25_T- Rev9_ Sept_2011	General arrangement
001_201-10553-47_rev0	Rapp_MCA_Martha-L-Black_
002_201-10553-47_rev0	HazMat_NGCC_M-L-Black
V2.2022-315797	Analysis report (Final 2002-09-07)

15.5.2.2 Regulation and standards

15.5.2.3 All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

15.5.2.4 The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations Revision / Date	Title / Description
7.B.4	Hot work
ASME B16.5-2020	Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24, Metric/Inch Standard

Standards & Regulations Revision / Date	Title / Description
ASME B16.20-2017	Metallic Gaskets for Pipe Flanges
ASME B16.21-2016	Non Metallic Gaskets for Pipe Flanges
ASME B31.1-2016	Power Piping
ASTM A105-2018	Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A106-2019	Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A193-2020	Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

15.5.2.5 Equipment Data

Exhaust System	Piping-Ext. D mm (in)	Piping-Length (m)	Silencer Ext. D mm (in)	Silencieux-Length (m)	Location
Boiler- Port	584 (23)	19	N/A	N/A	Funnel
Boiler - Stbd	584 (23)	19	N/A	N/A	Funnel
Auxiliary generator	457 (18)	28	1372 (54)	1.5	Funnel
Incinerator	457 (18)	9	N/A	N/A	Funnel
Emergency compressor	152 (6)	24	N/A	N/A	Funnel

15.5.2.6 Contractor Supplied Materiel

15.5.2.7 The Contractor must provide all tools, equipment, components and parts necessary to perform the work in this specification. This includes, but is not limited to bolts, anti-seize compounds for the bolts, gaskets, insulation blankets at the junctions between the ~~new~~ silencer and the existing piping and paint. All components supplied must be designed for use on an exhaust system and must be designed for high temperature (Minimum 600°C).

15.5.3 Technical Description

15.5.3.1 The Contractor must remove, from the work area, any items that may interfere with the removal of the exhaust piping and its components, including floors, ladders, handrails, etc.

15.5.3.2 The contractor must arrange and install a work platform in the stack, and remove platforms/scaffolding upon completion of the work.

15.5.3.3 The Contractor must put safety measures in place to prevent any parts, tools or debris from falling to lower levels. The Contractor must also install temporary protections to prevent dirt from the work from spreading to lower levels. Upon completion of the work, the Contractor must remove and dispose of these protections.

15.5.3.4 The Contractor must unbolt the upper part of the flexible joint located just after the machinery and insert a blanking plate to stop any debris that falls into the exhaust duct. The Contractor must then remove this blank after pressure testing upon completion of the work.

15.5.3.5 The Contractor must refer to drawings 63-00-01-Rev 3- March-1986, 63-10-01 Rev1-1986-03-06 and 63-00-01-A Rev 4- March-1986 for full details of the installation.

15.5.3.6 If needed, The Contractor must perform internal cleaning of carbon and other residue. The Contractor must dispose of all residue in accordance with the applicable regulations.

15.5.3.7 Following the removal of insulation as per item 15.6, the Contractor must conduct an internal and external visual inspection. The Contractor must take ultrasonic thickness measurements for each exhaust line. The Contractor must provide a measurement test report to the IA and the TA. Thickness measurements must be taken by a certified technician. The Contractor must provide a copy of the technician's certificate to the IA prior to completing the thickness measurements survey.

- 15.5.3.8 For bidding purposes, the Contractor's bid must include the price for taking 50 ultrasonic steel thickness readings (NDT) on the exhaust piping, as well as unit price per reading, to adjust the final cost, up or down, by PSPC 1379 process. The unit price must be based on the following two conditions:
- The NDT specialist is already on site; or
 - The NDT specialist must be called back on site for additional work, if required. In this case, this unit price must be used only for the first reading, followed by the price in (a) for follow on readings.
- 15.5.3.9 The Contractor must check around the support legs, the angle bars that are welded to the lower part of the silencer and along the exhausts lines, for cracks.
- 15.5.3.10 The Contractor must assess the internal and external steel repairs required, provide the IA and the TA with an inspection report identifying the repairs to be made, and must identify all defects found on the piping system with a yellow or white paint marker for CCG IA inspection.
- 15.5.3.11 The Contractor's bid must include a separate price for each of the four (4) exhaust pipe lines to be broken down to include the price for mobilization, demobilization (once) , material and components, and installation labour so that the price for each of the exhaust pipe lines can be discerned. Following the results of the steel thickness measurements, , the CCG will identify which section of pipes needs to be replaced.
- 15.5.3.12 ~~If required,~~ The Contractor must dismantle, remove from the vessel and dispose of the exhaust pipes. During disassembly the Contractor must retain the exhaust pipes supports which will be reused for the new installation.
- 15.5.3.13 After removing the old exhaust piping, the Contractor must clean the flanges in preparation for the installation of the new silencer.
- 15.5.3.14 The Contractor must supply and install the new exhaust pipe lines.
- 15.5.3.15 The material used for ~~modify~~ the new exhaust pipes must be ASTM A106 or ASME SA 106, SCH. 40. All flanges must be forged steel, conforming to ASTM A105 or ASME SA 105, with pressure ratings of ASME B16.5-2020 class #150.
- 15.5.3.16 All new steel used must be painted with one coat of Interzinc 22 primer and one coat of Intertherm 50, or equivalent, as recommended by the paint manufacturer.
- 15.5.3.17 The Contractor must supply and install new exhaust bellows on each exhaust pipe line.

- 15.5.3.18 The Contractor must supply new bolts required for reassembly. The bolts must be suitable for high temperature and designed for this purpose. The Contractor must also supply and apply the high temperature anti-seize compound required for the reassembly of the bolts (minimum 600°C) .
- 15.5.3.19 The Contractor must supply and replace the non-reusable fasteners equivalent, in grade and classification, to the existing fasteners. The Contractor's bid must include the price for supply and replacement of each set of ten (10) non-reusable fasteners. The final cost will be adjusted by PSPC 1379 process.
- 15.5.3.20 The Contractor must supply and install new gaskets for the flanges. Gaskets must be made of graphite laminate resistant to a nominal 600°C or higher; KLINGER Graphite Laminate SLS or equivalent.
- 15.5.3.21 The Contractor must remove and dispose of waste materials from work areas at the end of each day.
- 15.5.3.22 At the end of the work, the Contractor must reassemble all the components that were removed for acces; and restore all compartments and work areas to their original state of cleanliness and working condition
- 15.5.3.23 The Contractor must provide material and labour to repair any paint that has been disturbed by the work following the process outlined in CCG MLB 2022 - Refit Paint Specification.

Re-insulation of the exhaust pipes

- 15.5.3.24 The Contractor must install new insulation on all exhaust piping in accordance with the manufacturer's specifications.
- 15.5.3.25 All materials, supplied by the Contractor, and used in the performance of the work described in this specification must be suitable for the operating temperature of the exhaust systems, be free of ceramic fibers, and be asbestos free. All materials must have type approval for marine use. Insulation must be non-combustible.
- 15.5.3.26 The Contractor must install at bellows and flanges removable exhaust blankets, designed for high temperature Isotex-GM3200X or equivalent. Installation must be in accordance with the manufacturer's specifications.
- 15.5.3.27 The insulation of the exhaust pipe must be made of three layers, as detailed below:
- First layer: molded biosolutre fiber with a thickness of 1-inch designed for high temperature
 - Second layer: molded mineral fiber with a thickness of 2-inches on the pipes

- Third layer: aluminium roll jacketing, stucco embossed, with a minimum thickness of 0.020". The thickness must be according to the diameter of the pipes in accordance with the manufacturer's recommendations. The Contractor must install stainless steel strips to secure the aluminum sheets to the pipes by applying a minimum of three (3) strips per section length, with the end strips located approximately 100 mm from the side joints.

Note: Exhaust pipe insulation for propulsion generators is already included in item 12.4.3.4.12.11 of this specification.

15.5.4 Proof of performance

15.5.4.1 Inspection

- 15.5.4.1.1 The CCG IA must inspect the exhaust piping to verify the condition of the piping and to confirm the findings of the contractor's visual inspection.
- 15.5.4.1.2 During the performance of the work and at the completion, the Contractor must arrange for the visual inspection of the exhaust pipes installation and all related welding by the CCG IA.
- 15.5.4.1.3 The Contractor must arrange for the CCG to inspect the materials and components supplied by the Contractor and obtain CCG's approval before their use for this specification work.

15.5.4.2 Tests

- 15.5.4.2.1 If repairs are required on the exhaust piping, the Contractor must perform a pressure test on the exhaust pipe.
- 15.5.4.2.2 Upon completion of the installation work and prior to the installation of insulation, the Contractor must operate the machinery under load, visually inspect the exhaust piping and ensure that there are no exhaust leaks in the presence of the CCG IA.
- 15.5.4.2.3 Upon completion of the work, the Contractor must pressure test each silencer. The Contractor must blank off the upper part of the silencer with a blanking flange, like the bottom one. The Contractor must ensure that any openings are sealed for a 3 psi air test. The Contractor must provide new gaskets for the test. This test must be witnessed by the CCG IA and the ABS Inspector.

15.5.5 Deliverables

15.5.5.1 Documentation

- 15.5.5.1.1 The Contractor must submit, to CCG, the technical data sheets of the supplied components to be used for the installation, prior to their use.
- 15.5.5.1.2 The Contractor must provide a CWB-approved welding procedure for performing the welding repair work.

- 15.5.5.1.3 The Contractor must submit, to CCG, the report of steel thickness measurement readings and the inspection report identifying the repairs to be made. The report must include photographs of the defects.
- 15.5.5.1.4 The Contractor must submit, to CCG, a maintenance/repair report that must include, at the minimum, all observations, data from initial inspection, record of work/repair performed, data collected during the work, list of components and materials supplies/installed, and all related tests results.
- 15.5.5.1.5 The Contractor must update all drawings to ‘as fitted’.
- 15.5.5.1.6 The Contractor must provide documentation of new materials used including mill test certificates for steel
- 15.5.5.2 Certification
- 15.5.5.2.1 Prior to their use, the Contractor must submit the technical data sheets of the components they want to use for the installation.
- 15.5.5.2.2 The Contractor must submit, to CCG, a copy of the certification of the welders prior to start of any welding work.
- 15.5.5.2.3 The Contractor must submit, to CCG, a copy of the certification of NDT inspector, prior to start of any NDT work.
- 15.5.5.2.4 The Contractor must submit, to CCG, all components and/or equipment certifications or Type Approvals (where applicable).
- 15.5.5.2.5 The Contractor must submit, to CCG, one (1) electronic copy and two (2) hard copies of the inspection certificates along with the original copy bearing the ABS seal.

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F7049-210340041MD

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041MD
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15.6 ASBESTOS REMOVAL, INSPECTION AND INSTALLATION OF NEW ASBESTOS-FREE INSULATION

16.0 DOMESTIC SYSTEMS

16.1 POTABLE AND BOILER FEED WATER TANKS

16.1.1 Identification

16.1.1.1 Contractor must open, clean and prepare the identified potable water tanks for ABS inspection and survey. Tanks must be cleaned, visually inspected, repaired and must then be subjected to a pressure test and super chlorination (only for potable water tanks) . Upon completion of the work, the tanks must be returned to a state of operational readiness.

16.1.1.2 The Contractor must obtain ABS credit for tanks survey.

16.1.1.3 The Contractor must engage services of an International Paint/Coating TSR, with a NACE International certification of Coating Inspector, Level 2 as minimum, to **oversee** the work in this section. The Contractor must include an allowance of \$5,000 to cover the cost of this TSR. The \$5,000 allowance must form part of the overall bid and must be adjusted by PSPC 1379 action upon receipt of the final FSR invoice supported by copies of all related documentation to verify actual expenses.

Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses

16.1.2 References

16.1.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
108-H-0026, Rev 2 (April 2001)	Tanks Capacity Plan
108-H-23_25, Rev 9 (Sept 2011)	General arrangement
C14-53-009-01 (2015-02-10)	Tanks surfaces

16.1.2.2 Regulations and standards

All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section.

Standards & Regulations Revision / Date	Title / Description
FSM 7.A.12	Fleet Safety Manual, section on drinking water quality
FSM 7.B.3	Fleet Safety Manual, section on Entry into Confined Spaces
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
CCG Technical Bulletin 2015-01	Potable water tank epoxy based surface coatings update, lessons learned and recommendations
NSF/ANSI/CAN 61	Drinking Water System Components Program
NACE 6G186-2010-SG	Surface Preparation of Soluble Salt Contaminated Steel Substrates Prior to Coating
SA-2½ SSPC SP10	Near White metal blast cleaning
SSPC SP3	Power tool cleaning
SSPC Guide 15	Methods for Extraction and Analysis of Soluble Salts on Steel and other Nonporous Substrates Society for Protective Coatings (SSPC) Standards
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations

16.1.2.3 Equipment data

Tank	Location	Volume	Area
Port potable water	Frame 30-41	51.3 m ³	224.0 m ²
Starboard potable water	Frame 30-41	50 m ³	222.7 m ²
Boiler feed water	Frame 7-13	16.1 m ³	76.6 m ²

16.1.2.4 Contractor Supplied Materiel

Unless otherwise specified, the Contractor must furnish all tools, materials, equipment and parts to perform the work of this Specification Item.

16.1.3 Technical Description

General

16.1.3.1 The work of the potable water tanks must start as early in the work period to allow sufficient time for complete curing of applied coatings. The Work must start within the first week after the vessel has been safely docked. The Contractor is responsible for the immediate draining of their contents with assistance from the vessels' crew onboard.

- 16.1.3.2 It is the Contractor's responsibility to identify obstructions, remove and temporarily store them, and reinstall them on board after completion of the related work.
- 16.1.3.3 The Contractor must cover all equipment in work area near the tanks' access openings to prevent damage during tank maintenance and repairs. All protective coverings must be removed upon completion of work. Any damage resulting from inadequate protection must be repaired by the Contractor at his expense.
- 16.1.3.4 The Contractor must blank off the suction and filling lines, and tag where each blank is located. Tanks must be isolated from the filling main for the duration of the work.
- 16.1.3.5 The Contractor must keep the filling main pressurized from shore supply to provide water directly to the ship's domestic FW piping system.
- 16.1.3.6 The Contractor must ensure that all persons entering the tanks for any reason after cleaning, during and after coating do not introduce any contaminants. All persons must wear proper, clean, new, non-contaminating protective clothing, including protective shoe covers/ foot covers.
- 16.1.3.7 All products or materials (e.g.: lubricant, anti-seize products, gaskets, caulking, o-rings etc.) used when working must be certified for use in a potable water system according to the ANSI 61 standard. The Contractor must provide the TA and IA with justifying documents.

Initial preparation and Cleaning

- 16.1.3.8 The Contractor must open and remove the manhole covers, empty the tanks using portable pumps, ventilate tanks mechanically to outside of the ship, and certify them safe for personnel to enter prior to work being carried out internally as per Coast Guard Safety Management System. Copies of certificates must be given to the TA, and must be posted adjacent to points of entry. A valid certificate must be maintained at all times while work is in progress.
- 16.1.3.9 The Contractor must clean the interior of the tanks with a high-pressure water jet (10,000 psi), remove the debris, then wash and dry. Tanks must be scraped and wire brushed clean of any loose coating.
- 16.1.3.10 The Contractor must dispose of the residue, and debris.
- 16.1.3.11 The Contractor must wash down the tanks' internal surfaces, before they have dried off from draining, with non-toxic cleaning solution then hosed down with fresh water. MSDS and product application sheet, for the cleaning chemical used, must be provided to the TA for approval prior to use of the chemical inside the Tanks.

- 16.1.3.12 Tanks must be dried out prior to commencing remainder of work. Care must be taken to protect tank-sounding transducers for the duration of all work in the tanks. The tank level transmitter opening must be reamed out and proven clean and clear.
- 16.1.3.13 The Contractor must, using power tools, mechanically clean the tanks' surfaces with damaged coatings to bare metal (SSPC-SP-3 standard), and re-coated as described below. The specified areas must include a generous overlap (minimum 150 mm) in way of all bared edges.
- 16.1.3.14 After the tanks are cleaned of all residue, the Contractor must notify and arrange for presence of the IA, the NACE TSR and the ABS surveyor for inspection of each Tank. The purpose of this inspection is to:
- Ensure that the suction valves and sounding pipes are free of obstruction and that limber holes in the floors, stringers and web frames are free
 - Establish and agree on tank surfaces requiring repair due to corrosion or other damages, and determine the quantity of surfaces requiring coating work.
- 16.1.3.15 Any structural defects discovered during these inspections will be dealt with using PSPC 1379 process.
- 16.1.3.16 Once the tanks have been cleaned from all residue and contaminants, and prior to painting, the Contractor must conduct chloride ion testing on the bare metal surfaces to be coated. This test must be conducted in the presence of the IA, the NACE inspector and must be in accordance with SSPC Guide 15, Methods for Extraction and Analysis of Soluble Salts on Steel and other Nonporous Substrates. The Contractor must supply and use Chloride ion tests (ex: CHLOR*TEST "CSN SALTS" Test kit) conforming to NACE 6G186, SSPC Guide 15 or SSPC-TU-4. The maximum amount of chloride ion on the surfaces must be 5 µg/cm² or less. The Contractor must record the results of the testing and provide them to the TA and the IA prior to commencing any coating work. If the Chloride ion tests show results above the maximum permissible, additional remedial work must be conducted by the Contractor, at their cost, to reduce the chloride ion count to below the maximum permissible.
- 16.1.3.17 Chloride ion tests must be uniformly distributed over the tank area that is to be recoated.
- 16.1.3.18 For bidding purposes, the Contractor's bid must include the price for carrying out Chloride ion testing on 100% of the surface area of each tank, and unit price per each set of 10 tests. The final cost must be adjusted, up or down, using the PSPC 1379 process along with the supporting disposal documentation.

- 16.1.3.19 Prior to painting, the entire internal surfaces of the tanks must be clean and dry. All grit/debris must be vacuumed and removed ashore.
- 16.1.3.20 At the time of bid submission, the Contractor must provide the PSPC Contracting Authority with the following:
- The paint coating that has been bid and that will be applied, and its manufacturer
 - Manufacturer's work procedure sheets
 - Product Data Sheets and Material Safety Data Sheets (MSDS)
 - Proof that the paint meets the requirements, meets the NSF 61 Standard and that it is compatible with the current tanks' coating. The Contractor must also demonstrate that the two products, when applied one over the other, are NSF 61 approved
- 16.1.3.21 The Contractor must ensure that the paint manufacturer's recommendations are closely followed, especially with respect to:
- Surface preparation
 - Temperature of the paint and all surfaces at the time of application
 - Drying and curing conditions (including temperature, humidity, dew point, ventilation, and curing time)
 - The shelf life of the paint
 - Coating compatibility with tanks' materials
- 16.1.3.22 After preparing the surfaces and before applying the first coat of paint, the Contractor must provide a written statement certifying that the surface preparation has been performed in accordance with the manufacturer's instructions, signed by NACE TSR. Any deviations from those instructions must be noted in the certified statement.

Application of Coating (Paint)

- 16.1.3.23 The interior of these tanks is coated with a white epoxy paint.
- 16.1.3.24 At this stage the ABS inspector must inspect all the three (3) tanks.
- 16.1.3.25 The Contractor must maintain the temperature of the tanks to be painted and all walls at a minimum of 10°C.
- 16.1.3.26 The Contractor must supply and apply two coats of 100% solids epoxy paint on these surfaces, which:
- Does not contain Volatile Organic Compounds (VOCs)
 - Is certified "protective barrier material" for use on potable water tanks, as stipulated in the National Sanitation Foundation (NSF) and American National Standards Institute (ANSI) 61 "Drinking Water System Components Program – Standard 61".

- Is compatible with the existing coating allowing for NSF 61 certification
- 16.1.3.27 The white epoxy coating (Interline 850 full coat .006 dry film thickness, Interline 925 partial touch-up .006 dry film thickness) or its equivalent, must be applied according to the manufacturer's instructions to the thickness recommended by the manufacturer.
- 16.1.3.28 The Contractor must apply a stripe coat (as recommended by the paint manufacturer) to all edges and corners at right angles before the first coat of paint is applied.
- 16.1.3.29 For bidding purposes, the Contractor's bid must include the price for cleaning 40% of each tank's surface area (total of 210 m²) to bare metal (SSPC-SP-3 standard), and coating those surface as described above; as well as unit price per each square-meter. The final cost must be adjusted, up or down, using the PSPC 1379 process.
- 16.1.3.30 The use of solvent or thinners are not permitted for this Specification work.
- 16.1.3.31 The Contractor must use only new equipment for the application of coating, including pumps, hoses, spray guns, brushes, etc. Re-use of certain equipment, such as pumps but not hoses, may be allowed if the Contractor proves that the equipment has been adequately drained and flushed with a product that is NSF 61 approved for use in potable water tanks and does not contain any solvents.
- 16.1.3.32 The Contractor must control, measure and record the following parameters, and provide the CCG TA with printed copies of the recorded readings:
- The internal temperature and the humidity level inside each tank must be measured and recorded, before starting the work.
 - The ambient air temperature in each tank must be monitored continuously and be recorded once per hour using an electronic recording device, during the paint application and curing.
 - The dry and wet bulb temperatures of each tank and the temperature of the surfaces being painted must be measured and recorded every four (4) hours during the paint application.
- 16.1.3.33 The Contractor must note that the application of paint must not be made when the surface temperature is less than three (3) degrees Celsius above the dew point.
- 16.1.3.34 Upon completion of the work, the Contractor must flush all tanks' surfaces with fresh potable water.
- 16.1.3.35 Thereafter, the technical authority must inspect each tank.

16.1.3.36 Finally, the Contractor must reseal the manhole covers with new gaskets. The gaskets and sealant used to install the manhole covers must comply with NSF Standard 61.

Suction and discharge valves of the tanks

16.1.3.37 The Contractor must remove the suction and discharge valves and transport them to their shop for overhaul which involves the following work:

- Remove the valve caps from each valve
- Disassemble the valves and clean their discs, then grind them with an abrasive grinding powder to ensure proper seating
- Clean all valve stems, examine them for wear and then ring them
- Examine all piping and associated studs for signs of wear
- Bring to the attention of the technical authority any valve discs, seats or stems, etc that needs to be machined or replaced so that corrective action can be taken

For bidding purposes, the bid must include the price for 50 hours of machining for the work in this section, as well as unit price per hour of machining. The final cost will be adjusted, up or down, by means of PSPC 1379 Process

16.1.3.38 Upon completion of the cleaning and overhaul work, the Contractor must lay out all valve parts for inspection and review by the ABS inspector.

16.1.3.39 Upon successful completion of this examination, or after making the necessary repairs, the Contractor must perform the final reassembly of all valves, under the supervision of the technical authority, in good working order and to “closed position”. The Contractor must use new static seals and stem packing, and reinstall them on board in their original location with new seals. Gaskets used to reassemble the valves must comply with NSF 61.

16.1.3.40 The Contractor must supply and coat all moving parts and fasteners with an anti-seize product. This anti-seize product must be in accordance with NSF 61.

Filling and testing

16.1.3.41 Following completion of all work inside the potable water tank and prior to returning the tank to service, the Contractor must fill and drain the tank until the water discharged from the tank is clear and the measured turbidity level of the discharged water is less than 1 nephelometric turbidity unit (NTU). The Contractor is responsible for the disposal of water during flushing and draining.

16.1.3.42 Upon successful completion of flushing and draining, the Contractor must proceed with the potable water tank filling and testing activities listed in the Table below.

Process	1: Superchlorination of the tank
Description	Fill the tank and superchlorinate the water with bleach at a concentration of 50 mg/L free chlorine. Circulate the water through all the vessel's piping to superchlorinate and disinfect the system.
Duration	Superchlorinated water must be allowed to stand for a minimum of four (4) hours in accordance with Section 3.5 "Disinfection" of the CCG FSM Section 7.A.12 "Drinking Water Quality".
Sampling & deliverables	Prior to superchlorination of the tank, the Contractor must provide the technical authority with the calculations used to determine the concentration of chlorine solution to be used and indicate the number of containers to be used.
Process	2: Dechlorination and water removal
Description	Superchlorinated water must be dechlorinated to 0.1 mg/L or less. The tank must then be drained and flushed twice.
Duration	Dechlorination must be performed no less than four (4) hours after superchlorination of the tank.
Sampling & deliverables	None
Process	3. Filling and chlorination
Description	The tank must be filled and chlorinated. The free chlorine content in the tank should be maintained at a concentration of 0.2 mg/L to 0.5 mg/L free chlorine.
Duration	<ol style="list-style-type: none"> 1. Filing water samples must be collected during tank filling. 2. Water samples must be collected from the tank approximately four (4) hours after completion of filling.
Sampling & deliverables	<ol style="list-style-type: none"> 1. The Contractor must collect samples of the filling water from the hose that will be used to fill the tank. The Contractor must send the samples to an approved laboratory for analysis. 2. The Contractor must collect water samples directly from the sampling valve located on the tanks. The Contractor must send the samples to an approved laboratory for analysis. <p>The quantity of samples collected must be sufficient to conduct analysis for the twenty-nine (29) health and aesthetic objective parameters listed in CCG FSM Section 7.A.12 "Drinking Water Quality", Section 3.6, paragraph (f) inclusive. Water test results must be within the acceptable limits listed in the CCG FSM, Section 7.F.12 "Drinking Water Quality", Article 3.6, paragraph (f) before proceeding with the remaining work.</p>
Process	4. Final sampling
Description	Chlorinated water in the tank from the "Fill and Chlorinate" process must sit for three (3) days.
Duration	Water samples must be collected from the tank three (3) days after successful completion of the "Fill and Chlorinate" process

Sampling & deliverables	The quantity of samples collected must be sufficient to conduct an analysis of the twenty-nine (29) health and aesthetic objective parameters listed in CCG FSM Section 7.A.12 "Drinking Water Quality", Section 3.6. Laboratory analytical reports for water samples must be submitted to the technical authority. The analytical results must be within the acceptable limits listed in the CCG FSM, Section 7.A.12 "Drinking Water Quality," Article 3.6, before proceeding with the remaining work.
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16.1.3.43 Water from the tank must not be consumed on board the vessel until certificates of acceptable potability are received.

16.1.3.44 The Contractor must provide the equipment and materials required for tank disinfection and subsequent flushing. The Contractor is responsible for the disposal of water during flushing and draining. Flushing and draining water must be disposed of in accordance with applicable regulations.

16.1.3.45 The Contractor is responsible for all costs associated with water testing/analysis.

16.1.4 Proof of performance

16.1.4.1 Inspection

16.1.4.1.1 Within the scope of this specification, all work must be performed to the satisfaction of the Technical Authority.

16.1.4.1.2 The Contractor must hire the NACE Independent Inspector prior to the application of coatings to plan inspection points related to surface preparation, determine suitable environmental conditions, and ensure that coating applications comply with manufacturer's recommendations and industry best practices.

16.1.5 Deliverables

16.1.5.1 Documentation

16.1.5.1.1 The Contractor must provide a report of applied coatings, including prevailing environmental and atmospheric conditions provided by the NACE TSR, Application Procedures, Product Data Sheets and Material Safety Data Sheets for the coating product.

16.1.5.1.2 The Contractor must submit the reports, tests results as indicated throughout this Specification work item, and including:

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- temperature and relative humidity values in the tank during coating application and curing
 - copies of all water sampling results issued by the testing laboratory

16.1.5.2 Certifications

16.1.5.2.1 The Contractor must submit the following certificates:

- a copy of the certification of the NACE TSR
- copies of all tank entry certificates
- copies of waste and hyperchlorinated water disposal certificates
- copies of certificates indicating that all hoses and pumps used during tank filling and emptying operations are for potable water only

16.2 HVAC & REFRIGERATION SYSTEMS - ANNUAL MAINTENANCE

16.2.1 Identification

16.2.1.1 The Contractor must provide the services of a fully trained FSR technician, certified to work on refrigeration and air conditioning systems with a valid ASHRAE accreditation number, to perform the work described in this Work Specification. The FSR must supply all the specialty tools and parts, were required, to carry out the scope of work in this Specification item.

The FSR must provide all equipment, hardware, personnel and transportation required to carry out the scope of work under the direction and guidance of the technician

16.2.2 References

16.2.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
108-H-23_25, Rev 9 (Sept 2011)	General arrangement
65-20-02, Rev 1 (March 4, 1986)	Arrangement of refrigerant piping in winch compartment
7132433, Rev 0 (March 1995)	Diagramme d'écoulement

16.2.2.2 Regulations and standards

All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section.

Standards & Regulations Revision / Date	Title / Description
FHR 2022	Federal Halocarbon Regulations, 2022
April 2015, Errata June 2021	ENVIRONMENTAL CODE OF PRACTICE for the elimination of fluorocarbon emissions from refrigeration and air conditioning systems – Environment Canada En14-207-2021-eng.pdf (PDF, 630 KB)
IEEE-45, 2017	IEEE Recommended Practice for Electrical Installations on Shipboard

16.2.2.3 Equipment Data

System					
Domestic Refrigeration System, Refrigerant: R-134a					
Components	Manufacture	Type	Model	Room & Temp.	QTY
Compressor	Carlyle -Carrier	Open type	5F30-C654		2
Evaporator	KeepRite			Freezer, -20	1
Evaporator	KeepRite			Freezer, -20	1
Evaporator	KeepRite			Vegetable, +3	1
Evaporator	KeepRite			Vegetable, +3	1
Evaporator	KeepRite			Dairy, +3	1
Evaporator	KeepRite			Dairy, +3	1
Evaporator	KeepRite			Potatoes, +4	1
Evaporator	KeepRite		R375	Lobby, +6	1
System					
Main Air-conditioning System, Refrigerant: R-407C					
Components	Manufacture	Type	Model	Room & Temp.	QTY
Compressor	Blitzer	Semi-hermetic	4GE-30-5PU	A	2
Evaporator	Bronswork	Custom		All accom.. +20	2
System					
Server Room Air-conditioning System, Refrigerant: R-438A					
Components	Manufacture	Type	Model	Room & Temp.	QTY
Compressor /Evaporator	Carrier Transicold	Self-contained	90MA012-600-1	Server room +20	1
System					
Wheelhouse Air-conditioning System, Refrigerant: R-438A					
Components	Manufacture	Type	Model	Room & Temp.	QTY
Compressor	BergChilling	Semi-hermetic	MCR-5-AC		1
Evaporator	BergChilling	Custom		Wheelhouse +20	1
System					
Control Room Air-conditioning System, Refrigerant: R-438A					
Components	Manufacture	Type	Model	Room & Temp.	QTY
Compressor/ Evaporator	Carrier Transicold	Self-contained	90MA012-600-1	Control room-20	1

16.2.3 Technical Description

General (All Systems)

16.2.3.1 The Contractor must provide materials and labor to perform the following work:

- For each system, perform a leak detection test on the compressors, piping and evaporators.

- Perform an oil acidity test for each compressor

16.2.3.2 If more work is required, in addition to list in this section, the Contractor must provide an itemized list of work, and the required material and labour hours to CCG TA and the Contracting Authority prior to commencing the work. The cost will be dealt with by PSPC 1379 process along with the supporting documentation and justification.

For the Domestic Refrigeration system:

16.2.3.3 The FSR must conduct a complete systems inspection

16.2.3.4 The Contractor must supply and replace door seals for all refrigerated rooms in the domestic system (5 doors in total)

16.2.3.5 The FSR must supply Refrigerant gas. For bidding purposes, the Contractor's bid must include the price for a 13.6 kg cylinder of R134a refrigerant. The final cost will be dealt with by PSPC1379 process.

16.2.3.6 The FSR must check and adjust all operating parameters.

16.2.3.7 The FSR must perform the following tasks, for compressors, as the minimum:

- Replace oil and filters.
- Open the crankcases doors for inspection and cleaning.
- Check and adjust the unloaders
- Start and stop adjustments, cutout and thermostatic valves
- Transfer (rotation) of compressors from duty to stand-by and vice versa
- Check the condition of mechanical seals
- At the end of the work the Contractor must demonstrate that the 2 units are functional by putting them into operation

16.2.3.8 For bidding purposes, the Contractor must bid a unit price (parts and labor) to replace one (1) mechanical seal on the 5F30-C654 compressor. The price must also include laser alignment of the compressor and its electric motor. The final cost must be adjusted, up or down, using the PSPC 1379 process along with the supporting disposal documentation.

16.2.3.9 The FSR must perform the following tasks, on the system, as the minimum:

- Check and clean the evaporators (8) and their defrosting system. (freezer 2x, dairy 2x, cold room 2x, potato 1x and lobby 1x).

- Check the evaporator drain and heating cable system. Make sure they are free to drain. Repair the insulation after this check.

16.2.4 Proof of performance

16.2.4.1 Inspection

All work must be completed to the satisfaction of the Chief Engineer

16.2.4.2 Tests

The chief engineer or his delegate must be present during the tests.

16.2.5 Deliverables

16.2.5.1 Reports and documents

16.2.5.1.1 The Contractor must submit a complete type-written report, in unprotected PDF format, detailing the work performed, tests and their results, causes of failures (if any), modifications required (if any) and parts replaced.

16.2.5.1.2 The Contractor must submit MSDS and OEM manuals for all new parts, if any.

16.2.5.2 Certification

The Contractor must submit the FSR's certification and valid ASHRAE accreditation number to CCG prior to start any work.

16.3 KITCHEN HOOD- ANNUAL CLEANING

16.3.1 Identification

16.3.1.1 The contractor must provide the services of a certified subcontractor to perform the cleaning of the range hood and the range hood ducting, including the ducting to the extraction fan, the fan and the outside exhaust grille. The Contractor must provide all equipment, hardware, personnel and transportation required to carry out the scope of work.

16.3.2 References

16.3.2.1 Document

Drawing/Document No. Revision / Date	Title / Description
108/555-H-3800-2	Composite arrangement Upper deck
108/555-H-3810	HVAC Main deck
108/555-H-3820	HVAC Upper deck
1085-H-23-25	General arrangement

16.3.2.2 Regulation and standard

16.3.2.2.1 All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

16.3.2.2.2 The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section.

Standards & Regulations Revision / Date	Title / Description
NFPA 96	Kitchen Hood Cleaning Requirements
Martha L Black	Manuel de lutte contre les incendies
7B5	CCG ISM Lockout/Tagout
TP13585	Plan Approval And Inspection Requirements Under the Vessel Fire Safety Regulations
IMO MSC.1/Circular.1432	Guidelines for the Maintenance and Inspection of Fire Protection Systems and Appliances

16.3.3 Technical Description

- 16.3.3.1 The Contractor is responsible for the identification of any interference items, their temporary removal, storage and refitting to the vessel. The Contractor is responsible for protecting the surrounding area and equipment while carrying out this work.
- 16.3.3.2 The Contractor must open Galley's ceiling tiles to gain access to the hood's access panels.
- 16.3.3.3 To gain access to Galley's ventilation ducts passing through areas outside the Galley, the Contractor must only use the existing access panels.
- 16.3.3.4 The Range Hood and trunking must be chemically and/or steam cleaned. All dirt, grease, debris, and cleaning fluids must be trapped and removed ashore and disposed of by the Contractor.
- 16.3.3.5 Prior to cleaning, all mechanical and electrical connections to range hood must be released, including piping for fire extinguishing system, associated controls, fans and electrical lighting. All fittings liable to interfere with cleaning of the range hood must to be temporarily relocated and protected.
- 16.3.3.6 The range hood filter screens must be removed and cleaned.
- 16.3.3.7 The Contractor must thoroughly clean and degrease the entire exhaust duct, from the range hood to and including the exhaust louver. The trunking in way of the exhaust fan must be opened to allow complete degreasing of the fan (casing and impellers) as well as the fan's motor and its support brackets.

16.3.3.8 Trunking and the range hood must be reassembled in good order and adjusted upon completion of cleaning and inspection. All items removed or relocated, to allow this work package to proceed, must be reassembled in good order and functionally tested to the satisfaction of the TA. The applicable fire-rated insulations, if missing or disturbed, must be properly applied as per Classification Society requirements and the Fire Protection Plan.

16.3.3.9 The Contractor must restore the Galley to the same state of cleanliness as it was prior to the work.

16.3.4 Proof of performance

16.3.4.1 Inspection

16.3.4.1.1 The Contractor must allow the TA to inspect the system prior to “Closing up” the areas. Full credit must be afforded to Canada for all items in this specification item, upon Contractor’s failure to provide the TA with adequate notice and inspection period.

16.3.4.2 Test

16.3.4.2.1 The Contractor must start and test the system in the presence of CCG IA to make sure of the full functionality of the galley exhaust system.

16.3.4.2.2 The Signoff is when all work is completed to the satisfaction of the TA.

16.3.5 Deliverables

16.3.5.1 Documentation

16.3.5.1.1 The Contractor must provide a detailed report of the work performed by submitting two type-written copies and one electronic copy, in unprotected PDF format to CCG TA upon completion. At a minimum, the report must include:

- all certificates, results / recommendations, etc
- the dates and times each duct component was cleaned
- locations of any blockages encountered
- a summary of the work performed along with the workers information that performed the tasks.

16.3.5.1.2 The Contractor must provide the technical data sheets and MSDS of all chemicals and cleaning agents used.

16.3.5.2 Certifications

16.3.5.2.1 The Contractor must provide a certificate, from the service provider, that the work performed is in compliance with the requirements stated in NFPA 96.

16.3.5.2.2 The Contractor must submit to Canada all components and/or material certifications or Type Approvals (where applicable).

17.0 DECK EQUIPMENT / SHIP SUPPORT SYSTEMS

17.1 WINDLASS MAINTENANCE & FIVE-YEAR SURVEY

17.1.1 Identification

The objective of this Work Item is to perform the five-year inspection on the Windlass system according to ABS Regulations, and obtain ABS certification.

17.1.2 References

17.1.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
H-3110	Anchor Windlass Arrangement
900-400-134D	Windlass Assembly
900-400-351	Shaft & Motor Assembly
900-400-352	Clutch Assembly
900-400-355	Brake Assembly
900-400-134	Windlass specification

17.1.2.2 Regulations and Standards

All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section.

Standards & Regulations – Revision / Date	Title / Description
ISO 23309	Hydraulic fluid power systems - Methods of cleaning lines by flushing
ISO 16431	Hydraulic fluid power - System clean-up procedures and verification of cleanliness of assembled systems
TP127E (05/2018)	Transport Canada Marine Safety Electrical Standard
IEEE 45	Recommended Practice for Electrical Installations Shipboard
SOR/90-264	Marine Machinery Regulations
18-080-000-SG-003 (formerly DFO/5884 - TP 12445E)	Paints And Coatings Standard
ISO 8501-1:2007	Preparation of steel substrates before application of paints and related products

17.1.2.3 Equipment Data

Equipment	Brand	Type / Model	Other Data
Windlass	Pacific Winches Ltd.	900-400-134	Weight:14000Lbs
Hydraulic Pump	Rexroth	AA4V125-HD-	
Electric motor	Etaltech	CF1	Frame:326TC Voltage: 600V Power: 50HP Bearings: 6213ZZ Qty: 2
Hydraulic motor	Staffa	B200	

17.1.3 Technical Description

17.1.3.1 Unless otherwise specified, the Contractor must provide all materials, steel, paint, hardware, tools, lifting equipment including crane services, oil and grease products, seals, sealants and all other parts/equipment necessary for to complete the work as described below.

17.1.3.2 The Contractor is responsible for coordinating all required inspections with the IA and with ABS Surveyor.

- 17.1.3.3 Before working on the windlass, the Contractor must coordinate with IA to take a series of photos of the windlass and its components, including the hydraulic power pack and its components. The Contractor must pay particular attention to the controls, its piping and accessories to ensure everything is put back as it was before the work.
- 17.1.3.4 Prior to working on the windlass, the Contractor must conduct the test outlined in Section 17.1.4.2.1 of this specification.
- 17.1.3.5 The Contractor must drain the oil from the hydraulic unit, approximately 300 liters and 85 liters from the gear box and dispose of it immediately in accordance with all Federal, Provincial and Municipal regulations in effect. Used oil containers must not be left on the deck of the vessel.
- 17.1.3.6 The Contractor must completely disassemble each component of the windlass, clean and have them ready for inspection.
- 17.1.3.7 The Contractor must check all components listed below for wear and tear, including their keys, seals and bushings. The Contractor must take the measurements and include them in the final report for the following items as the minimum:
- Warping head
 - Pinion shaft
 - Output pinion
 - Wildcat sprocket
 - Wildcat shaft
 - Input gear /output gear
 - All brake mechanisms including brake bands
 - All clutch components
- 17.1.3.8 The Contractor must check the condition of all bushings and bearings, take measurements and record them in the report.
- 17.1.3.9 The Contractor must check all grease points and replace all grease nipples with high pressure 316 stainless steel types. All components must be lubricated with a grease having lubricating qualities effective at temperatures ranging from -50 to +30 degrees C provided by the Contractor.
- 17.1.3.10 The Contractor must dye test all pins and gears for cracks and provide a test report.
- 17.1.3.11 The Contractor must check the straightness of the shaft. This information must be included in the completion report.
- 17.1.3.12 The Contractor must check and record gear backlash.

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- 17.1.3.13 The Contractor must display the parts and measurements to the ABS inspector and the CCG representative. Any parts found to be damaged as a result of this inspection will be replaced and processed via the PSPC 1379 process.
- 17.1.3.14 The Contractor must reassemble all parts that were dismantle with new high quality gaskets, as stipulated in the manufacturer's Manual.
- 17.1.3.15 The Contractor must supply and replace all bolts, nuts and washers (flat and lock) of the various equipment and bases with new parts of equivalent quality, with the same grade and dimensions. All parts must be reassembled with an industrial grade copper anti-seize compound.
- 17.1.3.16 The Contractor must supply and replace both filter elements of the hydraulic system.
- 17.1.3.17 The Contractor must clean the hydraulic oil tank and gear box, have them inspected by ABS and the vessel's Chief Engineer prior to closing them up. The Contractor must close the inspection doors with new gasket-
- 17.1.3.18 The Contractor must reassemble all parts with NPT threads with a recognized product to facilitate lubrication of the threads while protecting them from the weather.
- 17.1.3.19 The Contractor must disassemble the following listed components for overhaul and performance verification on a test bench in the shop: main pump, , hydraulic motor, and operation control valve (if needed) . The Contractor must replace all the seals and bearings. If after opening of any of the listed components and their verification, it is determine that there are some damaged components, their repair or replacement will be dealt with by using PSPC 1379 process except for items specified in 17.1.3.20 below.
- 17.1.3.20 Before opening the components, it is important to know if the delivery of the known parts, needing to be replaced, is possible during the planned work period. The vessel must have its windlass in working order before leaving the site.
- The bid must include a separate price for replacing each of the main pump, , and the hydraulic motor – in a case these parts are no longer available. The new replacement units must be the same equipment from the same OEM, and have the same specifications including the modifications necessary to install the new parts.
- 17.1.3.21 The work and tests performed on each of the components must be included in the final report required at the end of the work.

- 17.1.3.22 The Contractor must send the electric motor of the hydraulic unit to a specialized firm for complete overhaul, cleaning, balancing, bearing replacement (SKF sealed bearings) and epoxy painting of the frame. The work and tests performed on each of the elements must be included in the final report required at the end of the work.
- 17.1.3.23 The Contractor must replace the couplings on the pumps with new coupling of the same OEM part or equivalent.
- 17.1.3.24 The Contractor must clean and check the two (2) hydraulic oil heating elements and provide the insulation resistance to ground, resistance and current flow through each element. The Contractor must check the thermostats for proper operation, replace them as necessary, and adjust them according to the manufacturer's specifications.
- 17.1.3.25 The Contractor must check the operation of the thermostat that prevents the pump from starting if the oil is below 10 degrees Celsius.
- 17.1.3.26 The Contractor must supply and fill the tank with 315 liters of new Hydrex MV 22 and gear box with 85 liters of new Enduratex Ep150.. Empty drums and containers must be collected and disposed of by the Contractor.
- 17.1.3.27 The Contractor must seal any oil leakage that is noticed during the work.
- 17.1.3.28 The Contractor must overhaul the manual brakes. Brake lining must be replaced with new bands, OEM type or equivalent, provided by the Contractor.
- 17.1.3.29 The Contractor must clean the windlass with a degreasing product to SSPC-SP1. Rust on the windlass and its components must be removed and the components mechanically cleaned to SSPC-SP3.
- 17.1.3.30 The Contractor must take care not to apply paint to the headstocks. All painting and preparation for painting must be done in accordance with the ship paint scheme. The contractor must supply and apply paint, compatible with the ship's paint system, according to the following codes:
- Two (2) coats: white, thickness 3 mils dry per coat on bare metal surfaces (undercoat)
 - Two (2) coats: buff color, thickness 2 mils dry per coat on all surfaces (top coat)
 - Two (2) coats: red color to the piping and metal near-deck components (top coat near deck)

- 17.1.3.31 The Contractor must protect the hoses and other components from being painted. Prior to painting, the Contractor must adequately protect the deck and all items as directed by the Chief Engineer. If the work is done on board the vessel, the paint application must be done with brushes and rollers; spray painting is not be accepted. The Contractor must remove this protection after the work is completed.
- 17.1.3.32 The Contractor must, after the paint has dried, and to the satisfaction of the Chief Engineer, lubricate all components with EP2 grease, supplied by the Contractor.
- 17.1.3.33 The Contractor must touch up paint on installed bolts and other scratched surfaces in accordance with the codes mentioned in 13.1.3.30.
- 17.1.3.34 The Contractor must, if required, prior to the installation of the windlass on the deck, apply a sealant to the contour of the seating where the equipment must be bolted on.
- 17.1.3.35 The Contractor must, after each day's work, leave the area around the windlass and the room of the hydraulic power pack unit clean and safe.
- 17.1.3.36 The Contractor must supply and fill the oil required to operate the windlass hydraulic system.
- 17.1.3.37 The Contractor must perform start-up and adjustments to the windlass and repair any deficiencies.

17.1.4 Proof of Performance

- 17.1.4.1 Inspection
- 17.1.4.1.1 All step of the work must be approved by the IA, TA and ABS Surveyor.
- 17.1.4.1.2 The Contractor must provide sufficient prior notice and arrange for presence of ABS inspector and CCG Chief Engineer to inspect the oil tank and gear box before closing them.
- 17.1.4.2 Tests
- 17.1.4.2.1 Before beginning the work, the ship's crew will demonstrate the proper operation of the equipment for the Contractor. If operating abnormalities are found during this test, the Contractor must immediately notify the IA.
- 17.1.4.2.2 The Contractor must conduct a full windlass test in the presence of the ABS and CCG IA or TA; and prove the system is fully operational.
- 17.1.4.2.3 The Contractor must undertake to rectify defects and deficiencies in the Contractor's installation or repair work, as soon as practicable. The Contractor is responsible to schedule such repairs at its own risk and cost.

17.1.4.2.4 The Contractor must reschedule unsatisfactory inspections/tests after the required repairs have been completed.

17.1.5 Deliverables

17.1.5.1 Reports & Documentation

17.1.5.1.1 The Contractor must provide CCG with an electronic copy of a type-written report detailing all work carried out, all tests performed, precise measurements taken, parts replaced and recommendations five (5) days prior to the end of the work period. This report must be in unprotected Adobe PDF format, on a non-password protected flash drive, and include the following, at the minimum:

- Condition and measurements of all sleeves, bushings and bearings
- Dye penetrant test report on all axles pins and gears
- Verification report of the straightness of the shafts
- The recorded Gear backlash
- The tests and work done on components taken out to the workshop
- The service, work performed and the parts replaced on the electric motor of the hydraulic unit
- Bill of Material for all new parts, and seals installed

17.1.5.1.2 The Contractor must provide the TA with 1 electronic copy and one paper copy of all waste oil and oily waste manifests showing disposal of the materials removed.

17.1.5.1.3 The Contractor must supply 2 copies of the maintenance manuals, drawings and parts lists for any new equipment installed on the windlass including, but not limited to, the hydraulic pumps, hydraulic motor, control valve, etc.

17.1.5.2 Certification

17.1.5.2.1 The Contractor must provide NDT operators certified to CAN/CGSB-48.9712- latest edition, Qualification and Certification of Non-Destructive Testing Personnel Level II for the appropriate method. Copies of the operator's certificates must be provided to the TA

17.1.5.2.2 The contractor must submit to CCG one (1) electronic copy and two (2) hard copies of the inspection certificates, issued by ABS (as the RO), along with the original copy bearing the Class seal – certifying that the windlass and its components meet all applicable regulatory requirements.

NOTE: Final acceptance will be based on ABS certification.

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

17.2 SPEED CRANE - MAINTENANCE & FIVE-YEAR SURVEY

17.2.1 Identification

17.2.1.1 The objective of this work item is to perform a five-year inspection of the "Speed Crane" cargo mast, according to ABS classification society regulations, and obtain ABS certification. The work includes, as the minimum:

- Inspection of the Crane and components;
- Disassembly for inspection, and reassembly after inspection;
- Functional tests and adjustments after inspection;
- Proof Load Testing of the Main and Auxiliary Hoists
- Set the crane to work at the completion of the work

17.2.2 References

17.2.2.1 Documents

The following Drawings are to be considered as Guidance Drawings:

Drawing/Document No. Revision / Date	Title / Description
1DG 6030-33	Instruction manuals for speedcrane
Speedcrane 1DG 6030-33	Rigging assembly
Speedcrane 1DG 6030-33	Pulleys list
125% test	Weights for 125% test

17.2.2.2 Regulations and Standards

All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements

in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section.

Standards & Regulations – Revision / Date	Title / Description
TP127E (05/2018)	Transport Canada Marine Safety Electrical Standard
70-000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment
IEEE 45	Recommended Practice for Electrical Installations Shipboard
ISO 9712:2005	International Standards for NDT
ISO 8501-1:2007	Preparation of steel substrates before application of paints and related products
18-080-000-SG-003 (formerly DFO/5884 - TP 12445E)	Paints And Coatings Standard
SOR/2017-128	Cargo, Fumigation and Tackle Regulations
SOR/90-264	Marine Machinery Regulation
DFO 5737	Fleet Safety and Security Manual – Sections 10.A.7 and 10.B.1

17.2.2.3 Equipment Data

The Derrick speed crane is specifically designed for the Type 1100 navigational aid vessel. The crane is manufactured by John Hastie of Greenock. The crane has a total capacity of 28 tonnes. It is composed of 5 winches driven by electric motors, one for topping, one for sleeving, one for the 20T hook, one for the 8T hook #1 and one for the 8T hook #2

17.2.3 Technical Description

17.2.3.1 The Contractor must provide labor and all materiel, unless otherwise specified, as well as tools and lifting equipment including crane services necessary to complete the work as described in this Specification.

-
- 17.2.3.2 The Contractor must conduct all inspections in accordance with applicable TCMSS and ABS (applicable RO) regulations, and under supervision/direction of ABS Inspector and CCG Representative.
- 17.2.3.3 The Contractor is responsible for the electrical and mechanical disconnection and reconnection of the crane components.
- 17.2.3.4 The Contractor must disassemble and inspect each part of the sheaves, swivels, attachment points and hook of the 20-tons MAIN CARGO system according to ABS inspection standards. This includes sheaves # 1, 2, 3 and 5 and hook # 4.
- 17.2.3.5 The Contractor must dismantle and inspect each part of the sheaves, swivels, attachment points and hook of the 8-tons "AUX. CARGO" system according to ABS inspection standards. This includes sheaves # 6, 7 and 8 and hook # 23.
- 17.2.3.6 The Contractor must dismantle and inspect each part of the sheaves, swivels, attachment points and hook of the 8-tons "AUX. CARGO" system (#2) according to ABS inspection standards. This includes sheaves # 19, 20 and 21 and hook # 22.
- 17.2.3.7 The Contractor must dismantle and inspect each part of the blocks, swivels and attachment points of the port and starboard TOPPING system according to ABS inspection standards. This includes blocks and attachment points 9, 10 A, 10 B, 10 C, 10 D and 11 as well as the swivel at the top attachment point (becket).
- 17.2.3.8 The Contractor must dismantle and inspect each part of the sheaves, swivels and attachment points of the port and starboard COMPENSATOR system, according to ABS inspection standards. This includes blocks 12, 13, 14 and 15.
- 17.2.3.9 The Contractor must disassemble and inspect each part of the sheaves, swivels and attachment points of the port and starboard "SLEW" system according to ABS inspection standards. This includes blocks and attachment points 16, 17 and 18.
- 17.2.3.10 The Contractor must inspect all supporting accessories, such as swivels, pins, shackles, etc., which are included in the items, along with the sheaves.
- 17.2.3.11 The Contractor must disassemble and inspect each part of the gooseneck (mast foot) according to ABS inspection standards; and take measurements of the axle and the bearing. The Contractor must replace the oil of the gooseneck with new oil supplied by CCG.
- 17.2.3.12 The Contractor must clean and chrome-coat the axle of the gooseneck.
- 17.2.3.13 The Contractor must dye penetrate all pins and sheaves for cracks and provide a report.

17.2.3.14 The Contractor must complete the inspection and testing of the speed crane to meet ABS inspection standards. This includes overload testing (125%) of the equipment. Loads must be provided by the Contractor.

Additional instructions

17.2.3.15 The Contractor must remove and reinstall all related wire ropes.

17.2.3.16 The Contractor must clean all parts, and remove rust, where required, by sandblasting or other methods. Special attention must be taken to clean the hydraulic grease paths of the axles and other parts.

17.2.3.17 Upon reassembly, the Contractor must grease all parts requiring lubrication in the presence of CCG TA or IA.

17.2.3.18 The Contractor must reassemble the main mast such that the grease nipples are all oriented in the correct direction for easy access during lubrication. CCG Representative must be present at the time of reassembly to ensure that the nipples are oriented correctly.

17.2.3.19 The cargo mast and any exposed metal parts must be coated with paint compatible with the Ship's paint system, and as directed by the paint manufacturer, in: One (1) coat of RAL 9003, white and Two (2) coats of RAL 070 7040, buff.

17.2.3.20 Any deficiencies must be reported to the CCG TA prior to proceeding with the work.

17.2.3.21 If necessary, at the request of the ABS inspector, non-destructive testing may be performed on any other part of the structure. The cost of this testing will be dealt with by PSPC 1379 process.

17.2.3.22 The Contractor must perform non-destructive inspection of the critical welds, if any identified by the ABS surveyor. The Contractor must prepare the structures and welds for examination, including the removal of coating systems and corrosion if required. Where the Contractor removes the coating system for the NDT examinations, the Contractor must apply two coats of primer and two coats of top coat paint as per Paint specifications. The Contractor must feather the paint edges to present a smooth appearance to the completed coating system.

For bidding purposes, the bid must include:

- a) The price for NDT examination of 50 meters linear length of weld; and must provide a price per meter for the NDT weld inspections considering the NDT inspector is on location. The bid must also include the price associated with calling back the NDT inspector to the location, in case a revisit to conduct more testing will be required at a different time. The final cost will be adjusted, up or down, by means of PSPC 1379 Process.
- b) The price for 50 meters linear length of applying two coats of primer and two coats of top coat paint; and must provide the price per meter as well. The final cost will be adjusted, up or down, by means of PSPC 1379 Process.

17.2.3.23 The Contractor must perform UT thickness measurements on steel plate, if any identified by ABS. The Contractor must bid on 50 point measurements; and must provide the unit price per point as well. The final cost will be adjusted, up or down, by means of PSPC 1379 Process.

17.2.3.24 The Contractor must pay special attention to the pins. If necessary, upon approval of the CCG TA, the Contractor must replace the copper liners (bushing).

For bidding purposes, the bid must include the price of material and labour to replace these bushings as a separate line-item.

17.2.3.25 Removal and reassembly of the shells surrounding the bearings must be included in the contract price as a separate line-item.

17.2.3.26 The Contractor must pay particular attention to the sheave grooves to ensure a smooth and even profile. The contact surface must be perfect to prevent wear of the rope and groove. Sheave grooves must be re-machined by the Contractor, if necessary, to provide maximum support for the wire rope (on 8% diameter).

For bidding purposes, the bid must include the price for 50 hours of machining for the work in this section, as well as unit price per hour of machining. The final cost will be adjusted, up or down, by means of PSPC 1379 Process.

17.2.3.27 If required, the steel used in the fabrication of the part must be type 4140 and certified.

17.2.3.28 The Contractor must perform the reassembly with new Contractor supplied pins and locks.

17.2.4 Proof of Performance

17.2.4.1 Inspection

17.2.4.1.1 The Contractor must perform visual inspection of the base column (including supporting structure below the main deck), slewing column (i.e. the rotating platform) and the boom for corrosion, wastage, and coating system integrity.

17.2.4.1.2 All blocks, swivels, attachment points, hooks, sheaves, etc. must be inspected and approved by ABS inspector and CCG TA before reinstallation.

17.2.4.2 Tests

17.2.4.2.1 The Contractor must perform an overload test (125%) of the equipment in the presence of the ABS inspector and the AT -GC. The certified weights must be provided by the Contractor.

17.2.5 Deliverables

17.2.5.1 Reports & Documentations

17.2.5.1.1 The Contractor must generate and provide CCG with an inspection report documenting the overall condition of the structure and the coating system with photographs and narrative description.

17.2.5.1.2 The Contractor must provide CCG with an electronic copy of a type-written report detailing all work carried out, all tests performed, precise measurements taken, parts replaced and recommendations five (5) days prior to the end of the work period. This report must be in unprotected Adobe PDF format, on a non-password protected flash drive, and include the following, at the minimum:

- Condition and measurements of all blocks, swivels, attachment points, hooks, sheaves, etc
- Dye penetrant test report on all pins and bearings
- Bill of Material for all new parts, and seals installed

17.2.5.2 Certification

17.2.5.2.1 The Contractor must provide NDT operators certified to CAN/CGSB-48.9712-latest edition, Qualification and Certification of Non-Destructive Testing Personnel Level II for the appropriate method. Copies of the operator's certificates must be provided to the TA.

17.2.5.2.2 The contractor must submit to CCG one (1) electronic copy and two (2) hard copies of the inspection certificates, issued by TCSM or ABS (as the RO), along with the original copy bearing the Class seal – certifying that the speed crane and its components meet all applicable regulatory requirements.

NOTE: Final acceptance will be based on ABS certification.

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

17.3 DUMBWAITER - ANNUAL MAINTENANCE

17.3.1 Identification

The purpose of this item is for the Contractor to provide the services of a fully trained and certified elevator Field Service Representative (FSR) to perform the annual maintenance, testing and recertification of the dumbwaiter..

17.3.2 References

17.3.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
Serie 100 Dumbwaiter	Maintenance and parts manual

17.3.2.2 Regulations and Standards:

Standards & Regulations – Revision / Date	Title / Description
CAN/CSA-B44-M90, section 12	Safety Code for Elevators

17.3.2.3 Equipment Data:

Equipment	Brand	Model	Series
Dumbwaiter	D.A. Mathot	100	17572

17.3.3 Technical Description

Sollicitation No. - N° de l'invitation

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

F7049-210340/A

041MD

Client Ref. No. - N° de réf. du client

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

F7049-210340 041MD.F7049-210340/A

- 17.3.3.1 The Contractor must provide parts and skilled labor to perform the annual inspection and maintenance of the vessel's dumbwaiter as directed in Section 12 of CAN/CSA-B44-M90.
- 17.3.3.2 Following completion of the work, the Contractor must submit inspection reports and update the equipment maintenance log.
- 17.3.3.3 For bidding purposes, the Contractor must quote for the replacement of the main cable of the dumbwaiter, if required (see Figure 17.3-1 cable certificate).

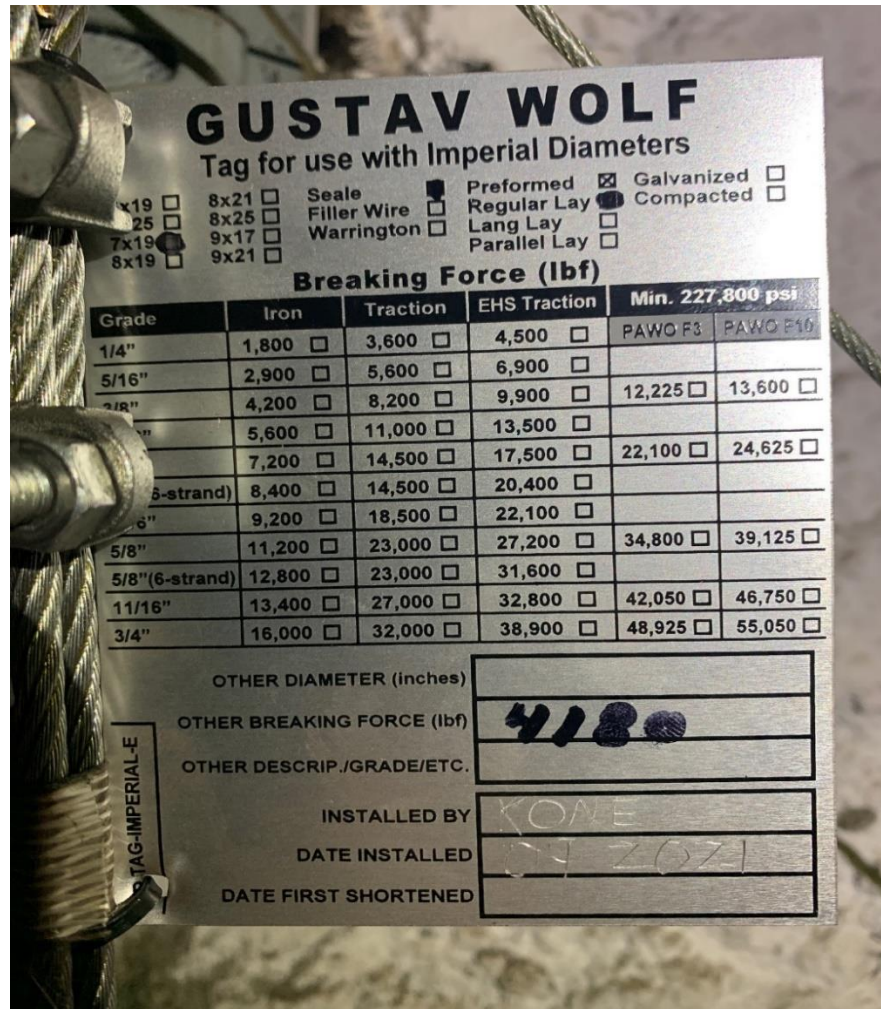


Figure 27.3.1 Cable certificate

Cable Specification	
Brand	Gustav Wolf
Other specs	Size 3/16"- 7x19; Length: 60 ft, seale, regular lay, preformed, breaking force 4180 lbf

17.3.4 **Proof of Performance**

17.3.4.1 Inspection

All work must be completed to the satisfaction of the chief engineer.

17.3.4.2 Tests

The Chief Engineer must be present during inspections and tests.

17.3.5 **Deliverables**

17.3.5.1 Documentation

- 17.3.5.1.1 Upon completion of the work, the Contractor must provide CCG with an electronic copy of a type-written report detailing the work performed, the cause of the failures (if any), the modifications applied, parts replaced, and recommendations if any. This report must be in unprotected Adobe PDF format, on a non-password protected flash drive.

17.3.5.2 Certification

- 17.3.5.2.1 The Contractor must submit to CCG one (1) electronic copy and two (2) hard copies of the inspection certificates, issued by the FSR certifying that the Dumbwaiter and its components meet all applicable regulatory requirements.
- 17.3.5.2.2 All components and/or equipment certifications or Type Approvals (where applicable) must be submitted to Canada.

17.4 MOORING WINCHES - FIVE-YEAR SURVEY

17.4.1 Identification

17.4.1.1 The objective of this item is for the Contractor to provide the services of a fully trained and certified hydraulic Field Service Representative (FSR) to perform the inspection on the four (4) mooring winches in order to obtain ABS certification for these equipment.

17.4.2 References

17.4.2.1 Documents

Drawing/Document Number/ Revision	Drawing Title
900-400-282	Mooring winch- Schematic
900-400-282	Operation instruction
900-400-282	specification
900-400-342	Brake assembly
900-400-343	Mooring winch assembly

17.4.2.2 Regulations and Standards

All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section.

Standards & Regulations – Revision / Date	Title / Description
SOR/90-264	Marine Machinery Regulation

17.4.2.3 Equipment data

Equipment	Brand	Type / Model	Other Data
Mooring Winch 1 to #4	Pacific Winches Ltd.	900-400-282	Weight:5500Lbs
Hydraulic Pump #1 to #4	Rexroth	AA4V125-HD-	
Electric motor # 1 to #4	Etaltech	CF1	Frame:326TC Voltage: 600V Power: 50HP Bearings: 6213ZZ Qty: 2
Hydraulic motor #1 to #4	Hagglund	UK 43 06800 AO LN 0108	

17.4.3 Technical Description

- 17.4.3.1 The Contractor must provide the material and labor to remove the guards on the 4 mooring winches to allow the ABS inspector to perform a visual inspection of the winches. Upon completion of the work the Contractor must reinstall all guards that were removed.
- 17.4.3.2 The Contractor must provide parts, equipment and specialized labor to perform a performance test on the hydraulic system of each of the 4 mooring winches.
- 17.4.3.3 The Contractor must provide specialized equipment and labor to perform a vibration analysis on the electric motor and hydraulic pump of each of the 4 mooring winches to determine the condition of the bearings.

17.4.3.4 At the end of the work, the Contractor must perform a test run including a pull test (bollard pull) on each of the 4 mooring winches in the presence of the ABS inspector.

17.4.4 Proof of Performance

17.4.4.1 Inspection

17.4.4.2 ABS inspector must be present during inspections. All work must be completed to the satisfaction of the Chief Engineer and the ABS inspector.

17.4.4.3 Tests

17.4.4.4 The Contractor must perform a test run including a pull test on each of the four (4) mooring winches in the presence of the ABS inspector, and the Chief Engineer.

17.4.5 Deliverable

17.4.5.1 Documentation

17.4.5.1.1 At the end of the work, the Contractor must provide a complete report which must include the performance tests done on the hydraulic systems of the four (4) winches and the report on the performed vibration analysis.

17.4.5.2 Certification

17.4.5.2.1 The contractor must submit to CCG one (1) electronic copy and two (2) hard copies of the inspection certificates, issued by ABS (as the RO), along with the original copy bearing the Class seal – certifying that the Dumbwaiter and its components meet all applicable regulatory requirements.

NOTE: Final acceptance will be based on ABS certification.

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

17.5 HELICOPTER HANGAR- MAJOR MAINTENANCE

17.5.1 Identification

17.5.1.1 The objective of this Specification Work Item is to perform a major overhaul on the helicopter hangar. The hangar is a DAF Indal Ltd aluminium telescopic type (model 1160) with three mobile sections and one fixed section. This work includes, among other things, the overhaul of the drive and braking system of the mobile sections (telescopic), the overhaul of the drive system of the curtain door, installation of several components of the hangar, the electrical connections of the components of the hangar and the heating cables of the rails. This work must be done in conjunction with the work under **item 11.6 Steel Work Hangar**.

17.5.1.2 The Contractor must include in its bid a \$10,000 allowance to cover the services of a Canadian Maritime Engineering Ltd (CME) representative to oversee the maintenance work on the helicopter hangar. The \$10,000 allowance must be part of the overall bid and must be adjusted up or down through the PSPC 1379 process upon receipt of the final invoice from the FSR supported by copies of all related documents and invoices to verify actual expenditures

Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses.

Dean Mitchell
Canadian Maritime Engineering Ltd (CME)
90 Thornhill Dr.
Dartmouth, Nova Scotia, B3B 1S3
Tel: 902-468-1888
Cel: 902-225-4342
Email: dmitchell@cmelimited.com

17.5.2 References

17.5.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
Daf Indal 1160	Operation and Maintenance instructions
1202-16_Rev0_June-1976	Pick up pads Assy
1209-14	Track heating cable installation
1224-1	Brake assembly mechanical type
1228-7	General assembly

17.5.2.2 Regulations and standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations - Revision / Date	Title / Description
FSM 7.B.3	Fleet Safety Manual, section on Entry into Confined Spaces
FSM 7.B.4	Fleet Safety Manual, section on Hotworks
FSM 7.B.5	Fleet Safety Manual, section on Lockout and Tag out
DFO 5737	Fleet Safety and Security Manual
IACS #47 -	Shipbuilding and Repair Quality Standard
SOR/2010-120	Marine Occupational Health and Safety Regulations
TP127	Ship electrical standards
SA-2½ SSPC SP10	Near White metal blast cleaning
SSPC SP3	Power tool cleaning
CSA 2001, CRC c. 1432	Canada Shipping Act, Hull Inspection Regulations
SOR/87-183	Maritime Occupational Health and Safety Regulations

17.5.2.3 Government Supplied Materiel (GSM)

Part number	Quantity
1163-13-2 Pignon	2
1200-17-3 Guideway	14
1209-079-7 Heater	4
1209-079-1 Heater	4
1209-079-9 Heater	4
1209-079-3 Heater	4
1209-079-11 Heater	4
1209-079-5 Heater	4
1209-34-1 Retaining bar	120
1209-19-4 Retainer Bar - Rev. E	120
1208-202-1 Hangar rail assembly	1
1200-355-3 Bar	6
1224-1-12 brake assembly	2
1162-13-2 drive shaft gears	2

17.5.2.4 Contractor Supplied Materiel (CSM)

Except for the items identified above, the Contractor must furnish all materials, equipment, tools (including scaffolding and crane services), lubricants, paint products, hardware and parts necessary to perform the work indicated. All bolts, nuts, washers, screws and fasteners must be stainless steel. Among other things, the Contractor must supply the following parts: Curtain door tracks, wheels (#V006725) and guides, the seals between each section part # 1253-001-47, the phenolic insulating strips that separate dissimilar metals (at the fixed part of the shed) and new shims and phenolic spacers for the assembly of rails.

17.5.3 **Technical description**

General

- 17.5.3.1 All work related to the major overhaul of the helicopter hangar must be done according to the manufacturer's recommendations described in the "DAF - Telescopic Aluminium Helicopter Hangar, model 1160'02-16 manual, applicable regulations, and the CME FSR recommendations in that order of priority.

- 17.5.3.2 The Contractor must identify, remove and temporarily store materiel and equipment that interfere with the work. Any equipment or items remaining inside the hangar during the work must be protected. Installed electrical fixtures must also be protected. The Contractor is responsible for repairing or replacing damaged items. Any item moved or removed must be reinstalled in their original location upon completion of the work.
- 17.5.3.3 Any components replaced during the overhaul of the hangar must be retained by the Contractor until the work is completed unless otherwise directed by the technical authority. The Contractor must dispose of the components in accordance with the applicable standards.
- 17.5.3.4 The Contractor must ensure that all electrical circuits in the hangar are locked out prior to commencing the work (e.g. but not limited to: lighting, track heaters, hangar drive system, curtain door open/close system, brakes, limit switches).
- 17.5.3.5 Prior to commencement of the work, the Contractor must perform a visual inspection and operational test of the hangar facility and its related equipment to determine if there are any defects. The contractor must submit to CCG TA, the written report of this inspection and test, and advise of defects, if any.
- 17.5.3.6 After completion of the work, the Contractor must restore all premises to their original functional and clean condition.

Telescopic sections and fixed section of the hangar

- 17.5.3.7 The Contractor must reinstall the removed sections and all their components, install parts that are identified as GSM in 17.5.2.3, as well as supply and install all parts identified herein (this work is included in section 11.6) .
- 17.5.3.8 Limit switches must be removed, cleaned and inspected by the Contractor. The Contractor must reinstall them when the hangar is reassembled.

- 17.5.3.9 The Contractor must install the two new mechanical brakes (#1224-1-12) including their shims (drawing 1224-1).
- 17.5.3.10 The Contractor must supply and install the phenolic guides and their fasteners (#1200-307-1 and 1200-235-1).
- 17.5.3.11 The Contractor must disassemble and replace with new the 2 drive shaft gears (GSM) for opening and closing the hangar.
- 17.5.3.12 The Contractor must remove the four stops on the ends of the two moving sections (drawing 1202-16); and reinstall them with new Belleville spring washers when the hangar is reassembled. The Contractor must supply the Belleville washers (quantity 96, see drawing 1202-16, item 7).
- 17.5.3.13 The Contractor must supply and replace all weather-stripping and insulation strips on the hangar (see parts list) as determined by the CME representative. Watertight joints between sections must be replaced (part # 1253-001-47) as well (CSM).
- 17.5.3.14 The Contractor must remove the curtain door drive system. The Contractor must supply and install new tracks, wheels (#V006725) and guides for the curtain door. The reel and its bearings must be dismantled, inspected, cleaned, greased (low temperature graphite base) and reassembled.
- 17.5.3.15 The Contractor must replace the drive shaft bearings, couplings and universal joints. Universal joints (#1203-54-5 (x2) and #1205-188-5 (x2)) are provided by CCG. The Contractor must supply the remaining bearings and couplings. The Contractor must submit purchase invoices for reimbursement through PSPC 1379 process.
- 17.5.3.16 The Contractor must also verify the straightness of all drive shafts in the hangar and make all necessary alignment adjustments to the satisfaction of FSR and the TA.
- 17.5.3.17 The Contractor must overhaul all the four (4) gear boxes. The Contractor must check the oil level in the gearboxes and refill them with new Contractor supplied oil (Mobil Spartan EP-150) as required.

- 17.5.3.18 The Contractor must overhauled the two electric motors (with brake).
- 17.5.3.19 The Contractor must inspect the mechanisms for the manual operation of the hangar and curtain door, and lubricate it as recommended by the manufacturer. The Contractor must verify the proper functioning of the manual operation before performing an electrical test.
- 17.5.3.20 Prior to finalizing the reinstallation, the Contractor must ensure that the rail racks, pinions, joints, wheel assemblies, T-bars and extrusions in the rails or T-bars are well lubricated, as well. The Contractor must provide oils and greases as recommended by the hangar manufacturer and CME Ltd.

17.5.4 Proof of performance

- 17.5.4.1 Inspection
- 17.5.4.2 All work performed must be completed to the satisfaction of the CME FSR and CCG IA.
- 17.5.4.3 A final reading of the hangar and rail alignment must be taken in the presence of the CCG IA. All rail alignment measurements taken during installation must be recorded.
- 17.5.4.4 Test
- 17.5.4.5 After reinstallation of the hangar and all its components, the Contractor must test the hangar for proper operation in the presence of the IA. Prior to testing, the Contractor must ensure that the oil level in all hangar and curtain door drive system gearboxes are at their operational level.
- 17.5.4.6 The Contractor must demonstrate the proper functioning of the following items in the presence of the CCG IA and the CME FSR:
- The heating wires of the rails

- The curtain door in electric and manual mode
- The two (2) electric brakes, adjusted as needed
- The open and close operation of the movable sections of the hangar in electric and manual mode to ensure the sections slide smoothly
- The limit switches
- The protection that prevents the operation of the mobile sections with the door closed
- The swivel arms that support the electrical wires of the hangar
- The effectiveness of the weatherstripping between the sections, at the bottom of the curtain door and the moving sections of the hangar, using a water jet. This should also include the bolted hatch above the mid-section of the hangar
- Clearances and alignment of the pinion/rail rack assemblies
- All lighting and electrical circuits in the hangar

17.5.5 Deliverables

17.5.5.1 Documentation

- 17.5.5.1.1 The Contractor must submit the initial visual inspection and functional test report, including list of defects (if any) that was done prior to commencement of the Work. This report must be typed-written and in an unprotected PDF format.
- 17.5.5.1.2 The Contractor must submit a copy of the CME FSR report (typed-written in PDF format) to CCG upon completion of the work.
- 17.5.5.1.3 The Contractor must submit a report (typed-written in PDF format) to IA of the rail and hangar alignment measurements. Measurements must be taken during construction and upon completion of the work.

17.5.5.2 Certification

- 17.5.5.2.1 The Contractor must submit all components and/or equipment certifications or Type Approvals (where applicable) to CCG.
- 17.5.5.2.2 The Contractor must submit the credentials and ABS certification of the marine electrician performing the Megger Test.

Sollicitation No. - N° de l'invitation

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

F7049-210340/A

041MD

Client Ref. No. - N° de réf. du client

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

F7049-210340 041MD.F7049-210340/A

18.0 VESSEL COMMUNICATIONS AND NAVIGATION

18.1 SHIPBOARD INTEGRATED COMMUNICATIONS SYSTEM SUPPLY AND INSTALLATION

18.1.1 Identification

18.1.1.1 The objective of this specification is to completely remove the existing Shipboard Integrated Communications System (SICS) components and cabling which consists of the following: the Public Address (PA) System, the Talkback (TB) System and the Public Branch Exchange (PBX) System. The existing SICS must be replaced with a new class approved, Contractor supplied, fully Integrated SICS that is composed of an Internet Protocol Telephone Exchange and Intercom System, and a PA system with loops A and B.

18.1.1.2 The Contractor must arrange for an OEM field service representative (FSR) to conduct the work described in 18.1.3.1.

18.1.1.3 This specification must be coordinated with the following specification work items:

- 11.6 – Helicopter Hangar – steel works
- 11.7 – Wheelhouse Windows maintenance and insulation works
- 18.4 – CAT6a Network.

18.1.2 References

18.1.2.1 Documents

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

Drawing/Document No. Revision / Date	Title / Description
108-H-23_25	Martha L. Black General Arrangement – 3 Sheets
LM601-612-SS	Système Téléphonique et Distribution Téléphonique – 3 Sheets

Drawing/Document No. Revision / Date	Title / Description
LM601-615-WI	Système de Sonorisation P.A. & Talkback – 4 Sheets
LM601-625-GA	Système de Communication Intégré – 12 Sheets

18.1.2.2 Regulations and Standards

All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section.

Standards & Regulations – Revision / Date	Title / Description
70-000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment
	Canada Shipping Act, 2001
TP15211	Canadian Supplement to the SOLAS Convention
SOLAS	SOLAS Consolidated Edition
LSA Code	International Life-saving Appliance (LSA) Code
MSC./Circular 808	Recommendations on Performance Standards for Public Address Systems on Passenger Ships, including Cabling
Resolution A.1021(26)	International Maritime Organization (IMO) Code on Alerts and Indicators

18.1.2.3 Equipment Data

18.1.2.3.1 The vessel is currently fitted with an analog United Marine Public Address and Talkback and a Mitel SX-200 PBX telephone system.

18.1.2.3.2 Government Supplied Materiel (GSM)

N/A

18.1.2.3.3 Contractor Supplied Materiel (CSM)

The Contractor must supply all tools, equipment, materials and parts, including the SICS complete system to perform the work of this Specification Item – unless clearly stated otherwise.

18.1.3 Technical Description

18.1.3.1 FSR Services

18.1.3.1.1 The Contractor must obtain the services of an FSR trained and certified by the SICS equipment manufacturer (TBD) to conduct all commissioning and final set-to-work activities, installation performance/site acceptance tests of the SICS system, and to provide a training course for CCG personnel.

18.1.3.1.2 The Contractor must include an allowance of \$20,000.00 to cover the cost of services to be provided by the FSR. The \$20,000.00 allowance must form part of the overall bid and must be adjusted up or down by means of PSPC 1379 process upon receipt of the final FSR invoice supported by copies of all related documentation and invoices to verify actual expenses.

Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses.

18.1.3.2 Old Systems Removal

18.1.3.2.1 The Contractor must remove and dispose of all cabling and junction boxes from the existing SICS throughout the vessel. This includes the PA, TB and PBX Systems. The majority of the cabling originates from the Electronics Equipment Room. Refer to drawings LM601-612-SS, LM601-615-WI and LM601-625-GA.

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18.1.3.2.2 The Contractor must remove and return to Canada all the existing equipment and equipment components, with the exception of those in 18.1.3.2.1 from the existing SICS throughout the vessel. This includes the PA, TB and PBX Systems. Refer to drawings LM601-612-SS, LM601-615-WI and LM601-625-GA.



Figure 18.1-1: SICS Control Head in Wheelhouse



Figure 18.1-2: Existing PA and Talkback Cabinets and Amplifiers



Figure 18.1-3: Existing Telephone System Cabinet (Rack #3)

18.1.3.3 SICS System Procurement/Supply

18.1.3.3.1 The Contractor must supply and install a fully commissioned and operable, type approved SICS that meets the requirements specified herein.

18.1.3.3.2 The Contractor must supply and install all ancillary equipment required to provide a complete operational system.

- 18.1.3.3.3 The Contractor must supply and install all material required for the fabrication of required brackets and mounts as recommended by the manufacturer to properly install all the required components such as the speakers, telephones, intercoms, strobe lights, and junction boxes.
- 18.1.3.3.4 The Contractor must indicate the make and models of the SICS equipment including Telephone and Intercom System, and PA System with their bid package.
- 18.1.3.3.5 The Contractor must provide the TA with the following information/documentation no later than four (4) weeks after contract award for review:
- Manufacturer of the SICS equipment
 - Bill of materials
 - Design installation drawings
 - PA system equipment locations layout on ship's general arrangement
 - Telephone and Intercom system equipment locations layout on ship's general arrangement
 - PA system single line diagram
 - Telephone and Intercom system single line diagram
 - Operator and service manuals.
- 18.1.3.3.6 The Contractor must obtain the American Bureau of Shipping (ABS) approval on the new SICS design documentation prior to proceeding with any work associated with this specification.
- 18.1.3.3.7 NOTE: Canada will cover the fees for the review and approval by ABS. However, it is the responsibility of the Contractor to obtain the final approval including any design changes required by ABS.
- 18.1.3.3.8 The Contractor must supply and install all material required for the fabrication of required brackets and mounts as recommended by the manufacturer to properly install all the required components such as the speakers, telephones, intercoms, strobe lights, and junction boxes.

18.1.3.4 Shipboard Integrated Communications System Requirements:

18.1.3.4.1 The SICS must be Type Approved by a Classification Society that is recognized by Transport Canada.

18.1.3.4.2 The SICS must consist of the following integrated systems:

- IP-based Telephone and Intercom System
- Public Address System in a Loop A and B configuration with 100 V line audio speakers.

18.1.3.4.3 The SICS must be tested and approved to the following standards:

Standards & Regulations – Revision / Date	Title / Description
IEC60945	Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results
IMO MSC/Circ. 808	Recommendation on Performance Standards for Public Address Systems on Passenger Ships, Including Cabling
IMO LSA Code VII 7.2	General alarm and public address system
IMO A.1021(26) Code on alert and indicators (2009)	Code on Alerts and Indicators, 2009

18.1.3.4.4 The SICS system must include a dedicated marine approved 120Vac, 60 Hz Uninterruptible Power Supply (UPS) to provide clean and conditioned power to the PA Loop A system and the Telephone and Intercom system during blackout conditions and the switch over from main and emergency power sources. It must be labelled and referred to in the documentation as UPS A.

- 18.1.3.4.5 The SICS system must include a dedicated marine approved 120Vac, 60 Hz UPS to provide clean and conditioned power to the PA Loop B system during blackout conditions and the switch over from main and emergency power sources. It must be labelled and referred to in the documentation as UPS B.
- 18.1.3.4.6 Each UPS must be capable of powering system/cabinet equipment for a duration of at least 30 minutes.
- 18.1.3.4.7 The SICS must have an automatic changeover facility from the main and emergency 120VAC power sources for the equipment cabinets.
- 18.1.3.4.8 The SICS system must provide the following discrete alarm outputs to be interfaced with the ship's alarm and monitoring system:
- Main/Emergency failure system A
 - Main/Emergency failure system B
 - UPS failure system A
 - UPS failure system B
 - PA system fault system A
 - PA system fault system B
 - Telephone System fault
- 18.1.3.5 Equipment Cabinets Requirements
- 18.1.3.5.1 Each cabinet must contain only one (1) PA System; the PA system for Loop A in one cabinet, and the PA System for Loop B in another cabinet.
- 18.1.3.5.2 The cabinet for the PA system for Loop A, along with the Telephone Exchange and Intercom System, must contain all equipment and materials for the end device connectivity and termination.
- 18.1.3.5.3 The cabinet for the PA system for Loop B, along with the Telephone Exchange and Intercom System, must contain all equipment and materials for the end device connectivity and termination.

- 18.1.3.5.4 The cabinet(s) must be installed in the space vacated by the old SICS cabinets and amplifiers on the bulkhead located in the Electronics Equipment Room (308) and must have the clearance as recommended by the manufacturer.
- 18.1.3.5.5 The cabinets must have/be of:
- Ingress Protection of IP22
 - Welded steel construction, and powder coated.
 - Floor/deck mountable
 - Cable access available through the bottom and the top of the cabinet
- 18.1.3.5.6 The cabinet(s) must come prepared with chassis ground and proper ventilation to allow sufficient airflow for the cooling of the equipment.
- 18.1.3.6 Public Address System Requirements
- 18.1.3.6.1 The PA system must have system redundancy through the Loop A and Loop B configuration.
- 18.1.3.6.2 The PA system must include two (2) PA System controllers in a Loop A and Loop B type configuration. Each controller must:
- Include the system controls and monitoring functions.
 - Have redundant network interfaces.
 - Be able to automatically take control of each other systems if either PA controller fails.
- 18.1.3.6.3 The PA system must include PA Amplifiers.
- The PA amplifiers must support 100 V line output.
 - The PA amplifiers must have redundant network interfaces.
 - The PA amplifiers must be continuously rated for the maximum power they are required to deliver to the PA system for audio and for alarm tone signals.
- 18.1.3.6.4 The PA system must have sufficient amplifiers to drive 100 V line audio speakers throughout the vessel.
- 18.1.3.6.5 The PA system must include a loudspeaker installation.

- 18.1.3.6.6 The PA system must provide routine and emergency broadcast PA facilities.
- 18.1.3.6.7 The PA system must provide the option to broadcast to selected areas (broadcast zones) of the ship.
- 18.1.3.6.8 The PA system must broadcast and be audible in all areas of the ship. If the listed speaker installations in this specification do not meet this requirement, additional speakers are to be installed with PSPC 1379 Work arising procedures.
- 18.1.3.6.9 The PA system must be clearly audible above the ambient noise in all spaces as prescribed in paragraphs 7.2.2.1 and 7.2.2.2 of the International Life-Saving Appliances (LSA) Code.
- 18.1.3.6.10 The PA system must be arranged into the following selectable broadcast groups. These groups must include the speakers referenced in section 18.1.3.13.6
- Group 1: Cabin Group
 - Group 2: General and Recreation Group
 - Group 3: Outdoor Deck Group
 - Group 4: Engineering Work Group
 - Group 5: Loudhailers
 - Group 6: All Call - No Cabins (Excludes Cabin Group)
 - Group 7: Emergency All Call Group (All Groups)
- 18.1.3.6.11 The PA System must include PA Master Stations:
- The PA Master stations must have a handheld microphone
 - The PA Master stations may have a button expansion panel
 - The PA Master stations must include a dedicated selection push-button for each of the PA broadcast groups listed above.
- 18.1.3.6.12 The PA system must broadcast PA messages to the broadcast zone(s) corresponding to the selected push-button(s).
- 18.1.3.6.13 The PA system must mute local speakers during a PA announcement initiated from a PA Master Station in the Wheelhouse and/or MCR.

- 18.1.3.6.14 The PA system must have a system management web interface that is accessible from a web browser or software running on a PC.
- 18.1.3.6.15 The PA system must have the broadcast groups listed above selectable via the telephone and intercom system.
- 18.1.3.6.16 The Telephone Exchange System must be configurable to broadcast to the PA system broadcast zones.
- 18.1.3.6.17 Any General Alarm (GA) or PA visual indicator must not be affected by the muting of an audible alarm during a PA announcement.
- 18.1.3.6.18 External Mute Requirements
- The PA system must include a discrete signal to mute a Sound Signal Reception System (SSRS) during any outdoor zone PA announcements or alarm. The mute function must be deactivated as soon as the PA announcement or alarm have concluded.
 - The PA system must include a discrete signal to mute an IPTV system during any PA announcement or alarms. The mute function must be deactivated as soon as the PA announcement or alarm have concluded.
- 18.1.3.6.19 General Alarm (GA) Requirements
- The PA system must include a discrete output to mute the existing external GA system during PA announcements. It must be deactivated as soon as the PA announcement has concluded.
 - The PA system must include a discrete input to broadcast the GA through the PA loudspeakers when activated from the existing external GA system.
- 18.1.3.6.20 Fire Alarm (FA) Requirements
- The PA system must include a discrete output to mute an external FA system during PA announcements. It must be deactivated as soon as the PA announcement has concluded.
 - The PA system must include a discrete input to broadcast the FA when activated from the Fire Detection System.

18.1.3.7 PA Speakers Requirements

18.1.3.7.1 The speakers included within the PA system must have at the minimum, an Ingress Protection rating as indicated below:

- 44 or better for IP Ceiling Loudspeaker for Wheelhouse and MCR
- 44 or better for Ceiling Loudspeaker, for cabins and common areas
- 55 or better for Ceiling Loudspeaker for Wet/Humid areas
- 66 or better for Horn type loudspeaker for machinery space areas
- 66 or better Horn type loudspeaker for outside space areas
- 66 or better Loudhailers for wheelhouse top area
- 67 or better for the end-of-line transponder fitted in speaker lines

18.1.3.7.2 The speakers included within the system must support 100 V line audio input except for the IP Ceiling speakers.

18.1.3.7.3 The two (2) Loudhailers must be activated by a dedicated push button on the wheelhouse PA Master Station and on the Wheelhouse Telephone Direct Access Key (DAK) keypads.

18.1.3.7.4 The speaker lines must be fitted with an end-of-line transponder that indicates, on the system controller, if there is a fault on the line.

18.1.3.8 Telephone and Intercom System Requirements:

18.1.3.8.1 The Telephone System must be type approved as part of the SICS.

18.1.3.8.2 The Telephone System must be an Internet Protocol based system.

18.1.3.8.3 The Telephone System must provide operator-free dialling and communication for incoming and outgoing calls between all internal telephone stations.

18.1.3.8.4 Each telephone must be able to dial all other telephones or intercom stations on board, access analog trunks and onboard communication systems such as satellite phone, if so programmed.

18.1.3.8.5 The Telephone System must have the following features:

- Caller ID
- Call forwarding
- Forward on busy
- Call Pick-Up
- Call Park
- 3-way conferencing
- Wake up system
- Programmable from Web Interface or software running on a PC
- Remote Diagnostics/Maintenance

18.1.3.8.6 The Telephone System must have the ability to have calls that would normally ring in the wheelhouse, also ring in the ship's passageways upon activation of push-button at the wheelhouse IP master station (commonly known as "night bells").

18.1.3.8.7 The Telephone System must interface to the PA system through an IP interface.

18.1.3.8.8 All telephones and intercoms must be able to be part of any PA zones/groups and must broadcast PA announcements as such.

18.1.3.8.9 All telephone stations must be able to activate the PA system via the telephone and intercom system through live (non-recorded) messages for emergency messaging, if so programmed.

18.1.3.8.10 All telephone stations must be able to activate the PA system via the telephone and intercom system through pre-recorded messages to reduce the amount of feedback, if so programmed.

18.1.3.8.11 The specifically programmed telephone station must be able to select which broadcast zones will broadcast the PA announcement (live and pre-recorded) created from the telephone station.

18.1.3.8.12 The telephone system must include one (1) analog telephone line for connection in the Commanding Officer's Dayroom. It will be used for an owner-supplied telephone. The cable must be terminated into an RJ11 wall mounted box.

18.1.3.9 Telephone System requirement - Cellular VoIP Gateway

18.1.3.9.1 The Telephone System must include four (4) cellular gateways. Each gateway must:

- use VoIP technology and interface with the PBX through a CAT6a network cable.
- be approved for use in Canada by Industry Canada.
- support 4G/LTE Technology.
- Be installed by the Contractor in the SICS Cabinet A.

18.1.3.9.2 All four (4) gateways must interface to a single outdoor antenna through the use of a combiner/splitter located in the SICS Cabinet A.

18.1.3.9.3 The Contractor must remove and discard the existing cellular antenna.

18.1.3.9.4 The Contractor must supply and install a Surecall SC-588W (**CSM**) in the same location as the previously removed antenna.

18.1.3.9.5 The Contractor must supply and replace the above-mentioned antenna coaxial cable with a Times Microwave LMR-400-UF-FR.

18.1.3.10 Telephone System requirement – External Communication interfaces

18.1.3.10.1 The Telephone System must interface to the vessel's satellite communications systems:

System	Type of interfaces
Thales VesseLINK 700	Three (3) VoIP Lines. SIP protocol.
Sailor SC4000	One (1) Analog telephone line

18.1.3.10.2 The Telephone System must be able to interface with the new four (4) vessel's cellular gateways.

18.1.3.10.3 The Telephone System must be configurable to limit external communication lines' access to specifically programmed telephone stations.

- 18.1.3.10.4 The Telephone System must have a call routing feature allowing the system to route external incoming calls to a specific telephone station or to an auto attendant.
- 18.1.3.10.5 The Telephone System must have an auto-attendant function that must:
- Allow the user to record a voice message for each auto attendant. from a specifically programmed phone.
 - Allow the user to change the recorded voice message from a specifically programmed phone.
 - Provide the incoming caller with the ability to select specific stations throughout the vessel.
- 18.1.3.10.6 For IP Intercom stations fitted with a visual indicator, the indicator must be turned on when a call is awaiting an answer.
- 18.1.3.10.7 For IP Intercom stations fitted with a visual indicator, the indicator which is turned on as a result of an incoming call, must be turned off when the call is answered, or the call is terminated.
- 18.1.3.11 IP Telephone and Intercom stations Requirements
- 18.1.3.11.1 The telephone system must include the following type of telephone which must meet the requirements identified herein in this section.
- IP Master Station
 - IP Desktop telephone
 - IP Intercom for Outdoor location
 - IP Intercom for machinery spaces
 - IP Intercom Explosion Proof
- 18.1.3.11.2 All telephones must have a built-in speaker that is approved as part of the PA system
- 18.1.3.11.3 All telephones and intercoms must be powered via Power Over Ethernet (POE)

18.1.3.11.4 The IP Master Station must be surface mountable (console) and include:

- a full dial pad;
- a marine handset retainer;
- hands-free communication capability;
- handset; and
- at a minimum, thirty (30) speed dial push buttons or soft keys.

18.1.3.11.5 The IP Desktop Telephone must be desk mountable, and include:

- a full-dial pad;
- a handset;
- marine handset retainer;
- hands-free communication capability; and
- at a minimum, ten (10) speed dial push buttons or soft keys.

18.1.3.11.6 The IP Intercom for outside locations must be of a bulkhead mountable, rugged type station with a minimum Ingress Protection rating of 66, and include:

- a built-in interface for a headset and handset;
- hands-free communication capability; and
- at a minimum, one (1) speed dial push buttons or soft keys.

18.1.3.11.7 The IP Intercom for machinery spaces must be of a bulkhead mountable, rugged type station with a minimum Ingress protection rating of 66, and include:

- have a built-in interface for a headset and handset;
- have a built-in relay for an external visual indicator activation;
- have hands-free communication capability; and
- at a minimum, one (1) speed dial push buttons or soft keys.

18.1.3.11.8 The IP Intercom Explosion proof must be of rugged type station with a minimum Ingress Protection rating of 66, and include:

- It must have at a minimum, an Ingress Protection rating of IP66;
- It must be a rugged type of station;
- have a built-in interface for a headset;
- have a built-in relay for an external visual indicator activation;
- have hands-free communication capability;
- at a minimum, one (1) speed dial push button or soft key; and
- certification for installation in an ATEX Zone 1 environment.

18.1.3.11.9 The visual indicator (or signalling beacon) for the IP Intercom stations must be blue and:

- have, at a minimum, an Ingress Protection rating of IP66;
- be able to use the existing 120Vac 60 Hz power feeds;
- be of the strobe light type (not rotating light type).

18.1.3.11.10 The headset for the IP Intercom stations must:

- be an Over-the-Head type of headset;
- have a Push-to-Talk device;
- be able to interface with the IP Intercom station for outdoor locations and Machinery Spaces;
- provide ear protection; and
- include a cable with a minimum length of 10 metres.

18.1.3.12 Digital Enhanced Cordless Telecommunications (DECT) Telephone System Requirements

18.1.3.12.1 An IP-based DECT Telephone System must be provided for operation throughout the vessel.

18.1.3.12.2 Any DECT equipment must be approved for use in Canada by Industry Canada.

18.1.3.12.3 The DECT system must be part of the telephone and intercom system (PBX).

18.1.3.12.4 The DECT system must support a configuration where multiple base units are installed across the vessel to enhance the coverage.

18.1.3.12.5 The base units must interface with the Telephone System through a Cat6A Network cable.

18.1.3.12.6 The base units must be Powered Over Ethernet (POE).

18.1.3.12.7 Portable telephones must have their unique telephone extension number.

18.1.3.12.8 Portable telephones must not broadcast PA announcements or any

18.1.3.12.9 The system must consist of:

- One (1) DECT base unit in each of the locations below:

Deck/Room	Details
Wheelhouse	Escaliers
Boat Deck	Staircase
Upper Deck	Center of Starboard passage way
Main Deck	Passage way in front of the Mess
Lower Deck	In front of the MCR entrance
Tank Top	Main Generator Room

- Twelve (12) DECT portable telephones with single chargers for installation on the vessel. Locations are TBD with the TA at the time of the work.

18.1.3.13 Installation of Public Address Speakers

- 18.1.3.13.1 The Contractor must supply and install PA speakers as per the type and location identified in sections 18.1.3.13.6. The system must be configured and installed such that the speakers are part of the broadcast groups as indicated in sections 18.1.3.13.6. Most speakers must be mounted in the space vacated by the old speakers.

Note: If the manufacturer recommends speaker installations above and beyond the listed speakers, the recommended speakers must be added to the installation with PSC 1379 Work arising procedures.

18.1.3.13.2 The Contractor must follow all recommendations for mounting all the speakers by the manufacturer and must meet the applicable classification society's guidelines. Exact placement locations are to be predetermined by the manufacturer on the equipment location layout on the ship's general arrangement drawing.

18.1.3.13.3 The Contractor must supply and install all required mounting plates and brackets to mount the speakers.

18.1.3.13.4 In the case where a new ceiling speaker is smaller than the removed one, the Contractor must supply and install an adapter plate, colour matched to the deckhead panels.

Note: It may be possible to reuse deckhead panels from the wheelhouse. They will be replaced as part of Specification 11.7 – Wheelhouse Windows maintenance and insulation works.

18.1.3.13.5 In the case where a space vacated by an old speaker is not reused with a new speaker, the Contractor must supply and install a cover plate, colour matched to the deckhead panels.

Note: It may be possible to reuse deckhead panels from the wheelhouse. They will be replaced as part of Specification Work item 11.7 – Wheelhouse Windows maintenance and insulation works.

18.1.3.13.6 The PA speakers are listed below with following types, quantities and location for each deck.

Wheelhouse Top

Quantity	Type of speaker	Location
2	100W Loudhailer	PS and SB Searchlight location
2	15W Horn Loudspeaker	PS and SB of the AC Room (Outside)
1	15W Horn Loudspeaker	FWD Bulkhead of the AC Room

Bridge Deck

Quantity	Type of speaker	Location
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4	IP Ceiling Speaker	1x PS of wheelhouse 2x SB of wheelhouse 1 x Top of stairwell
1	Wet/Humid Area Speaker	Wheelhouse bathroom

Officers Deck

Quantity	Type of speaker	Location
2	10W Ceiling speaker	1x Passageway 1x Staircase
3	Wet/Humid Area Speaker	3x Bathroom
6	6W Ceiling Speaker	4x in Cabins/Bedrooms 2x in Dayrooms/Offices
3	15W Horn Loudspeaker	1x PS outer deck FR94 1x SB outer deck FR94 1x Aft Facing side on the engine casing FR65 CL

Boat Deck

Quantity	Type of speaker	Location
13	6W Ceiling Speaker	4x Passageway 1x Staircase 2x in Officer's lounge (305) 2x in Electronics Room (308) 1x in Data treatment Room (312) 1x in Derrick Control Room (302) 1x in Officials Dayroom (300) 1x in Officials Bedroom (304)
3	Wet/Humid Area Speaker	2x Bathrooms 1x Laundry Room (303)
2	15W EX Proof Horn speaker	1x Helicopter Hangar (319) 1x Fire Equipment Room (318)
2	15W Horn Loudspeaker	2x AC Unit Room (328)
1	15W Horn Loudspeaker	1x Emergency Generator Room (317)
1	15W Horn Loudspeaker	1x Compressor Room (316)

Quantity	Type of speaker	Location
4	15W Horn Loudspeaker	1x PS Stairwell FR30 1x SB Stairwell FR30 1x PS Walkway FR60 1x SB Walkway FR60

Upper Deck/Forecastle Deck

Quantity	Type of speaker	Location
1	6W Ceiling Speaker	Officer's Pantry (201)
2	6W Ceiling Speaker	Officers Messroom (202)
1	6W Ceiling Speaker	Data Acquisition Room (203)
1	6W Ceiling Speaker	Quarter Master Station PS (204)
2	6W Ceiling Speaker	1x Aft Stairwell (outdoor) 2x Fwd Stairwell (indoor)
8	6W Ceiling Speaker	Indoor Passageways (3 on each side, 1 AFT and 1 FWD).
6	15W Horn Loudspeaker	3x SB walkway outer deck 3x PS walkway outer deck
2	15W Horn Loudspeaker	Aft Mooring station
3	15W Horn Loudspeaker	FWD Mooring Station (1x PS, 1x SB and 1x Center)
11	Wet/Humid Area Speaker	11x Bathrooms
1	6W Ceiling Speaker	Sickbay (244)
1	6W Ceiling Speaker	Logistic Officer Office (224)
2	6W Ceiling Speaker	Ship's Office (218)
1	6W Ceiling Speaker	Engineer's Office (226)
1	6W Ceiling Speaker	Gymnasium (232)
2	15W Horn Loudspeaker	Engine Casing (249)
17	6W Ceiling Speaker	In Cabins/Dayrooms/Bedrooms
1	6W Ceiling Speaker	Photocopier Room (225)

Main Deck

Quantity	Type of speaker	Location
2	6W Ceiling Speaker	PS Stairwell (inside) SB Stairwell (inside)
3	Wet/Humid Area Speaker	Galley (113)
2	6W Ceiling Speaker	Crew's Messroom (1123)
1	6W Ceiling Speaker	Dry Provision Store (116)
1	Wet/Humid Area Speaker	Potato Room (109)
1	Wet/Humid Area Speaker	Cool Room (110)
1	Wet/Humid Area Speaker	Fruits & Vegetables Room (111)
1	Wet/Humid Area Speaker	Refrigerated Spaces (108)
1	6W Ceiling Speaker	Main Deck Accommodation (106)
1	6W Ceiling Speaker	Canteen (161)
2	6W Ceiling Speaker	Crew's Lounge (154)
8	6W Ceiling Speaker	Indoor Passageways (3 on each side, 1 AFT and 1 FWD.
2	15W Horn Loudspeaker	Engine Casing (167)
1	15W Horn Loudspeaker	Incinerator Flat (125)
1	15W Horn Loudspeaker	Bosun & Rope Store (166)
2	15W Horn Loudspeaker	Steering Gear Compartment (151)
1	15W Horn Loudspeaker	Stores handling Room (141)
1	15W Horn Loudspeaker	General Stores & Clothing (158)
2	15W Horn Loudspeaker	Bosun & Rope Store (100)
2	15W Horn Loudspeaker	Winch Power Room (101)
1	15W Horn Loudspeaker	CO2 & FM200 Compartment (102)
1	15W EX Proof Horn speaker	Paint Locker (103)
10	Wet/Humid Area Speaker	1x Laundry Room (143) 8x Bathrooms 1x Public Washroom (127)
1	6W Ceiling Speaker	Linen Locker (136)
15	6W Ceiling Speaker	Cabins
2	15W Horn Loudspeaker	FWD Deck (FWD PS and FWD SB)
2	15W EX Proof Horn speaker	FWD Deck (Aft PS and Aft SB)

Lower Deck

Quantity	Type of speaker	Location
1	6W Ceiling Speaker	Central Store (57) above the desk
1	15W Horn Loudspeaker	Central Store (57) PS bulkhead
2	IP Ceiling Speaker	Machinery Control Room (52)
1	15W Horn Loudspeaker	Electrician's Workshop (53)
1	15W Horn Loudspeaker	Engineer's Workshop (51)
2	15W Horn Loudspeaker	Cargo Hold
2	15W Horn Loudspeaker	Winch Compartment
1	15W Horn Loudspeaker	Bow Thruster Compartment (3)
2	15W Horn Loudspeaker	Transformer Room
4	15W Horn Loudspeaker	E.R Flats area
2	15W Horn Loudspeaker	Propulsion Motor Room
1	15W Horn Loudspeaker	Lobby area
1	15W Horn Loudspeaker	Hot Water Tank Compartment (54)
1	15W Horn Loudspeaker	Senior Engineer's Store (56)

Tank Top

Quantity	Type of speaker	Location
4	15W Horn Loudspeaker	Main Generator Room
1	15W Horn Loudspeaker	Purifier Room
2	15W Horn Loudspeaker	Cycloconverter Room
2	15W Horn Loudspeaker	Propulsion Motor Room
2	15W Horn Loudspeaker	Sewage Compartment Area

18.1.3.14 Installation of PA Master Stations

18.1.3.14.1 The PA Master Stations must have a button expansion panel and a handheld microphone.

18.1.3.14.2 The PA Master Stations must include a dedicated button for each of the PA broadcast groups.

- 18.1.3.14.3 The Contractor must supply and install two (2) new PA Master Stations, mounted within the space vacated by the old stations, in the Wheelhouse. They must be flush mounted in adapter plates matching the fit and finish of the consoles.
- 18.1.3.14.4 The Contractor must supply and install one (1) new PA Master Station in the MCR. It must be flush mounted in a location TBD by the TA.
- 18.1.3.15 Installation of Telephone and Intercom Equipment:
- 18.1.3.15.1 The Contractor must supply and install all new telephone and intercom stations as indicated in the document *M017-MLM23-012 Telephones and Intercom Stations Requirements* and as per the manufacturer drawings.
- 18.1.3.15.2 Each telephone and intercom station must be configured with the extension number as indicated in the document *M017-MLM23-012 Telephones and Intercom Stations Requirements*.
- 18.1.3.15.3 Each telephone and intercom station must be configured as part of a ringing group as indicated in the document *M017-MLM23-012 Telephones and Intercom Stations Requirements*, if applicable.
- 18.1.3.15.4 Each telephone and intercom stations must be fitted with the ancillary equipment as indicated in the document *M017-MLM23-012 Telephones and Intercom Stations Requirements*, if applicable, such as Direct Access Key (DAK) panel, handset, headset, ruggedized handset and/or strobe light.
- 18.1.3.15.5 The Contractor must mount the new telephones and intercom stations in the space vacated by the old telephones and talkback stations.
- 18.1.3.15.6 The Contractor must remove and discard the old telephones and talkback station foundations.
- 18.1.3.15.7 The Contractor must supply the material, fabricate and install the new mounting support, bracket and foundation for all new telephones and intercom stations.
- 18.1.3.15.8 The Contractor must follow all manufacturer's recommendations for mounting of all the telephones and intercom stations and must meet the applicable classification society's guidelines.
-

18.1.3.16 Telephone's Visual Indicator

18.1.3.16.1 The Contractor must supply and install new blue strobe lights at the locations identified in the document *M017-MLM23-012 Telephones and Intercom Stations Requirements*.

18.1.3.16.2 The Contractor must interface the strobe lights with the relay output of the associated IP Intercom station for Machinery Spaces.

18.1.3.16.3 The Contractor must reuse the following circuits for the strobe lights:

Circuit	Provides power to
EL-104-1	Emergency Generator Room Strobe Lights
EL-101-9	Steering Compartment Strobe Lights
EL-101-1	Lower Deck and Tank Top Strobe lights

18.1.3.16.4 The Contractor must supply and install new cabling from each circuit breaker to the end device.

18.1.3.16.5 For circuit EL-101-1, the Contractor must supply and install new marine metal junction boxes with fused terminal blocks for each output.

18.1.3.17 Electrical

18.1.3.17.1 The Contractor must reuse the existing Emergency Bus 120 VAC source to feed the new SICS system. The Contractor must determine, with assistance from the TA, three additional 120 VAC power sources for the new SICS system. A total of four (4) 120 VAC feeds are required for the new system: Two (2) Emergency 120 VAC feeds and two (2) Main 120 VAC feeds, one of each to the new system/cabinets.

18.1.3.17.2 The Contractor must supply and install four (4) new 120 VAC AC breakers that are required for the new SICS system with the applicable ratings as indicated by the manufacturer and wire sizes. These breakers must be suitable and fit the existing power panels.

18.1.3.17.3 The Contractor must relabel and update all modified electrical supply feeds on electrical panels within this specification. The related documentation must be updated and submitted to the TA.

18.1.3.17.4 The Contractor must supply, install, and terminate a new relay for the General Alarm System for connection of the SICS system to this panel for muting and unmuting functions of the General alarm during a PA announcement.

18.1.3.18 Cabling

18.1.3.18.1 The Contractor must supply and install all cables associated with the new SICS that are required by the manufacturer. All cables must be Type Approved, suitable for marine application and acceptable for installation on board vessels by Transport Canada.

18.1.3.18.2 The Contractor must follow the cable labelling scheme provided by the manufacturer. AC power sources must be labelled with the applicable power panel along with the circuit number.

18.1.3.18.3 For the purpose of bidding, the Contractor must include the price for the supply and installation of approximately 10,000 metres of Bergen BC-10-021 DNV GL Maritime LAN S/FTP CAT6a cable (Category 6A Shipboard Marine Type Approved) according to the manufacturer's recommendations for the connection of IP telephones and IP intercom stations, and other devices and accessories as detailed in the manufacturer's reference drawings.

The Contractor must also include unit price per meter for supply and installation of this cable. The final amount must be adjusted, up or down, based on the actual length of cable by means of PSPC 1379 process.

18.1.3.18.4 For the purpose of bidding, the Contractor must include the price for the supply and installation of 5000 metres of marine Type Approved 1x2x0.75mm² shielded twisted pair cabling for the system to be installed.

The Contractor must also include unit price per meter for supply and installation of this cable. The final amount must be adjusted, up or down, based on the actual length of cable by means of PSPC 1379 process.

18.1.3.18.5 For the purpose of bidding, the Contractor must include the price for the supply and installation of approximately 300 metres of marine Type Approved 6x2x0.75mm² screened cables for the connection between junction boxes and equipment cabinets for the Loop A and Loop B PA Systems, as detailed in the SICS OEM's documentation package.

The Contractor must also include unit price per meter for supply and installation of this cable. The final amount must be adjusted, up or down, based on the actual length of cable by means of PSPC 1379 process.

18.1.3.18.6 The Contractor must supply and install the recommended cabling by the SICS OEM to interface the following systems to the SICS system:

- Cellular Telephone Terminals #1, 2,3 and 4.
- Satellite Telephone Terminal #1 (Sailor SC4000 Phone)
- Satellite Telephone Terminal #2 (VesseLink Satellite Phone)
- Ship's Alarm Monitoring System
- General Alarm System
- Fire Detection System

18.1.3.18.7 For the purpose of bidding, the Contractor must include the price for the supply and installation of approximately 200 metres of marine Type Approved 10AWG/3C cable for the purpose of connecting the four (4) 120 VAC power sources to each equipment cabinet.

The Contractor must also include unit price per meter for supply and installation of this cable. The final amount must be adjusted, up or down, based on the actual length of cable by means of PSPC 1379 process.

18.1.3.18.8 For the IP desk telephones, the Contractor must supply and install seventy-five (75) RJ45 wall boxes (Bergen Cabling BC-12-253) and patch cables for each telephone installed in cabins and offices on the vessel.

18.1.3.19 Cable Terminations

- 18.1.3.19.1 The Contractor must complete the wiring terminations for all cables.
- 18.1.3.19.2 Any wires terminating into a terminal block or terminal strip must be terminated using crimped ferrules.
- 18.1.3.19.3 CAT6a cables must not be terminated with a male connector, except for the pre-moulded patch cords. All field cables must be terminated with a Bergen Cabling jack connector.
- 18.1.3.19.4 All CAT6a cables must be terminated using the wiring code T-568B.
- 18.1.3.19.5 All CAT6a cables must be terminated following Bergen Cabling (OEM) instructions.
- 18.1.3.19.6 All CAT6a cables must be tested after termination using a Fluke DSX 5000 Cable Analyzer (or equivalent) to generate a report with a unique Cable Identifier for all CAT6a Cabling. This report must include the test results for the following parameters as the minimum: Wire Map, Cable Length, Propagation Delay, Resistance, Insertion Loss, Return Loss, and Cross Talk.

An electronic copy of the reports must be provided to the TA within 15 days of completing the tests.

NOTE: The Contractor must provide the TA with the opportunity to review the test reports for all CAT6a cables.

- 18.1.3.19.7 A cable that has been installed by the Contractor that is found defective (fails the above-mentioned test) or damaged must be replaced and fixed by the Contractor at their expense (material and labour) before commissioning.

18.1.3.20 Locations

Throughout the vessel.

18.1.3.21 Interferences

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

18.1.4 Proof of Performance

18.1.4.1 Inspection Points

18.1.4.1.1 All work may be subject to witness by the TA or delegate.

18.1.4.1.2 HOLD POINT 1: The Contractor must provide the TA or delegate the bill of materials for the SICS including manufacturer and model numbers prior to purchase, for review and verification of requirements.

18.1.4.1.3 HOLD POINT 2: The Contractor must allow the TA or delegate the opportunity to inspect the installation of the SICS prior to the power up / energizing of the equipment.

18.1.4.1.4 HOLD POINT 3: The Contractor must provide the TA with the opportunity to review the test reports for all CAT6a cables.

18.1.4.1.5 HOLD POINT 4: The Contractor must allow the TA or delegate to witness the system commissioning performed by the manufacturer's FSR and the Contractor

18.1.4.2 Testing / Trials

18.1.4.2.1 The Contractor must provide the TA with 5 days' notice of completion of all hardware and cabling specified herein to allow for the coordination of an Installation Check (IC), testing, and commissioning activities. The Contractor shall not energize any system before the completion of these activities.

18.1.4.2.2 Canada will perform an Installation Check (IC) of all Work specified herein to ensure conformity with this specification. The Contractor is responsible for any necessary corrections.

- 18.1.4.2.3 The Contractor must undertake to rectify defects and deficiencies in the Contractor's installation or repair work, as soon as practicable. The Contractor is responsible to schedule such repairs at its own risk and cost.
- 18.1.4.2.4 The Contractor must reschedule unsatisfactory inspections after the required repairs have been completed.
- 18.1.4.2.5 Testing must be completed on the system to confirm that all system aspects are in accordance with the requirements of ABS and Transport Canada to ensure a class approved installation. A report on all testing and findings shall be submitted to CCG prior to the acceptance of this Specification Work Item. The TA and ABS must sign the test report prior to the acceptance of this Specification Work item.
- 18.1.4.2.6 The FSR must submit a test agenda to Canada for approval at least four (4) weeks prior to conducting the final testing on the system.
- 18.1.4.3 Commissioning
- 18.1.4.3.1 All commissioning and final set to work test activities related to the affected system(s) must be conducted by the FSR.
- 18.1.4.3.2 Final programming of the system must be carried out by the FSR at time of commissioning.

18.1.5 Deliverables

- 18.1.5.1 Documentation
- 18.1.5.1.1 The Contractor must supply one (1) electronic copy of the testing report to the TA for the tests conducted in paragraph 18.1.3.19.6 within 15 days of completing the test.
- 18.1.5.1.2 The Contractor must supply (two (2) copies – one (1) unprotected electronic and one (1) hard copy of the commissioning and testing report to the TA signed and dated by the attending FSR. This report must include all the tests performed during the commissioning with their short description, applicable parameters, as well as the result and values collected during each test.

18.1.5.1.3 The Contractor must ensure that all operation, maintenance, and installation manuals supplied with the new equipment are submitted to the TA prior to the acceptance of this item.

18.1.5.1.4 Prior to installation, the Contractor must provide the complete documentation package that is designed and developed by the manufacturer for installation. Canada and ABS must review and approve the document prior to the installation by the Contractor. This must include, at minimum, the following:

Document	File format(s) required
Datasheets for all equipment	PDF
Operator manual for all equipment	PDF
Service manual for all equipment	PDF
Equipment dimensional drawings	PDF and AutoCAD
PA System Single line block diagrams with cable identification (ID) and cable type indication	PDF and AutoCAD
Telephone System single line block diagrams with cable ID and cable type indication	PDF and AutoCAD
PA System Connection and terminal drawings	PDF and AutoCAD
Telephone System Connection and terminal drawings	PDF and AutoCAD
SICS Equipment location on the General Arrangement Drawings (overlay)	PDF and AutoCAD
SICS Cabinet(s) Internal wiring diagram	PDF and AutoCAD
SICS Cabinet (s) Dimensional drawing with theoretical weight	PDF and AutoCAD

18.1.5.1.5 The Contractor must provide an as-built drawing package. At a minimum, this package must include separate drawings/documents as listed below:

Document	File format(s) required
PA System Single line block diagrams with cable identification (ID) and cable type indication	PDF and AutoCAD
Telephone System single line block diagrams with cable ID and cable type indication	PDF and AutoCAD

Document	File format(s) required
PA System Connection and terminal drawings	PDF and AutoCAD
Telephone System Connection and terminal drawings	PDF and AutoCAD
SICS Equipment location on the General Arrangement Drawings (overlay)	PDF and AutoCAD
SICS Cabinet(s) Internal wiring diagram	PDF and AutoCAD
SICS Cabinet (s) Dimensional drawing with actual weight	PDF and AutoCAD
Vessel Telephone Directory	Microsoft Excel
Programming/Configuration file	USB Memory Drive

18.1.5.1.6 The Contractor must provide one (1) copy of the vessel Telephone Directory per telephone station. It must be printed and laminated in 10 mil laminating pouches.

18.1.5.1.7 The Contractor must provide an itemized list with equipment for all replaceable items to the TA. This is required for CCG to be able to enter all items into the Asset Management System. The list must include the following information

- Manufacturer
- Part number
- Serial Number

18.1.5.2 Certification

18.1.5.2.1 All original Class approval certificates for the system components must be submitted to CCG prior to acceptance of this item.

18.1.5.3 Spares

18.1.5.3.1 The Contractor must supply the following spare equipment.

- Four (4) Ceiling Loudspeaker
- One (1) IP Ceiling Loudspeaker

- One (1) Loudhailer
- Four (4) Horn Loudspeaker for Machinery Space
- Four (4) Horn Loudspeaker for Outside Space
- Two (2) Horn Loudspeaker, Explosion proof
- Four (4) IP Telephone
- Four (4) IP Intercom for Machinery spaces
- Four (4) IP Intercom for Outside spaces
- One (1) IP Master Station complete (Telephone)
- One (1) Headset for IP Intercom
- One (1) Handset for IP Intercom
- One (1) Strobe Light for IP Intercom
- One (1) PA Master Station complete

18.1.5.3.2 The Contractor must submit the manufacturer's recommended spare parts list that CCG should keep in warehouse to the TA.

18.1.5.4 Training

18.1.5.4.1 The Contractor shall provide two (2) training courses each of four (4) hours duration, to be held onboard the vessel, after the final installation and commissioning of all the new system components. This training shall be provided to the ship's personnel involved in the operation of the system (both crew groups). The training must be provided by the manufacturer's technical representative (FSR). Training must encompass the items outlined in the operating instructions as supplied by the manufacturer.

18.2 GYROCOMPASS SYSTEM REPLACEMENT

18.2.1 Identification

18.2.1.1 The objective of this item is to remove the existing gyrocompass system and replace it with a new Government Supplied Materiel.

18.2.1.2 This specification must be coordinated with the following related specification work items:

- 11.7 – Wheelhouse Windows maintenance and insulation works
- 18.5 – Simplified Voyage Data Recorder (SVDR) Installation

18.2.2 References

18.2.2.1 Documents

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

Drawing/Document No. Revision / Date	Title / Description
108-H-23_25	Martha L. Black General Arrangement – 3 sheets
M017-MLM23-001 (Rev A)	Navigat 2100Gyrocompass Removal Drawing
LM601-230-IN (Rev MLM)	Gyrocompass Drawing
056372/J3	Sperry Marine Navigat 3500 Compass Net Installation Manual

18.2.2.2 Regulations and Standards

All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the

vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section

Standards & Regulations Revision / Date	Title / Description
Publications	
FSM 7.B.3	CCG Fleet Safety Manual, Entry into Confined Spaces
FSM 7.B.4	CCG Fleet Safety Manual, Hot work
FSM 7.B.5	CCG Fleet Safety Manual, Lock-out / Tag-Out
70-000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment

18.2.2.3 Equipment Data

18.2.2.3.1 Government Supplied Materiel (GSM)

Note: These makes and models are provided as an indication only. Equivalent equipment may be provided by Canada, pending the Canada procurement process.

Description	Manufacturer	Part No.	Quantity
Gyrocompass Sensor	Sperry Marine	Navigat 3500 (73525)	2
Mounting Tray	Sperry Marine	44863	2
24VDC, 3 metres, cable	Sperry Marine	44861	2
RS422, 3 metres cable	Sperry Marine	44862	2
Data Distribution Unit (DDU)	Sperry Marine	74907	1
Converter and Amplifier Board (CAU) for installation inside DDU	Sperry Marine	25826	2

Description	Manufacturer	Part No.	Quantity
Control and Display Unit	Sperry Marine	Navitwin V (74902)	1
Bearing Repeater	Sperry Marine	74880	4
Terminal Box	Sperry Marine	74859	4
Bearing Repeater on stand 1300 mm	Sperry Marine	74911	1
Bulkhead Steering Repeater	Sperry Marine	74883	1
Azimuth Device	Sperry Marine	75135	4

18.2.2.3.2 Contractor Supplied Materiel (CSM)

The Contractor must supply and install all materials, equipment and parts, such as those listed below, as well as any other which are required to perform the specified Work – unless clearly stated otherwise.

Description	Purpose	Part No.	Quantity
Marine connection box with a hinged cover and required fused terminal blocks, ground terminal blocks and hardware. All terminal blocks must handle a wire conductor size of 2.5 mm ² .	For main and back-up power connections.	TBD	2
Marine connection box with a hinged cover and required fused terminal blocks, ground terminal blocks and hardware. All terminal blocks must handle a wire conductor size of 2.5 mm ² .	For connection of existing port and starboard wings Digital repeaters	TBD	2
Type Approved Power supply 120Vac Input, 24Vdc Output, 20A Output power- DIN Rail Mount	For main and back-up power.	TBD	2

18.2.3 Technical Description

18.2.3.1 Services by Field Service Representatives

The Contractor must obtain the services of an FSR trained and certified by the Gyrocompass equipment manufacturer (TBD) to conduct the commissioning, final set to work activities and training related to the Gyrocompass installation. The Contractor must include an allowance of \$20,000.00 to cover the cost of services to be provided by the FSR. The \$20,000.00 allowance must form part of the overall bid and must be adjusted up or down by means of PSPC 1379 process upon receipt of the final FSR invoice supported by copies of all related documentation and invoices to verify actual expenses.

Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses.

18.2.3.2 Equipment Retainment

The Contractor must retain the following existing equipment:

- The Steering Repeater located at the helm position
- The Digital Repeater located at the helm position
- The Digital Repeaters located at the Port and Starboard wing stations
- The pigtail cable attached to each of the above-mentioned repeaters



Figure 18.2-1: Existing helm position repeaters to retain



Figure 18.2-2: Existing Digital Repeater to retain

18.2.3.3 Cable and Equipment Removal

- 18.2.3.3.1 The Contractor must remove cables in accordance with drawing M017-MLM23-001.

18.2.3.3.2 The Contractor must remove the existing equipment listed in the table below and IAW drawing M017-MLM23-001.

Note: The Contractor must provide the TA with the opportunity to verify that the equipment has been removed IAW this specification.

Pictures are provided in Figure 18.2-3 to Figure 18.2-6.

Equipment	Location
Gyrocompass Sensor (Qty 2) Sperry Navigat 2100	Electronic Equipment Room Gyrocompass Wall
Distribution Unit (Step) Anschutz	Electronic Equipment Room Gyrocompass Wall
Sperry Booster (Step)	Electronic Equipment Room Gyrocompass Wall
Interface and Power Supply Unit (Qty 2) Sperry Marine	Electronic Equipment Room Gyrocompass Wall
Switch Over Unit	Electronic Equipment Room Gyrocompass Wall
Navigat 2100 Control and Display Unit (Qty 2)	Electronic Equipment Room Gyrocompass Wall
NMEA Splitter Actisense NBF-3	Electronic Equipment Room Gyrocompass Wall
Power Supply N163S	Electronic Equipment Room Gyrocompass Wall
Heading Management Control and Display Unit	Wheelhouse Chart table
Terminal Strip	Wheelhouse

Sollicitation No. - N° de l'invitation

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

F7049-210340/A

041MD

Client Ref. No. - N° de réf. du client

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

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Equipment	Location
	Inside Chart table behind the display
Gyro Repeater	Steering Gear Compartment
Bearing Repeater Note: Leave gimbal and rail in place.	Wheelhouse Port side on rail
Bearing Repeater Note: Leave gimbal and rail in place.	Wheelhouse Starboard side on rail
Bearing Repeater Note: Leave gimbal and rail in place.	Wheelhouse Stbd Side of Helmsperson
Bearing Repeater with Stand	Top of wheelhouse

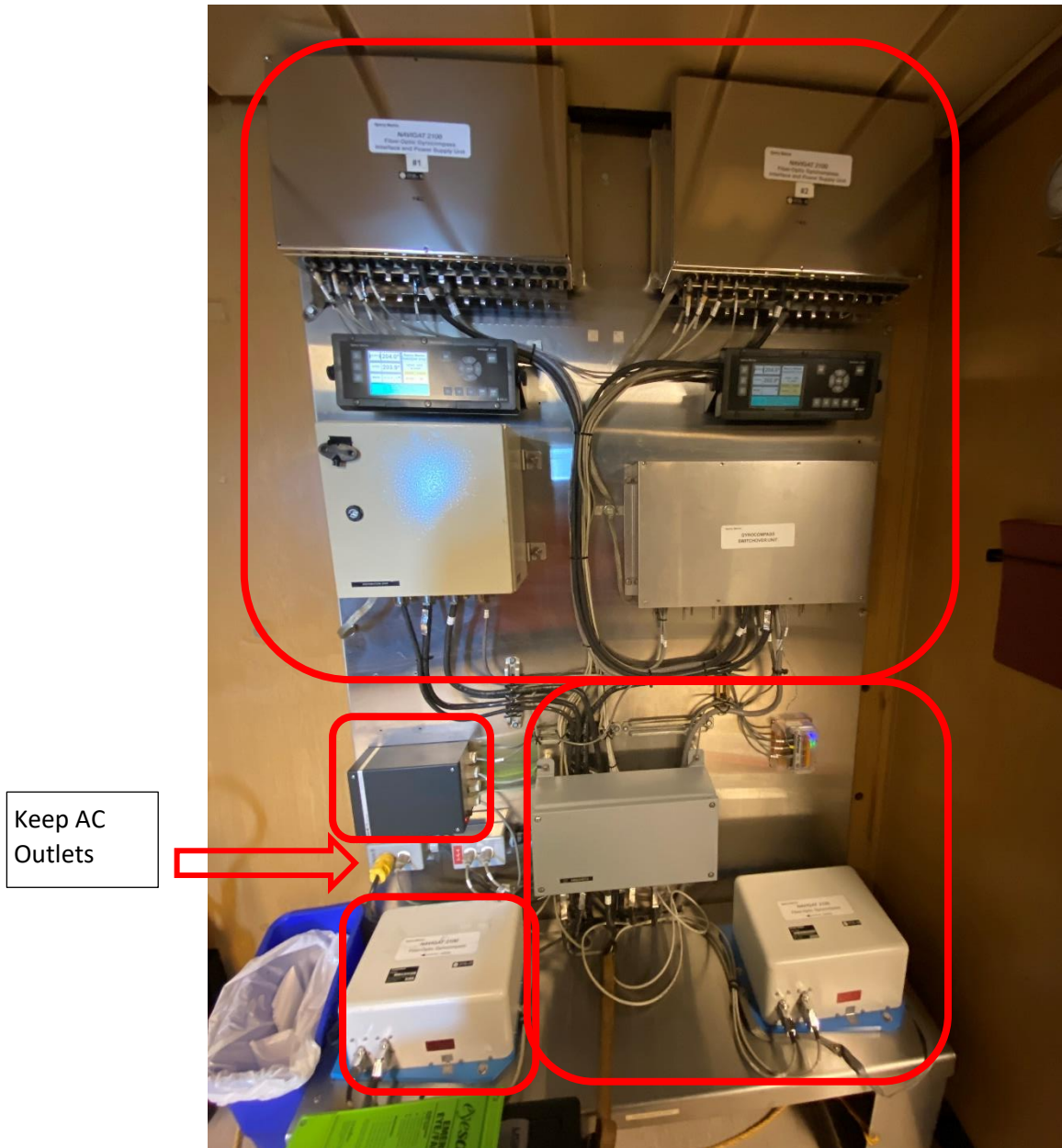


Figure 18.2-3: Gyrocompass wall in Electronics Equipment Room

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Buyer ID - Id de l'acheteur

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Figure 18.2-4: Heading Management CDU (chart table)

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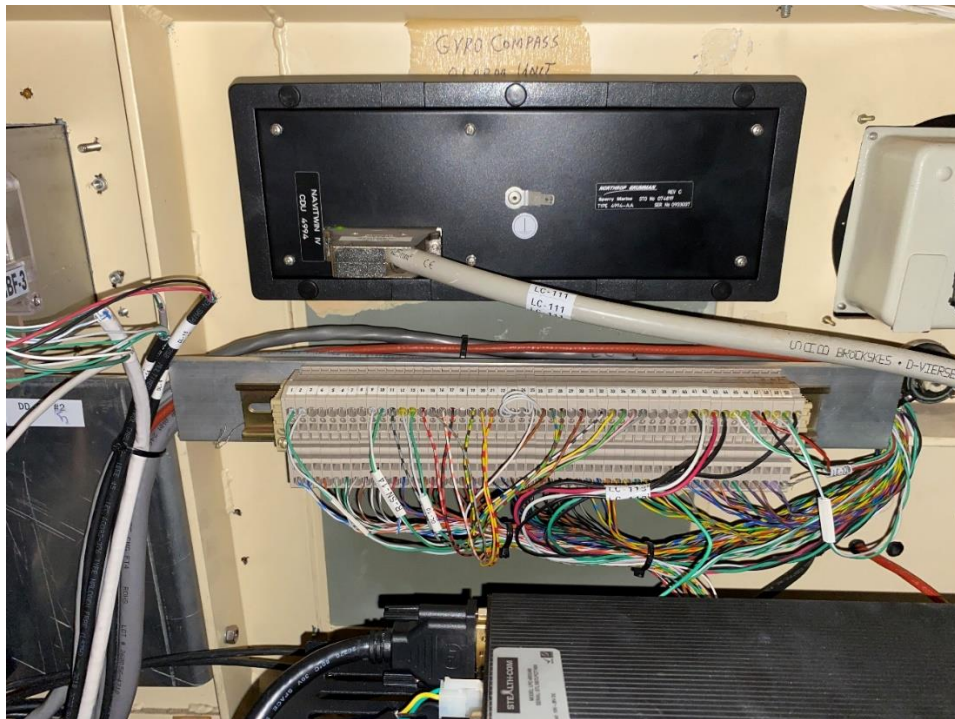


Figure 18.2-5: Gyro terminal strip inside chart table



Figure 18.2-6: Bearing repeater on stand (Top of wheelhouse)

18.2.3.4 Bearing Repeater Rail and Gimbal mount Refurbishment

- 18.2.3.4.1 The Contractor must remove the existing bearing repeater bracket units and gimbals, from the port wing and starboard wing repeaters.
- 18.2.3.4.2 The Contractor must sandblast and refinish the parts with a powder coating (Colour TBD). Refer to the pictures below.
- 18.2.3.4.3 The Contractor must remove the existing bearing repeater bracket units, gimbals, and sliding rail from the repeater on the starboard side of the helmsperson.
- 18.2.3.4.4 The Contractor must sandblast and refinish the parts with a powder coating (Colour TBD). Refer to the pictures below.
- 18.2.3.4.5 The Contractor must reinstall these refinished bracket units, gimbals and sliding rail using new stainless steel mounting hardware that is of the same size as the existing. Refer to Figure 18.2-7 to Figure 18.2-9.
- 18.2.3.4.6 The Contractor must supply and install three (3) new cover plates (**CSM**) on the existing bearing repeater terminal boxes on the bracket units. (The old terminal boxes had a switch and a control knob on the plate.) They must be finished with a powder coating (Colour TBD). Refer to Figure 18.2-7, below.



Figure 18.2-7: Cover plate to be replaced

Note: The Contractor must provide the TA with the opportunity to verify that the rail, gimbal mounts and brackets have been refurbished IAW this specification.

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Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

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041MD

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File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

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Figure 18.2-8: Bearing repeater on sliding rail (Fwd centre)



Figure 18.2-9: Bearing Repeater on sliding rail (Stbd side)

18.2.3.5 Power Supply Mounting Boxes

- 18.2.3.5.1 The Contractor must supply and install two (2) marine connection boxes (**CSM**) with a hinged cover. In each box, the Contractor must supply and install twelve (12) fused terminal blocks and six (6) ground terminal blocks that can handle a wire conductor size of 2.5 mm² and provide the necessary materials required to mount the terminal blocks within the connection box.
- 18.2.3.5.2 The Contractor must supply and mount one (1) power supply (**CSM**) inside each mounting box.
- 18.2.3.5.3 The mounting boxes must be installed on the gyrocompass mounting plate (bulkhead) in the Electronics Equipment Room IAW drawing LM601-230-IN Revision MLM.

18.2.3.6 Core Equipment Installation

18.2.3.6.1 Gyrocompass Sensor #1 Navigat 3500(Sperry Marine 73525) **(GSM)**

- The mounting tray (P/N 44863) is included with the sensor.
- The Contractor must install the sensor on the gyrocompass stand in the electronics room.
- The unit must be grounded on the mounting plate.

18.2.3.6.2 Gyrocompass Sensor #2 Navigat 3500(Sperry Marine 73525) **(GSM)**

- The mounting tray (P/N 44863) is included with the sensor.
- The Contractor must install the sensor on the gyrocompass stand in the electronics room.
- The unit must be grounded on the mounting plate.

18.2.3.6.3 Data Distribution Unit (DDU), (Sperry Marine 74907) **(GSM)**

- The Contractor must install the unit on the gyrocompass mounting plate in the EER.
- Inside the DDU, the Contractor must install two (2) Converter and Amplifier Unit (CAU) board (Sperry Marine 25826) **(GSM)**.
- The unit must be grounded on the mounting plate.

18.2.3.6.4 Control and Display Unit (Sperry Marine 74902) **(GSM)**

- The Contractor must install the display unit on the chart table.
- Location is the same as the old control unit.
- Adapter plate (if required) must be supplied by the Contractor and must be colour matched to the console using a powder coat finish.

18.2.3.7 Wheelhouse Existing Repeater

18.2.3.7.1 The Contractor must supply and install one (1) Connection box **(CSM)** for each existing Port and Starboard wing Digital repeater.

18.2.3.7.2 In each box, the Contractor must supply and install twelve (4) terminal blocks **(CSM)** and one (1) ground terminal blocks **(CSM)** that can handle a wire conductor size of 2.5 mm² and provide the necessary materials required to mount the terminal blocks within the connection box.

18.2.3.8 Top of wheelhouse bearing repeater Installation

18.2.3.8.1 The Contractor must supply and install one (1) cable penetration **(CSM)** inside the stand. The cable penetration must be of one (1) inch NPT kick pipe type with a suitable marine-approved cable gland.

18.2.3.8.2 Bearing Repeater stand (Sperry Marine 74911) **(GSM)**

- The Contractor must install the bearing repeater stand on top of the wheelhouse
- The Contractor must supply and install four (4) mounting studs in accordance with OEM documentation.

18.2.3.8.3 Bearing Repeater (Sperry Marine 74880) **(GSM)**

- The Contractor must mount the repeater inside the stand.
- The Contractor must connect the repeater pigtail inside the junction box.

18.2.3.9 Wheelhouse Bearing repeater

18.2.3.9.1 Qty 3 of Terminal Box (Sperry Marine 74859) **(GSM)**

The Contractor must install one (1) terminal box below each repeater sliding rail.

18.2.3.9.2 Qty 3 of Bearing Repeater (Sperry Marine 74880) **(GSM)**

- The Contractor must install one (1) repeater in each existing sliding rail gimbal mount.

- The attached pigtails must be connected in the terminal boxes on the gimbal mount. The existing spiral cable must be connected to the new Terminal box Sperry Marine 74859.

18.2.3.10 Steering gear Steering Repeater

18.2.3.10.1 Terminal Box (Sperry Marine 74859) **(GSM)**

The Contractor must install a terminal box in the proximity of the repeater

18.2.3.10.2 Wall Mounting Bracket (Sperry Marine 26857) **(GSM)**

- The Contractor must install the wall mounting bracket
- If required, the Contractor must supply and install a new bulkhead foundation and mounting plate **(CSM)**. It must be primed and painted in accordance with the referenced paint specification.

18.2.3.10.3 Bulkhead Steering Repeater (74883) **(GSM)**

The Contractor must install the repeater in its wall mounting bracket.



Figure 18.2-10: Existing repeater in Steering gear compartment

18.2.3.11 Cable Installation

- 18.2.3.11.1 The Contractor must supply and install the new cables (**CSM**) IAW drawing LM601-230-IN Revision MLM.
- 18.2.3.11.2 A CAT6a cable that has been installed by the Contractor that is found defective (fails the test mentioned in 18.2.3.12.3) or damaged must be replaced and fixed by the Contractor at their expense (material and labour) before commissioning.
- 18.2.3.11.3 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 defective

(fails continuity test) or damaged must be replaced by the Contractor at their expense (material and labour).

18.2.3.12 Wiring Terminations

18.2.3.12.1 The Contractor must complete the wiring terminations for all cables.

- Refer to LM601-230-IN Revision MLM for terminations details.
- Any wire terminating into a terminal block or terminal strip must be terminated using crimped ferrules.

18.2.3.12.2 All CAT6a cables identified in the drawing must be terminated by:

- using the wiring code T-568B.
- following Bergen Cabling (OEM) instructions.

18.2.3.12.3 All CAT6a cables must be tested after termination using a Fluke DSX 5000 Cable Analyzer (or equivalent) to generate a report with a unique Cable Identifier for all CAT6a Cabling. This report must include the test results for the following parameters as the minimum: Wire Map, Cable Length, Propagation Delay, Resistance, Insertion Loss, Return Loss, and Cross Talk.

An electronic copy of the reports must be provided to the TA within 15 calendar days after the test is performed.

18.2.3.12.4 CAT6a cables must not be terminated with a male connector, except for the pre-moulded patch cords. All field cables must be terminated with a jack connector.

18.2.3.13 Locations

Throughout the following Areas on the vessel: Wheelhouse, Electronic Equipment Room, Top of Wheelhouse, and Steering Gear Compartment.

18.2.3.14 Interferences

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

18.2.4 Proof of Performance

18.2.4.1 Inspection Points

18.2.4.1.1 HOLD POINT 1: The Contractor must provide the TA with the opportunity to verify that the equipment has been removed IAW this specification. The contractor must identify this hold point in the ITP, and project schedule, and provide at least one day notice for CCG personnel to coordinate this verification task.

18.2.4.1.2 HOLD POINT 2: The Contractor must provide the TA with the opportunity to verify that the rails have been refurbished IAW this specification. The contractor must identify this hold point in the ITP, and project schedule, and provide at least one day notice for CCG personnel to coordinate this verification task.

18.2.4.2 Testing / Trials

18.2.4.2.1 The Contractor must provide the TA with 5 days notice of completion of all hardware and cabling specified herein in order to allow for the coordination of an Installation Check (IC), testing, and commissioning activities. The Contractor shall not energize any system before the completion of these activities.

18.2.4.2.2 Canada will perform an Installation Check (IC) of all work specified herein to ensure conformity with this specification. The Contractor is responsible for any necessary corrections.

18.2.4.2.3 The Contractor must undertake to rectify defects and deficiencies in the Contractor's installation or repair work, as soon as practicable. The Contractor is responsible to schedule such repairs at its own risk and cost.

18.2.4.2.4 The Contractor must reschedule unsatisfactory inspections after the required repairs have been completed.

18.2.4.2.5 The FSR must demonstrate that the operator does not have the ability to change the gyro sensor selection when the autopilot is engaged.

18.2.4.2.6 The FSR must demonstrate that the gyrocompass system is providing heading information to the following system:

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System/Equipment	Receives Heading information (Pass/Fail)
Autopilot	
Simplified Voyage Data Recorder (S-VDR)	
Bearing Repeater Port Wing	
Bearing Repeater Starboard Wing	
Bearing Repeater Forward	
Bearing Repeater Top of Wheelhouse	
Port Wing Digital Repeater	
Starboard Wing Digital Repeater	
Helm Digital Repeater	
Helm Steering Repeater	
Steering Compartment Repeater	
Telesat	
Satellite Television	
NMEA Splitter 1	
NMEA Splitter 2	
Radar S-Band	
Radar X-Band	
Radar X-Band (AFT)	
AVOS	
VHF Direction Finder	
DGPS 1	
DGPS 2	
AIS	

System/Equipment	Receives Heading information (Pass/Fail)
ECDIS	
ECS-1	
ECS-2	
Port Server	

18.2.4.3 Commissioning

18.2.4.3.1 All commissioning and final set to work test activities related to the affected system(s) must be conducted by the FSR.

18.2.5 Deliverables

18.2.5.1 Documentation

18.2.5.1.1 The Contractor must supply final Redline as Fitted drawings, in accordance with the Documentation section of the General Notes, for the following drawings:

Drawing Number & Revision	Drawing Title
LM601-230-IN (Rev MLM)	Gyrocompass Drawing

18.2.5.1.2 The Contractor must provide Canada with any OEM documentation such as operator manual, technical manual, maintenance manual, service manual, guides, MSDS, etc.

18.2.5.1.3 The Contractor must supply (two (2) copies – one (1) unprotected electronic and one (1) hard copy) of the commissioning and testing report to the TA signed and dated by the attending FSR. This report must include all the tests performed during the commissioning with their short description, applicable parameters, as well as the result and values collected during each test.

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18.2.5.2 Certification

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

18.2.5.3 Training

18.2.5.3.1 The FSR must provide one (1) training course of eight (8) hours duration to be held onboard after the final installation and commissioning of the gyrocompass system. The training shall be provided to the ship's personnel involved in the operation of the system. The training must encompass the items outlined in the operator manual as supplied by the manufacturer.

18.3 ANNUAL COMMUNICATIONS EQUIPMENT INSPECTION

18.3.1 Identification

- 18.3.1.1 The Contractor must perform the annual GMDSS A4 inspection of all listed shipboard communications instruments, including the Emergency Position Indicating Radio Beacon (EPIRB) and the Automatic Identification System (AIS), in accordance with the Transport Canada (TC) Ship Radio Inspection (SRI) Program and ABS Rules for Survey After Construction.
- 18.3.1.2 The contractor must provide the services of a well-trained Technical Service Representative (TSR), well-trained marine electrical and electronics specialist certified by ABS to perform the required annual radio inspection. The TSR must supply all the specialty tools and parts, where required, to carry out the scope of work in this Specification item.
- 18.3.1.3 For bidding purposes, the bid must include an allowance of \$3000 to cover the cost of services to be provided by the TSR. The \$3000 allowance must form part of the overall bid and must be adjusted, up or down, by PSPC 1379 process upon receipt of the final invoice from the FSR supported by copies of all related documentation to verify actual expenses.

Reasonable cost of travel and living expenses, where applicable, must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses

18.3.2 References

- 18.3.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
QUE0336453, Aug 11, 2022	Mackay Service Report

18.3.2.2 Regulations and standards

All materials and work must meet ABS and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in order of priority, to the work performed in this section.

Standards & Regulations – Revision / Date	Title / Description
ABS Rules	Survey After Construction-2021 Sections 1.1.7 & 1.1.8
SOR/2020-216	Navigation Safety Regulations

18.3.2.3 Equipment Data

RADIO EQUIPMENT				
Equipment	Manufacturer	Model	Serial number	Location
VHF 1	SAILOR	6222	1621810372	CHART TABLE
VHF DSC 1	INTEGRATED			
VHF 2	SAILOR	6222	1621810312	CHART TABLE
VHF DSC 2	INTEGRATED			
VHF 3	SAILOR	6222	1639750325	CHART TABLE
VHF DSC 3	INTEGRATED			
MF/HF 1 (250W) MF/HF DSC (250W)	SAILOR	6301	81065541	GMDSS CONSOLE

RADIO EQUIPMENT				
Equipment	Manufacturer	Model	Serial number	Location
MF/HF terminal (250W)	SAILOR	6006	1218350195	GMDSS CONSOLE
MF/HF (500W) MF/HF (500W)	SAILOR	6301	91068157	GMDSS CONSOLE
MF/HF terminal (500W)	SAILOR	6006	1185810071	GMDSS CONSOLE
INMARSAT-C 1	SAILOR	6006	1187300199	GMDSS CONSOLE
NAVTEX	SAILOR	6004	3016140048	GMDSS CONSOLE
VHF PORTATIF 1	SAILOR	SP 3520	0798440625	Batt. : 2028-05-01
VHF PORTATIF 2	SAILOR	SP 3520	0888760235	Batt. : 2028-05-01
VHF PORTATIF 3	SAILOR	SP 3520	0540040343	Batt. : 2028-05-01
SART 1	JOTRON	SART20	12102	Batt. : 2026-08-01
SART 2	JOTRON	SART20	12092	Batt. : 2026-08-01
RADAR 1	FURUNO			X-BAND 25Kw
RADAR 2	FURUNO			S-BAND 30Kw
RADAR 3	FURUNO			X-BAND 12Kw
WEATHER FAX	JRC	JAX-9A	GF36881	DESK
AIS	SAAB	R5		CHART TABLE
EPIRB				
Manufacturer	Model	Battery date	Release unit	

RADIO EQUIPMENT				
Equipment	Manufacturer	Model	Serial number	Location
SAILOR	SE406-II	2025-02-01	Manufacturer	Expiry date
HEX IDENTIFICATION NUMBER		A78D451FF800331	HAMMAR	2023-06-01

18.3.3 **Technical Description**

- 18.3.3.1 The Contractor must contact the ABS inspector to obtain an inspection number prior to commencing the work.
- 18.3.3.2 The FSR must be Transport Canada approved for the inspection and certification of all listed equipment in this SOW and must have access to all applicable standards, forms and other documentation.
- 18.3.3.3 All work performed by the TSR must be compliant with the SRI Program, the Navigation Safety Regulations (NSR) and ABS Rules for Survey After Construction.
- 18.3.3.4 The FSR must perform the annual Global Maritime Distress and Safety System (GMDSS) A4 radio inspection of all listed equipment in compliance with ABS Rules for Survey After Construction sections 1.1.7 and 1.1.8 and Transport Canada requirements for the Great Lakes Basin and the Coasts of Canada valid in the VHF, MF and MFHF coverage areas. The Radio inspection must include the annual inspection of the EPIRB.
- 18.3.3.5 The TSR must perform the annual AIS Inspection in compliance with ABS Rules for Survey After Construction sections 1.1.7 and 1.1.8 and Transport Canada requirements.

18.3.4 **Proof of performance**

18.3.4.1 Inspections

All inspection requirements must be established and validated by the ABS surveyor.

18.3.4.2 Tests

The Contractor must provide ABS Surveyor and CCG IA the opportunity to witness a fully functional test of all communications equipment identified for inspection.

18.3.5 Deliverables

18.3.5.1 Documentation

18.3.5.1.1 The Contractor must supply (two (2) copies – one (1) unprotected electronic and one (1) hard copy) of the commissioning and testing report to the TA, signed and dated by the attending TSR. This report must include all the tests performed during the commissioning with their short description, applicable parameters, as well as the result and values collected during each test.

18.3.5.1.2 Prior to the close of the contract, the Contractor must submit to CCG a detailed inspection report, in approved ABS format, for the certification of all identified communications equipment. The report must be provided in both hard copy and soft copy.

18.3.5.2 Certification

18.3.5.2.1 Prior to the start of all work, the Contractor must submit to CCG, the valid certification of the FSR, from Transport Canada, for being qualified to perform this work.

18.3.5.2.2 Up on completion of this annual survey, the Contractor must submit to CCG, a certificate that all required survey has been performed as per ABS Regulations.

18.4 CAT6A NETWORK

18.4.1 Identification

- 18.4.1.1 The objective of this item is to remove the Fiber-Optic cabling infrastructure and replace it with new Type approved CAT6a network cable throughout the vessel.
- 18.4.1.2 The Network equipment and cabling must be relocated to Rack #3. Rack #3 is currently occupied by the Telephone System. The telephone system must be relocated to a new SICS Cabinet as part of specification work item 18.1 – Shipboard Integrated Communications System (SICS) Replacement.
- 18.4.1.3 This specification work item must be coordinated with the following related specification work items:
- 18.1 – Shipboard Integrated Communications System (SICS) Replacement
 - 18.6 – Closed Circuit Television System (CCTS) Replacement
 - 18.7 – TV Distribution
- 18.4.1.4 Rack #1 is located in the Data Treatment Room (room 312) and currently holds the IT Equipment.
- 18.4.1.5 Rack #2 is located in the Data Treatment Room and currently holds the Fiber-Optic termination panels. The Contractor must remove it and return it to Canada.
- 18.4.1.6 Rack #3 is located in the Electronic Equipment Room, room #308 (EER), and holds the Telephone System. It must be removed, discarded and replaced by the Contactor with a new rack (**GSM**).
- 18.4.1.7 Racks #4, 5, and 6 are located in the EER and hold various electronic equipment.

18.4.2 References

- 18.4.2.1.1 Drawings and Documents

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

Drawing/Document No. Revision / Date	Title / Description
108-H-23_25	Martha L. Black General Arrangement – 3 Sheets
M017-MLM23-003 (Rev A)	Electronic Equipment Room - Racks Layout Modification Drawing
M017-MLM23-005 (Rev A)	Fibre Optic Removal Drawing
LM601-670-BD (Rev MLM)	Network Distribution System Block Diagram
M017-MLM23-011	New CAT6a Cables list and patch panel terminations details

18.4.2.2 Regulations and Standards

All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section.

Standards & Regulations Revision / Date	Title / Description
FSM 7.B.3	CCG Fleet Safety Manual, Entry into Confined Spaces

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Standards & Regulations Revision / Date	Title / Description
FSM 7.B.4	CCG Fleet Safety Manual, Hot work
FSM 7.B.5	CCG Fleet Safety Manual, Lock-out / Tag-Out
ANSI/TIA-568	Commercial Building Telecommunications Cabling Standard
70-000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment

18.4.2.3 Equipment Data

18.4.2.3.1 Government Supplied Materiel (GSM)

Quantity	Part Number	Description
1	JL074A	HPE Aruba 48 Ports Main Network Switch
2	JL087A	HPE Aruba 1050W 54Vdc Power supply Note: Premounted in Main Network switch by Canada.
3	R8N85A	HPE Aruba 48 Ports Distribution Network Switch
2	R8N87A	HPE Aruba 24 Ports Distribution Switch
6	J9583B	HPE Aruba Universal 4-post Rack Mount kit (1 per switch)
1	MRK-4036	Middle Atlantic Rack 40U

18.4.2.3.2 The Contractor Supplied Materiel (CSM)

The Contractor must supply and install all materials, equipment and parts, such as those listed below, as well as any other which are required to perform the specified Work – unless clearly stated otherwise.

Quantity	Part Number	Description
11	BC-13-204	Bergen Cabling 24 Ports Patch panel, Black with CAT6a jack connectors
100	BC-12-253	Bergen Cabling Outlet 1x RJ45 STP CAT6a Angled Keystone with wall box
25	BC-12-254	Bergen Cabling Outlet 2x RJ45 STP CAT6a Angled Keystone with wall box
25	BC-12-212	Bergen Cabling Outlet 1xSTP CAT6a DIN, Keystone
10	BC-12-021	Bergen Cabling Maritime Housing IP67 with 1x CAT6a
Sufficient quantity	BC-10-021	DNV GL Approved, Bergen Cabling Maritime LAN CAT6a cable with SHF1 sheath (Indoor)
Sufficient quantity	BC-10-025	DNV GL Approved, Bergen Cabling Maritime LAN S/FTP CAT6a stranded cable (Outdoor)
2	TBD	8U Wall cabinets with 19 inches internal frame, and a minimum usable depth of 22 inches
Sufficient quantity	Various	Bergen Cabling – CAT6a Factory moulded Male-Male Patch cord

18.4.3 Technical Description

18.4.3.1 Equipment and Cabling Removal

Note: The steps identified in section 18.4.3.1 must be executed in the specified order below.

18.4.3.1.1 As per specification item 18.1, the Contractor must remove all telephone system components from Rack #3 and have it fully emptied before starting any of the related work as specified hereinafter.

18.4.3.1.2 The Contractor must remove and discard Rack #3.

18.4.3.1.3 The Contractor must modify the Rack #3 foundation to allow mounting the new Middle Atlantic Rack (**GSM**) in that location.

18.4.3.1.4 The Contractor must install the new Middle Atlantic Rack (**GSM**) on the newly modified foundation (rack #3 location).

- 18.4.3.1.5 The Contractor must, supply and install temporary network cables (minimum CAT5e) from Rack #3 in EER to: Chief Engineer Office, Senior Engineer Office, and the Engineer's Office. The Contractor must remove and discard these cables upon completion of this specification work item.
- 18.4.3.1.6 Canada will remove the Network Equipment (Servers, firewall, storage array, switches and UPS) from Rack #1 in the Data Treatment Room.
- 18.4.3.1.7 Canada will reinstall these Network Equipment (Servers, Firewall, Storage Array, Switches and UPS) in the newly installed Rack #3.
- 18.4.3.1.8 The Contractor must remove the existing cabling and equipment IAW drawing M017-MLM23-005.
- 18.4.3.1.9 The Contractor must remove Rack #1 and Rack #2 along with their foundations from the Data Treatment Room (312). This work includes at a minimum:
- Ensuring the deck is smooth and levelled after removing the foundation.
 - Replacing the flooring section affected by the removal of the cabinets. The result must be seamless.



Figure 18.4-1: Existing Rack #1 (IT) and Rack #2 (Fiber Optic) to be removed

18.4.3.2 EER (room #308) Network Cabinet – IT Equipment

18.4.3.2.1 The Contractor must install one (1) new 48 ports Main Network Switch (**GSM**) in the Network Cabinet in the EER IAW drawing M017-MLM23-003.

18.4.3.2.2 The Contractor must install one (1) new 48 ports Distribution Network Switch (**GSM**) in the Network Cabinet in the EER IAW drawing M017-MLM23-003.

18.4.3.2.3 The Contractor must install four (4) Bergen Cabling 24 ports Network Patch panels (**CSM**) in the Network Cabinet in the EER IAW drawing M017-MLM23-003.

18.4.3.2.4 The Contractor must supply and install a fixed shelf (**CSM**) in the Network cabinet.

18.4.3.2.5 The Contractor must supply and install ten (10) Bergen Cabling DIN Rail Network Outlet (BC-12-212) **(CSM)** on the fixed shelf.

18.4.3.3 Photocopier Room (room #225) Network Cabinet Installation

18.4.3.3.1 The Contractor must supply and install an 8U cabinet **(CSM)** in the Photocopier Room; please see Figure 18.4-2. The cabinet must be installed on the joiner panel above the photocopier and must be grounded. If required, a foundation must be supplied, welded and painted by the Contractor.

18.4.3.3.2 The Contractor must supply and install three (3) Bergen Cabling 24 ports Network Patch panels **(CSM)** in the cabinet. They must be grounded inside the cabinet.

18.4.3.3.3 The Contractor must install one (1) 48 ports Network switch **(GSM)** in the cabinet.

18.4.3.3.4 The Contractor must install one (1) 24 ports Network switch **(GSM)** in the cabinet.

18.4.3.3.5 The Contractor must work with the TA to define a 120Vac circuit breaker that will feed the cabinet. The Contractor must supply and install the power cable from the breaker and a dual AC outlet **(CSM)** in the cabinet.

18.4.3.4 Canteen (room #161) Network Cabinet Installation

18.4.3.4.1 The Contractor must supply and install an 8U cabinet **(CSM)** in the canteen. It must be installed on the joiner panel and be grounded. If required, a foundation must be supplied, welded and painted by the Contractor. The location is represented by the red rectangle in the Figure 18.4-3.

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Figure 18.4-2: Location of new cabinet in the Photocopier Room (225)

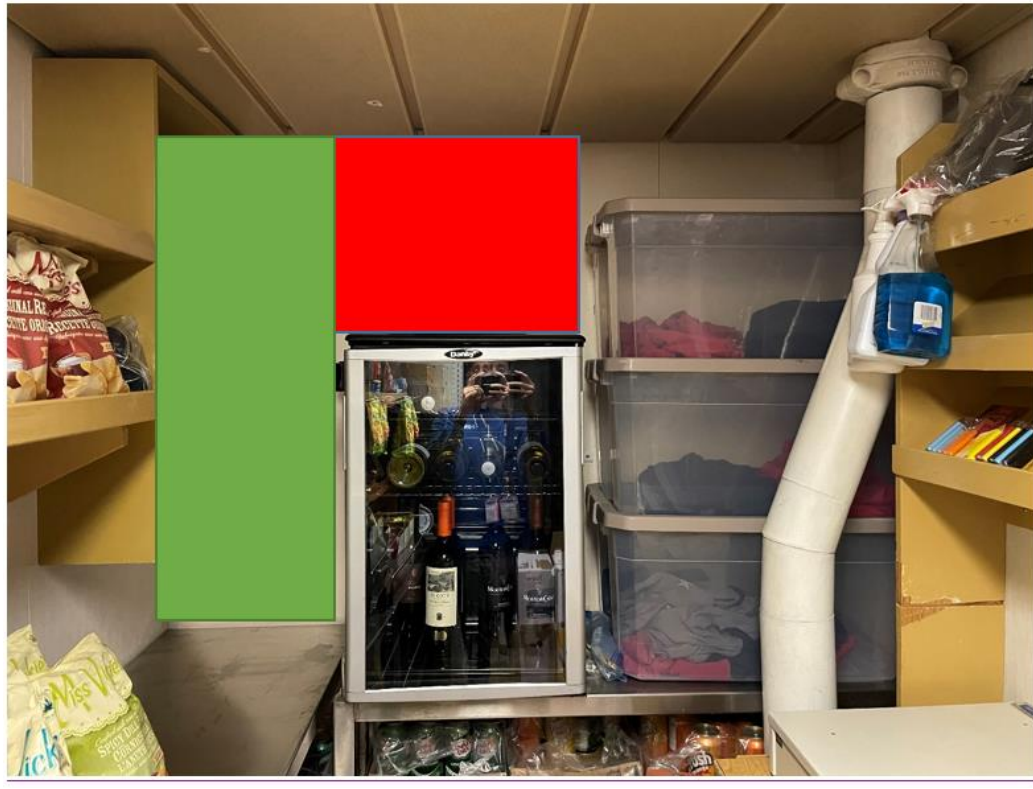


Figure 18.4-3: Location for new cabinet in red and new shelves in Green.

- 18.4.3.4.2 The Contractor must supply and install two (2) Bergen Cabling 24 ports Network Patch panels (**CSM**) in the cabinet. They must be grounded inside the cabinet.
- 18.4.3.4.3 The Contractor must install one (1) 48 ports Network switch (**GSM**) in the cabinet
- 18.4.3.4.4 The Contractor must work with the TA to define a 120Vac circuit breaker that will feed the cabinet. The Contractor must supply and install the power cable from the breaker and a dual AC outlet (**CSM**) in the cabinet.
- 18.4.3.4.5 The Contractor must remove the existing shelves module on starboard side of the mini fridge.

- 18.4.3.4.6 The Contractor must fabricate and install a new shelves unit on the aft bulkhead, next to the mini-fridge and new cabinet. It must be of full height, i.e., from the counter to the ceiling. The location is represented by the green rectangle on the Figure 18.4-3.
- 18.4.3.5 Control Room (room #52) Network Switch Installation
- 18.4.3.5.1 The Contractor must install one (1) new 24 ports Network Switch (**GSM**) in the Control Room.
- 18.4.3.5.2 The Contractor must supply and install one (1) Bergen Cabling 24 ports Network Patch panel (**CSM**) in the Control Room.
- 18.4.3.6 Network Outlet Installation
- 18.4.3.6.1 The Contractor must supply and install one (1) DIN Rail Network Outlet (BC-12-212) (**CSM**) in each of the locations identified as such on drawing LM601-670-BD Rev MLM – with the following requirements:
- Each outlet must be labelled with the cable identifier.
 - The incoming cable must be terminated using the supplied CAT6a jack connector (supplied with the outlet).
- 18.4.3.6.2 The Contractor must supply and install one (1) Single Network outlet Wall box (BC-12-253) (**CSM**) in each of the locations identified as such on drawing LM601-670-BD Rev MLM – with the following requirements:
- It must be installed on the joiner panel.
 - In the case of a single outlet, the second hole must be blanked with the supplied blanking plate.
 - Each outlet must be labelled with the cable identifier.
 - The incoming cables must be terminated using the supplied CAT6a jack connector (supplied with the wall box).
 - In the case of the IPTV Single Outlet, they must be mounted behind the television.
-

18.4.3.6.3 The Contractor must supply and install one (1) Dual Network outlet Wall box (BC-12-254) **(CSM)** in each of the locations identified as such on drawing LM601-670-BD Rev MLM – with the following requirements:

- It must be installed on the joiner panel.
- Each outlet must be labelled with the cable identifier.
- The incoming cables must be terminated using the supplied CAT6a jack connector (supplied with the wall box).



BC DIN outlet with Cat.6A Connector



Dust cap and side cover



BC DIN Outlet with Dust cap and side cover

Figure 18.4-4: DIN Rail Network Outlet

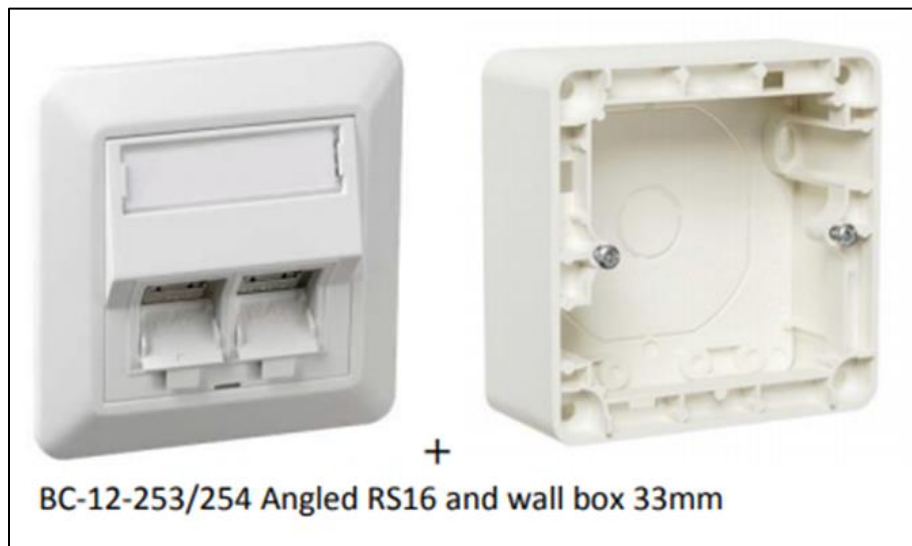


Figure 18.4-5: Single and Dual Network Outlet Wall Box

18.4.3.6.4 The Contractor must supply and install one (1) Single IP67 Network outlet Wall box (BC-12-021) **(CSM)** in each of the locations identified as such on drawing LM601-670-BD Rev MLM – with the following requirements:

- For the Science containers, it must be installed in the Science Container Connection Box.
- For the Helicopter Hangar, it must be installed on the bulkhead at a location agreed upon with the on-site TA.
- Each outlet must be labelled with the cable identifier using a stainless-steel engraved tag.
- The incoming cables must be terminated using the supplied CAT6a jack connector (supplied with the wall box).

18.4.3.7 Cable Installation

18.4.3.7.1 The Contractor must supply and install all the cables **(CSM)** identified in drawing LM601-670-BD Rev MLM. More details can also be found in document 18.4 – M017 MLM2023 – New Cables list and Patch panel terminations detail.

- 18.4.3.7.2 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 defective (fail continuity test) or damaged must be replaced by the Contractor at their expense (material and labour).
- 18.4.3.7.3 A CAT6a cable that has been installed by the Contractor that is found defective (fails the test mentioned in 18.4.3.8.4) or damaged must be replaced and fixed by the Contractor at their expense (material and labour) before commissioning.
- 18.4.3.8 Wiring Terminations
- 18.4.3.8.1 The Contractor must complete the wiring terminations for all cables.
- Refer to *LM601-670-BD Rev MLM* for terminations details.
 - Refer to *18.4 – M017 MLM2023 – New Cables list and Patch panel terminations detail* for more details.
 - Any wire terminating into a terminal block or terminal strip must be terminated using crimped ferrules.
- 18.4.3.8.2 All CAT6a cables must be terminated by:
- Using the wiring code T-568B.
 - Following Bergen Cabling (OEM) instructions.
 - Using a Bergen Cabling Jack Connector
- 18.4.3.8.3 CAT6a cables must not be terminated with a male connector, except for the pre-moulded patch cords.
- 18.4.3.8.4 All CAT6a cables must be tested after termination using a Fluke DSX 5000 Cable Analyzer (or equivalent) to generate a report with a unique Cable Identifier for all CAT6a Cabling. This report must include the test results for the following parameters as the minimum: Wire Map, Cable Length, Propagation Delay, Resistance, Insertion Loss, Return Loss, and Cross Talk.
- 18.4.3.8.5 An electronic copy of the reports must be provided to the TA within 15 calendar days after the test is performed.
-

NOTE: The Contractor must provide the TA with the opportunity to review the test reports for all CAT6a cables before connecting the cables to the pieces of equipment.

18.4.3.9 Locations

Throughout the vessel.

18.4.3.10 Interferences

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

18.4.4 Proof of Performance

18.4.4.1 Inspection Points

18.4.4.1.1 HOLD POINT 1: The Contractor must provide the TA with the opportunity to review the test reports for all CAT6a cables before connecting the cables to the equipment. The contractor must identify this hold point in the ITP, and project schedule, and provide at least one day notice for CCG personnel to coordinate this verification task.

18.4.4.2 Testing / Trials

18.4.4.2.1 The Contractor must provide the TA with 5 days' notice of completion of all hardware and cabling specified herein to allow for the coordination of an Installation Check (IC), testing, and commissioning activities. The Contractor must not energize any system before the completion of these activities.

18.4.4.2.2 Canada will perform an Installation Check (IC) of all work specified herein to ensure conformity with this specification. The Contractor is responsible for any necessary corrections.

18.4.4.2.3 The Contractor must undertake to rectify defects and deficiencies in the Contractor's installation or repair work, as soon as practicable. The Contractor is responsible to schedule such repairs at its own risk and cost.

18.4.4.2.4 The Contractor must reschedule unsatisfactory inspections after the required repairs have been completed.

18.4.4.3 Commissioning

All commissioning and final set to work test activities related to the affected system(s) will be conducted by Canada.

18.4.5 Deliverables

18.4.5.1 Documentation

18.4.5.1.1 The Contractor must supply final Red-line As Fitted drawings, in accordance with the Documentation section of the General Notes, for the following drawings:

Drawing Number & Revision	Drawing Title
LM601-670-BD (Rev MLM)	Network Block Diagram
M017-MLM23-003 (Rev A)	Electronic Equipment Room - Racks Layout Modification Drawing

18.4.5.1.2 The Contractor must provide Canada with any OEM documentation such as operator manual, technical manual, maintenance manual, service manual, guides, MSDS, etc.

18.4.5.1.3 The Contractor must supply one (1) electronic copy of the testing report to the TA for the tests conducted in paragraph 18.4.3.8.4 within 15 days of completing the test.

18.4.5.2 Certification

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

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18.4.5.3 Training

Not used.

18.5 SIMPLIFIED VOYAGE DATA RECORDER INSTALLATION

18.5.1 Identification

- 18.5.1.1 The objective of this item is to install a Government supplied Danelec DM100 SVDR G2.
- 18.5.1.2 This specification must be coordinated with the other specification work items in subsection 18.

18.5.2 References

18.5.2.1 Documents

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

Drawing/Document No. Revision / Date	Title / Description
108-H-23_25	Martha L. Black General Arrangement – 3 sheets
LM601-380-WI, (Rev A)	SVDR Schéma de Branchement
M017-MLM23-009, (Rev A)	SVDR Capsule Pedestal
LM601-310-WI, (Rev MLM)	Sondeurs Électro Sonores Diagramme de câblage
LM601-310-WI, (Rev K)	Sondeurs Électro Sonores Diagramme de câblage
DBS10956-24 Rev 2.4	Installation Manual for DM100 S-VDR G2

18.5.2.2 Regulations and Standards

All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the

vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section.

Standards & Regulations Revision / Date	Title / Description
FSM 7.B.3	CCG Fleet Safety Manual, Entry into Confined Spaces
FSM 7.B.4	CCG Fleet Safety Manual, Hot work
FSM 7.B.5	CCG Fleet Safety Manual, Lock-out / Tag-Out
70-000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment

18.5.2.3 Equipment Data

18.5.2.3.1 Government Supplied Materiel (GSM)

Description	Manufacturer	Part Number	Quantity
DM100 Bridge Control Panel	Danelec	1302379	1
DM100 Capsule MK4	Danelec	1302373	1
DM100 Data Acquisition Unit	Danelec	1302368	1
DM100 Data Processing Unit (DPU 100-02)	Danelec	1305184	1
DM100 Indoor Bridge Microphone	Danelec	1302646	5
DM100 DVI Remote Video Interface	Danelec	1302365	1

18.5.2.3.2 Contractor Supplied Materiel (CSM)

The Contractor must supply and install all materials, equipment and parts, such as those listed below, as well as any other which are required to perform the specified Work – unless clearly stated otherwise.

Description	Manufacturer	Part Number	Quantity
MK4 Capsule Acoustic Beacon	Danelec	AUB-90	1
DM100 DAU Battery Pack	Danelec	TBD	1
DM100 DAU Cooling Fan	Danelec	TBD	1
NMEA Splitter	Actisense	PRO-BUF-2	1

18.5.2.3.3 The Contractor must supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

18.5.3 Technical Description**18.5.3.1 FSR Services**

18.5.3.1.1 The Contractor must obtain the services of an authorized Danelec FSR, approved by ABS, to conduct all commissioning and final set to work activities as well as conducting the Installation Performance Test.

18.5.3.1.2 The Contractor must include an allowance of \$10,000.00 to cover the cost of services to be provided by this FSR. The \$10,000.00 allowance must form part of the overall bid and must be adjusted up or down by means of PSPC 1379 process upon receipt of the final FSR invoice supported by copies of all related documentation and invoices to verify actual expenses.

Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses.

18.5.3.2 Capsule Pedestal

18.5.3.2.1 The Contractor must manufacture and install a VDR Capsule Pedestal (**CSM**). It must be built in accordance with drawing M017-MLM23-009.

18.5.3.2.2 The location of the pedestal will be determined by the TA and ABS on site. It will be on top of the wheelhouse.

18.5.3.2.3 The Contractor must remove insulation under the deck before welding.

18.5.3.2.4 The Contractor must supply and install new insulation under the deck after welding.

Note: The Contractor must provide the TA with the opportunity to verify that the pedestal is built and installed IAW with the specification.

18.5.3.3 Deck Penetrations

The Contractor must supply and install one (1) cable penetrations on the aft side of the capsule pedestal. The cable penetrations must be of one (1) inch NPT kick pipe with a suitable marine-approved cable gland.

Note: The Contractor must provide the TA with the opportunity to verify the cable penetrations and inspect the welds.

18.5.3.4 Equipment Installation

18.5.3.4.1 SVDR Data Acquisition Unit (DAU) (**GSM**)

- The Contractor must install the DAU in the electronics room on the gyro mounting plate IAW drawing LM601-230-IN Rev MLM Sheet 5.
- It must be grounded to the mounting plate

18.5.3.4.2 Digital Remote Video Interface (RVI) (GSM)

- The Contractor must install the Remote Video Interface inside the X-Band Radar console.
- It must be mounted on the existing port side mounting plate.

18.5.3.4.3 Fixed Capsule (GSM)

The Contractor must install the capsule on the new pedestal.

18.5.3.4.4 Bridge Control Panel (GSM)

The Contractor must install the Bridge Control Panel on the navigation console in the wheelhouse. It must be flush mounted. Location TBD by the TA on site.

18.5.3.4.5 Bridge Indoor Microphone Unit (GSM)

The Contractor must install one (1) microphone at each of the locations below. The microphones must be mounted on the ceiling tiles. Refer to the LM620-380-WI drawing for a specific location.

- Above Port Wing Console
- Above Starboard Wing Console
- Above Chart table (port) in the proximity of S-Band Radar and Aft Radar station
- Above X-Band Radar and ECDIS Console (Stbd)
- Above the helm's position

18.5.3.5 Cable Installation

18.5.3.5.1 The Contractor must supply and install the cables (CSM) listed in the table below and in accordance with drawings LM601-380-WI Rev A and LM601-310-WI Sheet 1 & 2 Rev MLM.

Cable Label/Type	Source	Destination
VDR-01 Factory CAT5e	VDR Data Acquisition Unit	Fixed Capsule

Cable Label/Type	Source	Destination
VDR-02 IEC ANGLED POWER CORD	VDR Data Acquisition Unit	AC Outlet
VDR-03 2 Pairs 18 AWG Shielded	VDR Data Acquisition Unit	Microphone Helmsman
VDR-04 2 Pairs 18 AWG Shielded	VDR Data Acquisition Unit	Microphone Chart Table
VDR-05 2 Pairs 18 AWG Shielded	VDR Data Acquisition Unit	Microphone Port Wing
VDR-06 2 Pairs 18 AWG Shielded	VDR Data Acquisition Unit	Microphone Stbd Wing
VDR-07 2 Pairs 18 AWG Shielded	VDR Data Acquisition Unit	Microphone Radar Station
VDR-08 2 Pairs 18 AWG Shielded	VDR Data Acquisition Unit	VHF FM#2 Chart Table
VDR-09 2 Pairs 18 AWG Shielded	VDR Data Acquisition Unit	VHF FM#1 Chart Table
VDR-10 CAT6a	VDR Data Acquisition Unit	Bridge Control Panel Safety Console
ES-18 Belden 8723SB	VDR Data Acquisition Unit	Echo sounder NMEA Splitter
ES-19 Belden 8723SB	VDR Data Acquisition Unit	Echo sounder NMEA Splitter
VDR-13 Belden 8723SB	VDR Data Acquisition Unit	Wind Sensor NMEA Splitter

Cable Label/Type	Source	Destination
GC-017/S Belden 8723SB	VDR Data Acquisition Unit	Gyrocompass New Data Distribution Unit
VDR-15 CAT6a	VDR Data Acquisition Unit	Remote Video Interface (RVI)
VDR-15A DVI-D 3 Feet	Remote Video Interface (RVI)	X-Band Radar Processor
VDR-16 Belden 8723SB	VDR Data Acquisition Unit	Speed Log NMEA Splitter
VDR-18 Belden 8723SB	VDR Data Acquisition Unit	DGPS NMEA SPLITTER
VDR-19 Belden 8723SB	VDR Data Acquisition Unit	AIS NMEA Splitter
VDR-20 Belden 8723SB	VDR Data Acquisition Unit	VHF FM#3 GMDSS Console
ES-16 Belden 8723SB	Port Echosounder Terminal Strip (Existing)	Echo sounder NMEA Splitter (New)
ES-17 Belden 8723SB	Stbd Echosounder Terminal Strip (Existing)	Echo sounder NMEA Splitter (New)
ES-20 2 Conductors 16 AWG	Echo sounder Repeater 12Vdc Power Supply (new)	Echo sounder NMEA Splitter (New)
ES-21 2 Conductors 16 AWG	New Terminal blocks	Echo sounder NMEA Splitter (New)
ES-22 1 Pair 18 AWG	New Terminal blocks	Echo sounder NMEA Splitter (New)
ES-23 1 Pair 18 AWG	New Terminal blocks	Echo sounder NMEA Splitter (New)

Cable Label/Type	Source	Destination
ES-24 2 Conductors 16 AWG	New Terminal blocks	Echo sounder Repeater 12Vdc Power Supply (new)
ES-25 2 Conductors 16 AWG	New Terminal blocks	Echo sounder Repeater 12Vdc Power Supply (new)

18.5.3.6 Wiring Terminations

18.5.3.6.1 The Contractor must complete the wiring terminations for all cables.

- Refer to LM601-380-WI Rev A for termination details.
- Refer to LM310-WI Rev MLM for terminations details – Echosounder.
- Any wire terminating into a terminal block or terminal strip must be terminated using crimped ferrules.

18.5.3.7 Battery pack and Acoustic Beacon Replacement.

18.5.3.7.1 The FSR must supply and install a new battery pack for the Data DAU. It must be performed by the FSR.

18.5.3.7.2 The FSR must supply and install a new acoustic beacon in the SVDR Capsule. It must be performed by the FSR.

18.5.3.8 Echosounder NMEA Splitter

18.5.3.8.1 The Contractor must remove the existing Wago Power supply which feeds the Wings repeaters. See Figure 18.5-1.

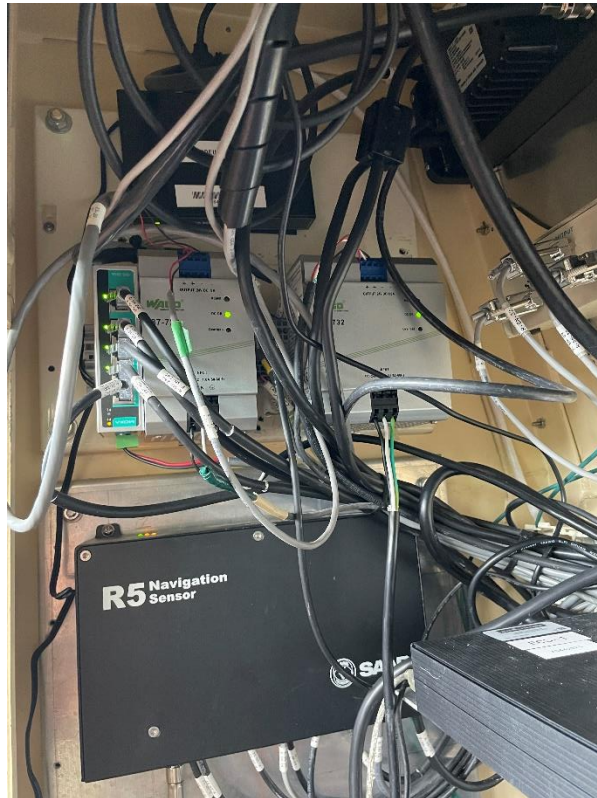


Figure 18.5-1: Repeater's Power supply to be replaced.

- 18.5.3.8.2 The Contractor must supply and install a new Type Approved Power supply, 120Vac 60Hz to 12Vdc, 10A output power **(CSM)**.
- 18.5.3.8.3 The Contractor must supply and install new terminal blocks **(CSM)** on a new DIN Rail in the chart table for connection of the indicators to the NMEA splitter and the new power supply.
- 18.5.3.8.4 The contractor must supply and install an NMEA Buffer (Actisense PRO-BUF-2) **(CSM)** such that:
- The NMEA Splitter for the echosounders must be inside the chart table.

- The NMEA Splitter must be configured such that input 1 feeds Output 1 to 6 and Input 2 feeds output 7-12. The Auto-baud function on the input must be disabled. It must be manually set at 4800 baud rate. The configuration must be performed by the FSR.

18.5.3.8.5 The Contractor must modify the cabling and wiring of the echo sounders IAW drawings LM601-310-WI Revision MLM.

Refer to the original drawing LM601-310-WI Revision K to view the existing system configuration.

18.5.3.9 Locations

Top of wheelhouse, Wheelhouse, Electronic Equipment Room.

18.5.3.10 Interferences

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

18.5.4 Proof of Performance

18.5.4.1 Inspection Points

18.5.4.1.1 HOLD POINT 1: The Contractor must provide the TA with the opportunity to verify that the pedestal is built and installed IAW with the specification.

18.5.4.1.2 HOLD POINT 2: The Contractor must provide the TA with the opportunity to verify the cable penetrations and inspect the welds.

18.5.4.1.3 There is no cables continuity test requirement, however, all cables which have been installed by the Contractor that are found defective (fail continuity test) or damaged must be replaced by the Contractor at their expense (material and labour).

18.5.4.2 Testing / Trials

18.5.4.2.1 The Contractor must provide the TA with 5 days notice of completion of all hardware and cabling specified herein in order to allow for the coordination of an Installation Check (IC), testing, and commissioning activities. The Contractor shall not energize any system before the completion of these activities.

18.5.4.2.2 Canada will perform an Installation Check (IC) of all work specified herein to ensure conformity with this specification. The Contractor is responsible for any necessary corrections.

18.5.4.2.3 The Contractor must undertake to rectify defects and deficiencies in the Contractor's installation or repair work, as soon as practicable. The Contractor is responsible to schedule such repairs at its own risk and cost.

18.5.4.2.4 The Contractor must reschedule unsatisfactory inspections after the required repairs have been completed.

18.5.4.2.5 An Installation Performance Test (IPT) must be carried by the same FSR. The FSR must provide the Certificate of Compliance (COC) to the TA and ABS.

18.5.4.3 Commissioning

18.5.4.3.1 All commissioning and final set to work test activities related to the affected system(s) must be conducted by the FSR who is authorized by Danelec and ABS to conduct the commissioning of Danelec DM100 SVDR G2.

18.5.4.3.2 The FSR must demonstrate that the Echosounders are interfaced with the external systems. The table below must be filled out.

External Equipment	Receives Port Side Echosounder Data (Pass/Fail)	Receives Starboard Side Echosounder Data(Pass/Fail)
Furuno Sensor Adapter MC3000S)		
Port Side Wing Indicators		
Starboard Side Wing Indicators		
Simplified Voyage Data Recorder (S-VDR)		

18.5.5 Deliverables

18.5.5.1 Documentation

18.5.5.1.1 The Contractor must supply final Redline As-Fitted drawings, IAW the Documentation section of the General Notes, for the following drawings:

Drawing Number & Revision	Drawing Title
LM601-380-WI, (Rev A)	S-VDR Wiring Diagram
LM601-310-WI, (Rev MLM)	Sondeurs Électro Sonores Diagramme de câblage

18.5.5.1.2 The Contractor must provide Canada with any OEM documentation such as operator manual, technical manual, maintenance manual, service manual, guides, MSDS, etc.

18.5.5.1.3 The Contractor must supply (two (2) copies – one (1) unprotected electronic and one (1) hard copy) of the commissioning and testing report to the TA, signed and dated by the attending FSR. This report must include all the tests performed during the commissioning with their short description, applicable parameters, as well as the result and values collected during each test.

18.5.5.2 Certification

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

18.5.5.2.2 The Contractor must provide the Certificate of Compliance (COC) delivered by the FSR.

18.5.5.3 Training

The FSR must provide one (1) training course of eight (8) hours duration, to be held onboard, after the final installation and commissioning of the gyrocompass system. The training shall be provided to the ship's personnel involved in the operation of the system. The training must encompass the items outlined in the operator manual as supplied by the manufacturer.

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18.6 CLOSED-CIRCUIT TELEVISION SYSTEM REPLACEMENT

18.6.1 Identification

18.6.1.1 The objective of this item is to replace the Closed-Circuit Television System (CCTV) with a new Government Supplied system.

18.6.1.2 This specification must be coordinated with the following related specification items:

- 18.1 – Integrated Communication System
- 18.4 – CAT6A Network

18.6.2 References

18.6.2.1 Drawings and Documents

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

Drawing/Document No. Revision / Date	Title / Description
108-H-23_25	Martha L. Black General Arrangement – 3 Sheets
M017-MLM23-006, (Rev A)	CCTV Removal Drawing
LM601-910-WI, (Rev MLM)	CCTV Wiring Diagram

18.6.2.2 Regulations and Standards

All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in

accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section.

Standards & Regulations Revision / Date	Title / Description
Publications	
FSM 7.B.3	CCG Fleet Safety Manual, Entry into Confined Spaces
FSM 7.B.4	CCG Fleet Safety Manual, Hot work
FSM 7.B.5	CCG Fleet Safety Manual, Lock-out / Tag-Out
70-000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment

18.6.2.3 Equipment Data

18.6.2.3.1 Government Supplied Materiel (GSM)

Description	Manufacturer	Part No.	Quantity
CCTV Server	TBD	TBD	1
CCTV Network Switch High Power POE	TBD	TBD	2
CCTV Joystick	TBD	TBD	3
CCTV Monitor	Hewlett Packard	E24 G4 FHD	2
CCTV Workstation	Hewlett Packard	Prodesk 600 G6 Desktop Mini	3

Description	Manufacturer	Part No.	Quantity
Exterior PTZ Dome Camera with mounts	TBD	TBD	7
Fixed Dome Camera with mounts	TBD	TBD	4
Explosion Proof PTZ Dome Camera with mounts	TBD	TBD	1
Fisheye Camera with mount	TBD	TBD	2

18.6.2.3.2 Contractor Supplied Materiel (CSM)

The Contractor must supply and install all materials, equipment and parts, such as those listed below, as well as any other which are required to perform the specified work – unless clearly stated otherwise.

Description	Manufacturer	Part No.	Quantity
Bergen Cabling 24 Ports Patch panel, Black with CAT6a jack connectors	Bergen Cabling	BC-13-204	2
Bergen Cabling Outlet 1x RJ45 STP CAT6a Angled Keystone with wall box	Bergen Cabling	BC-12-253	2
DNV GL Approved, Bergen Cabling Maritime LAN CAT6a cable with SHF1 sheath (Indoor)	Bergen Cabling	BC-10-021	Sufficient quantity
DNV GL Approved, Bergen Cabling Maritime LAN S/FTP CAT6a stranded cable (Outdoor)	Bergen Cabling	BC-10-025	Sufficient quantity
Bergen Cabling Maritime LAN Connector Cat6A STP, Keystone DNV GL Certified	Bergen Cabling	BC-11-004	10

Description	Manufacturer	Part No.	Quantity
Sliding Shelf, Rackmount 19in	TBD	TBD	2
Fixed Shelf, Rackmount 19in	TBD	TBD	1
Dual AC Outlet	TBD	TBD	2

18.6.3 Technical Description

18.6.3.1 Equipment Removal

18.6.3.1.1 The Contractor must remove equipment and cables in accordance with drawing M017-MLM23-006.

- There are two CAT6 cables and a Blackbox KVM Unit in the CCTV Cabinet in the wheelhouse. They must be retained in place.
- The laptop and its power supply must be retained on top of place in the CCTV Cabinet.
- The power bars in the CCTV Cabinet must remain in place
- See Figure 18.6-1 to figure 18.6-7.

18.6.3.1.2 All remaining cables that were not identified on drawing M017-MLM23-006 must be removed by the Contractor. The Contractor's bid must include the unit price for removal of each 2-meters of cable. The final cost of removal of the cables will be dealt with by PSPC 1379 process.

Note: The Contractor must provide the TA with the opportunity to confirm that all equipment has been removed in accordance with the specification.



Figure 18.6-1: CCTV Cabinet location

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Figure 18.6-2: Front of CCTV Cabinet

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CCC No./N° CCC - FMS No./N° VME

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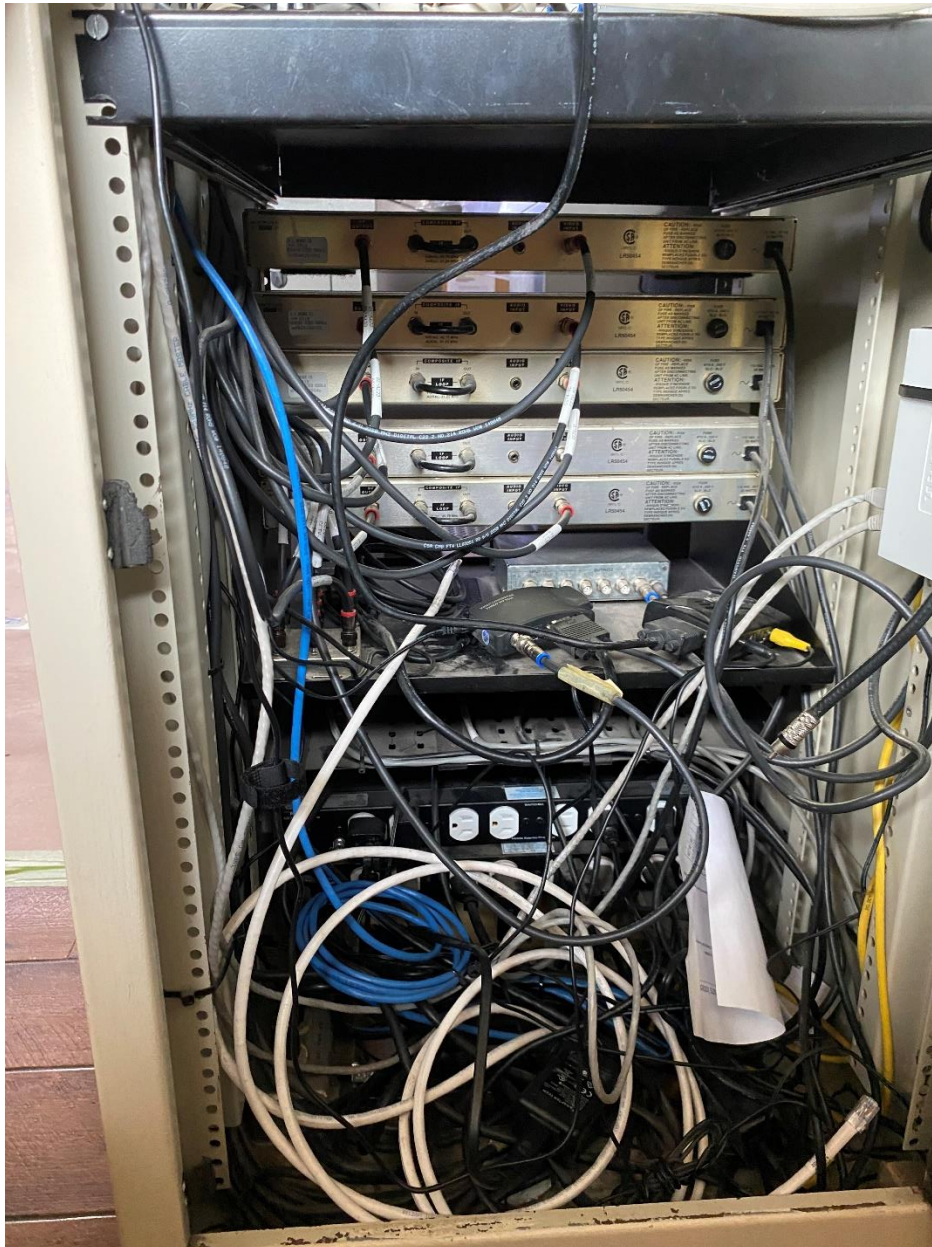


Figure 18.6-3: Inside the CCTV Cabinet

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Buyer ID - Id de l'acheteur

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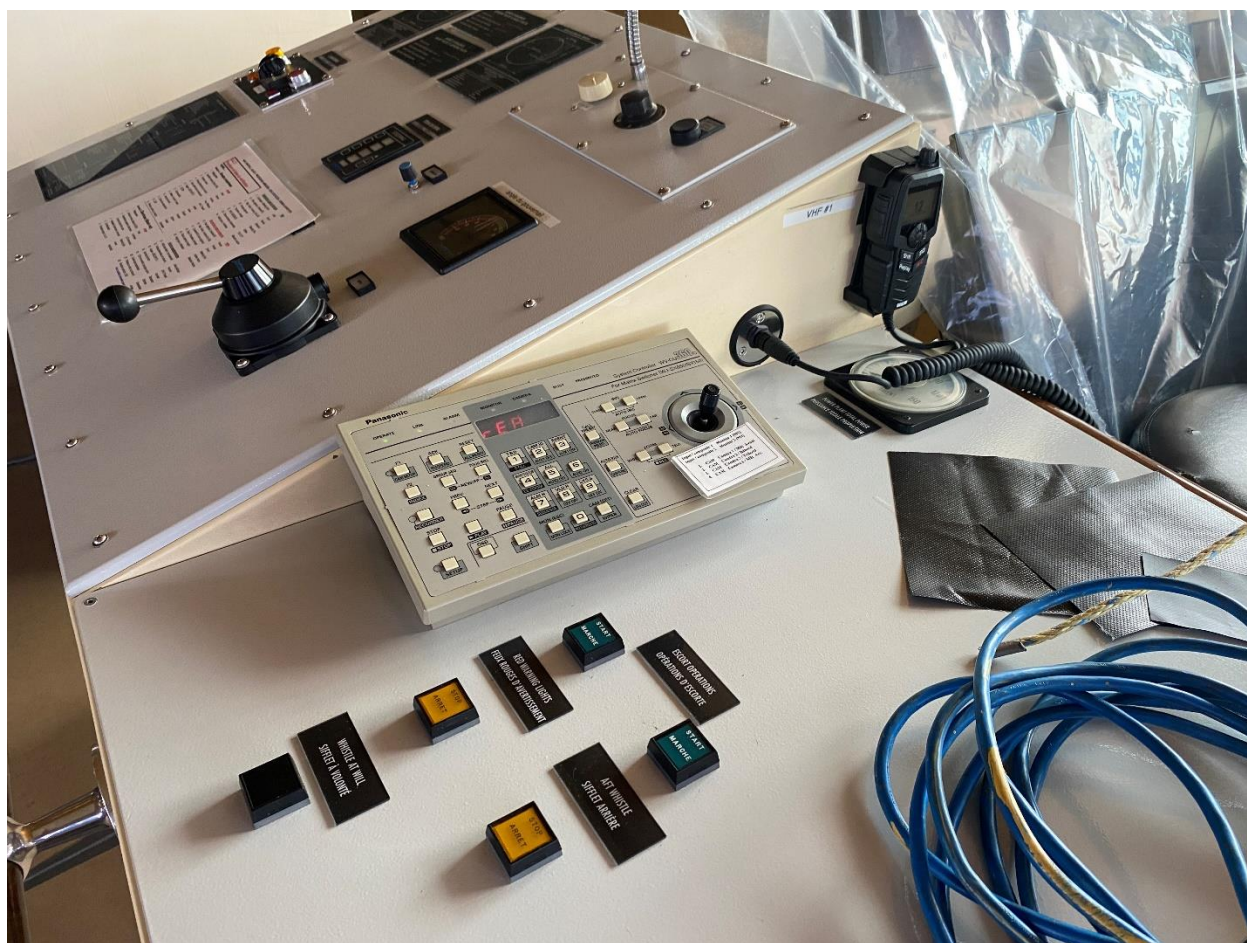


Figure 18.6-4: CCTV Joystick in Stbd Wing station



Figure 18.6-5: FWD Mast camera to be replaced



Figure 18.6-6: AFT Mast camera to be replaced



Figure 18.6-7: Port Side Camera to be replaced

18.6.3.2 CCTV Cabinet Equipment Installation

The contractor must install the following equipment in the CCTV Cabinet IAW drawing LM601-910-WI Revision MLM sheet 2.

Equipment	Quantity
CCTV Network Switch	1
24 Ports Patch panel	1
CCTV Server	1
CCTV Workstation (on a sliding shelf)	1
AC Outlet (on a fixed shelf)	1
Existing Blackbox Video Matrix module (on a sliding shelf)	1
Sliding Shelf, Rackmount	2
Fixed Shelf, Rackmount	1

18.6.3.3 Canteen Cabinet (Room 161)

18.6.3.3.1 The Cabinet must be installed as part of specification work item 18.6 – CAT6a Network.

18.6.3.3.2 The Contractor must install one (1) CCTV Network switch (**GSM**) in the cabinet.

18.6.3.3.3 The Contractor must supply and install one (1) 24 Ports Patch panel (**CSM**) in the cabinet.

18.6.3.4 Control Room (52) Equipment Installation

18.6.3.4.1 The Contractor must install one (1) CCTV Workstation (**GSM**) in the Control Room.

18.6.3.4.2 The Contractor must install one (1) CCTV Monitor (**GSM**) in the Control Room.

18.6.3.4.3 The Contractor must supply and install one (1) Single Network outlet Wall box (BC-12-253) (CSM) in the Control Room for connection of the CCTV Workstation – such that:

- The second hole must be blanked with the supplied blanking plate
- The outlet must be labelled with the Cable identifier.
- The incoming cable must be terminated using the supplied CAT6a jack connector (supplied with the wall box)

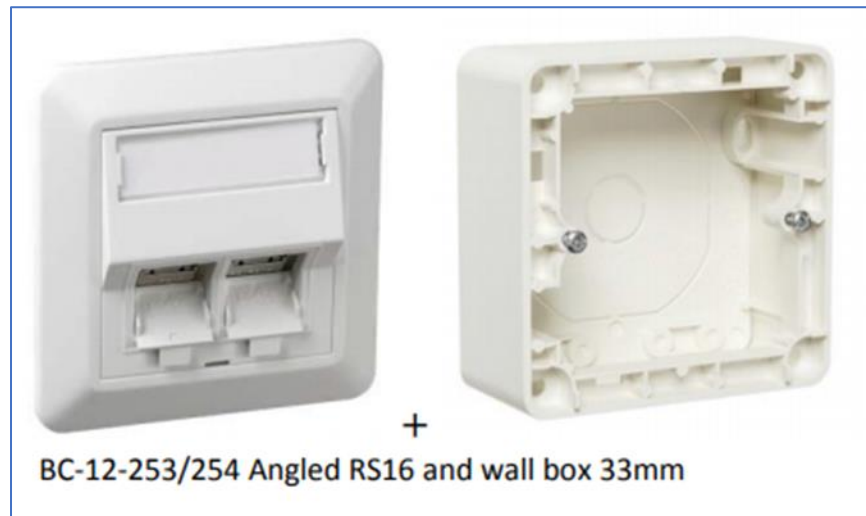


Figure 18.6-8: Single Network Outlet Wall box (BC-12-253)

18.6.3.5 Derrick Control Room (302) Installation

18.6.3.5.1 The Contractor must supply and install one (1) Single Network outlet Wall box (BC-12-253) (CSM) in the Control Room for connection of the CCTV Workstation – such that:

- The second hole must be blanked with the supplied blanking plate
- The outlet must be labelled with the Cable identifier.
- The incoming cable must be terminated using the supplied CAT6a jack connector (supplied with the wall box)

- 18.6.3.5.2 The Contractor must install one (1) CCTV Workstation (**GSM**) in the Derrick Control Room
- 18.6.3.5.3 The Contractor must supply and install a mounting bracket (**CSM**) for the computer. It must be made out of aluminum and have a black color finish.
- 18.6.3.5.4 The Contractor must install one (1) CCTV Monitor (**GSM**) in the Derrick Control Room.
- 18.6.3.5.5 The Contractor must supply and install a wall mounting bracket (**CSM**) for the Monitor.
- 18.6.3.5.6 The Contractor must supply and install a dual AC Outlet (**CSM**) in the vicinity of the monitor and workstation.
- 18.6.3.6 Camera Installation
- 18.6.3.6.1 The Contractor must install a new camera (**GSM**) in the following locations:

Location	Orientation	Camera Type	Notes
Main Mast	Forward	PTZ Dome	Same location as existing one
Aft Mast	Towards Aft (escorted ship)	PTZ Dome	Same location as existing one
Port Side under the catwalk	Fwd Deck and Gangway	PTZ Dome	Same location as existing one
Starboard side under the catwalk	Fwd Deck and Gangway	PTZ Dome	Same location as existing one
Forecastle deck Mast	Facing aft of vessel (Fwd deck)	PTZ Dome	
Aft Mooring Station	Winch and Escorted vessel	PTZ Dome	
Emergency Generator Compartment	Generator	Fixed Dome	
Steering Gear Compartment	Global view	Fisheye	
Bow thruster	Global view	Fisheye	
Helicopter Hangar	Global view	PTZ – Explosion Proof	
Winch Compartment 1	Winch	Fixed Dome	
Winch Compartment 2	Winch	Fixed Dome	
Winch Compartment 3	Winch	Fixed Dome	
Cargo Hold	Cargo	PTZ Dome	

18.6.3.6.2 The contractor must follow OEM documentation for the installation of the above-mentioned cameras.

18.6.3.6.3 The Contractor must install the above-mentioned cameras using the OEM provided mounts.

18.6.3.6.4 The Contractor must account for the supply and welding of a new foundation for each of the above-mentioned cameras.

18.6.3.7 Cable Installation

The Contractor must supply and install all the cables identified in drawing LM601-910-WI Revision MLM.

18.6.3.8 Wiring Terminations

18.6.3.8.1 The Contractor must complete the wiring terminations for all cables IAW drawing LM601-910-WI Revision MLM.

18.6.3.8.2 All CAT6a cables identified in the drawing must be terminated using the wiring code T-568B.

18.6.3.8.3 All CAT6a cables identified in the drawing must be terminated following Bergen Cabling (OEM) instructions.

18.6.3.8.4 All CAT6a cables must be tested after termination using a Fluke DSX 5000 Cable Analyzer (or equivalent) to generate a report with a unique Cable Identifier for all CAT6a Cabling. This report must include the test results for the following parameters as the minimum: Wire Map, Cable Length, Propagation Delay, Resistance, Insertion Loss, Return Loss, and Cross Talk.

An electronic copy of the reports must be submitted to the TA within 15 calendar days of completion of the tests.

NOTE: The Contractor must provide the TA with the opportunity to review the test reports for all CAT6a cables before connecting the cables to the pieces of equipment.

18.6.3.8.5 A cable that has been installed by the Contractor that is found defective (fails the above-mentioned test) or damaged must be replaced and fixed by the Contractor at their expense (material and labour) before commissioning.

18.6.3.8.6 CAT6a cables must not be terminated with a male connector, except for the pre-moulded patch cords. All field cables must be terminated with a jack connector.

18.6.3.9 Locations

Throughout the vessel.

18.6.3.10 Interferences

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

18.6.4 Proof of Performance

18.6.4.1 Inspection Points

18.6.4.1.1 HOLD POINT 1: The Contractor must provide the TA with the opportunity to confirm that all equipment has been removed in accordance with the specification.

18.6.4.1.2 HOLD POINT 2: The Contractor must provide the TA with the opportunity to review the test reports for all CAT6a cables.

18.6.4.1.3 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 defective (fail continuity test) or damaged must be replaced by the Contractor at their expense (material and labour).

18.6.4.2 Testing / Trials

18.6.4.2.1 The Contractor must provide the TA with 5 days notice of completion of all hardware and cabling specified herein in order to allow for the coordination of an Installation Check (IC), testing, and commissioning activities. The Contractor must not energize any system before the completion of these activities.

18.6.4.2.2 Canada will perform an Installation Check (IC) of all work specified herein to ensure conformity with this specification. The Contractor is responsible for any necessary corrections.

18.6.4.2.3 The Contractor must undertake to rectify defects and deficiencies in the Contractor's installation or repair work, as soon as practicable. The Contractor is responsible to schedule such repairs at its own risk and cost.

18.6.4.2.4 The Contractor must reschedule unsatisfactory inspections after the required repairs have been completed.

18.6.4.3 Commissioning

All commissioning and final set to work test activities related to the affected system(s) will be conducted by Canada.

18.6.5 Deliverables

18.6.5.1 Documentation

18.6.5.1.1 The Contractor must supply one (1) electronic copy of the testing report to the TA for the tests conducted in paragraph 18.6.3.8.4 within 15 days of completing the test.

18.6.5.1.2 The Contractor must supply final Redline As-Fitted drawings, IAW the Documentation section of the General Notes, for the following drawings:

Drawing Number & Revision	Drawing Title
LM601-910-WI, (Rev MLM)	CCTV Wiring Diagram

18.6.5.1.3 The Contractor must provide Canada with any OEM documentation such as operator manual, technical manual, maintenance manual, service manual, guides, MSDS, etc.

18.6.5.2 Certification

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

18.6.5.3 Training

Not used.

18.7 TELEVISION DISTRIBUTION

18.7.1 Identification

18.7.1.1 The objective of this item is to completely remove the existing TV/FM Radio Distribution equipment and cabling throughout the vessel and install all new equipment and cabling.

18.7.1.2 This specification must be coordinated with the following related specification items:

- 18.1 – Shipboard Integrated Communication System (SICS)
- 18.2 – Gyrocompass
- 18.4 – CAT6a Network

18.7.1.3 Rack #6 is located in the Electronics Equipment Room (308).

18.7.2 References

18.7.2.1 Documents

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

Drawing/Document No. Revision / Date	Title / Description
108-H-23_25	Martha L. Black General Arrangement – 3 Sheets
M017-MLM23-003 (Rev A)	Electronic Equipment Room - Racks Layout Modification Drawing
M017-MLM23-007, (Rev A)	Satellite TV and TV Distribution Modification Drawing
LM601-492-SS, (Rev MLM)	Television System

18.7.2.2 Regulations and Standards

All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section.

Standards & Regulations Revision / Date	Title / Description
FSM 7.B.3	CCG Fleet Safety Manual, Entry into Confined Spaces
FSM 7.B.4	CCG Fleet Safety Manual, Hot work
FSM 7.B.5	CCG Fleet Safety Manual, Lock-out / Tag-Out
70-000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment

18.7.2.3 Equipment Data

18.7.2.3.1 Government Supplied Materiel (GSM)

Description	Manufacturer	Part No.	Quantity
Distribution Amplifier Rackmount	Cabletronix	CTA-30RK-1000	1

Description	Manufacturer	Part No.	Quantity
Video Encoder 8 channels, Rackmount	TBD	TBD	1
Video Encoder 1 channel, Table mount	TBD	TBD	3
Active Combiner 16 channels, Rackmount	Quintech	LC16 1000A	1
Satellite TV Multi-switch 16 channels	Televes	Nevoswitch 5X16 714505	1
Secondary Amplifier	TBD	TBD	2
Divider 1:4	TBD	TBD	3
Divider 1:16	TBD	TBD	2

18.7.2.3.2 Contractor Supplied Materiel (CSM)

The Contractor must supply and install all materials, equipment and parts, such as those listed below, as well as any other which are required to perform the specified Work – unless clearly stated otherwise.

Description	Manufacturer	Part No.	Quantity
ABS Approved RG-6 Coaxial Cable	Belden	1694SB	As Required
RG-6 Male Connector	Belden	TBD	As Required
F Type Female Connector – Wall mounted box	TBD	TBD	60
AC Outlets	TBD	TBD	4
Power Junction box	TBD	TBD	1
Fixed Rackmount Shelf (For Multi-switch)	TBD	TBD	1
Power Bar	Middle Atlantic	PD-915R	2

18.7.3 Technical Description

18.7.3.1 Equipment and Cable Removal

The Contractor must remove equipment and cables in accordance with drawing M017-MLM23-007.

18.7.3.2 New equipment Installation

18.7.3.2.1 The Contractor must install a new Multi-switch (**GSM**) on a fixed shelf IAW with drawing M017-MLM23-003 Rev A.

18.7.3.2.2 The Contractor must install a new Distribution Amplifier (**GSM**) in Rack #6 IAW with drawing M017-MLM23-003 Rev A.

18.7.3.2.3 The Contractor must install a new Active Combiner (**GSM**) in Rack #6 IAW with drawing M017-MLM23-003 Rev A.

18.7.3.2.4 The Contractor must install a new Rackmount 8 channels HDMI Digital Encoder (**GSM**) in Rack #6 IAW with drawing M017-MLM23-003 Rev A.

18.7.3.2.5 The Contractor must install new single channel Digital Encoder (**GSM**) at the following locations, IAW drawing LM601-492-SS Revision MLM:

- Officer's Lounge (room 305) on TV furniture, for connection to the Bell Receiver.
- Crew's Lounge (room 154) on TV furniture, for connection to the Bell Receiver.
- Wheelhouse (room 501) in CCTV Cabinet, for connection to the PC Babillard.

18.7.3.2.6 The Contractor must supply and install a new power junction box (**CSM**) at the bottom of Rack #6. It must be fed by circuit RR-101-14.

18.7.3.2.7 The Contractor must supply and install new AC outlets (**CSM**) identified in the table below and IAW drawing LM601-492-SS Revision MLM.

Quantity	Location
1	Officer's Deck – Location TBD

Quantity	Location
1	EER (308) – Rack #6
1	Upper Deck – Passageway in bulkhead
1	Main Deck – Passageway in bulkhead

18.7.3.2.8 The Contractor must supply and install two (2) new rack mounted power bars (**CSM**) in Rack #6 IAW with drawing M017-MLM23-003 Rev A.

18.7.3.2.9 The Contractor must install new Secondary Amplifiers (**GSM**) identified in the table below and IAW drawing LM601-492-SS Revision MLM.

Quantity	Location
1	Upper Deck – Passageway in bulkhead
1	Main Deck – Passageway in bulkhead

18.7.3.2.10 The Contractor must install new TV Dividers (**GSM**) identified in the table below and IAW drawing LM601-492-SS Revision MLM.

Quantity	Description	Location
1	Divider 1:4	Officer's Deck – Location TBD
2	Divider 1:4	EER (308) – Rack #6
1	Divider 1:16	Upper Deck – Passageway in bulkhead
1	Divider 1:16	Main Deck – Passageway in bulkhead

18.7.3.3 Cable Installation

18.7.3.3.1 The Contractor must supply and install all new cables IAW drawing LM601-492-SS Revision MLM.

18.7.3.3.2 The Contractor must supply and install wall-mounted boxes (**CSM**), each fitted with an F-Type connector, in accordance with the table below:

Quantity	Room Number	Room Description	Notes
2	405	CO Dayroom	1 for Bell Receiver 1 for TV Distribution
2	404	Chief Off. Dayroom	1 for Bell Receiver 1 for TV Distribution
2	213	Chief Engineer Dayroom	1 for Bell Receiver 1 for TV Distribution
2	216	Logistic Officer Cabin	1 for Bell Receiver 1 for TV Distribution
2	217	Senior Engineer Dayroom	1 for Bell Receiver 1 for TV Distribution
3	305	Officer's Lounge	1 for Bell Receiver 1 for TV Distribution 1 for HDMI Encoder
3	154	Crew's Lounge	1 for Bell Receiver 1 for TV Distribution 1 for HDMI Encoder
31	Various	All other cabins	Behind TV
1	308	Electronics Equipment Room	Desk
1	232	Gymnasium	Behind TV

18.7.3.4 Wiring Terminations

18.7.3.4.1 The Contractor must complete the wiring terminations for all cables IAW drawing LM601-492-SS Revision MLM.

18.7.3.4.2 All wires terminating in a terminal strip or terminal block must be terminated with a crimped ferrule.

18.7.3.4.3 All RG-6 cables must be terminated with a male F-type connector.

18.7.3.5 Locations

Throughout the vessel

18.7.3.6 Interferences

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

18.7.4 Proof of Performance

18.7.4.1 Inspection Points

18.7.4.1.1 There is no requirement for continuity testing of cables; however, all cables which have been installed by the Contractor that are found defective (fail continuity test) or damaged must be replaced by the Contractor at their expense (material and labour).

18.7.4.2 Testing / Trials

18.7.4.2.1 The Contractor must provide the TA with 5 days notice of completion of all hardware and cabling specified herein in order to allow for the coordination of an Installation Check (IC), testing, and commissioning activities. The Contractor shall not energize any system before the completion of these activities.

18.7.4.2.2 Canada will perform an Installation Check (IC) of all work specified herein to ensure conformity with this specification. The Contractor is responsible for any necessary corrections.

18.7.4.2.3 The Contractor must undertake to rectify defects and deficiencies in the Contractor's installation or repair work, as soon as practicable. The Contractor is responsible to schedule such repairs at its own risk and cost.

18.7.4.2.4 The Contractor must reschedule unsatisfactory inspections after the required repairs have been completed.

18.7.4.3 Commissioning

18.7.4.3.1 All commissioning and final set to work test activities related to the affected system(s) will be conducted by Canada.

18.7.5 Deliverables

18.7.5.1 Documentation

18.7.5.1.1 The Contractor must supply final Redline As-Fitted drawings, in accordance with the Documentation section of the General Notes, for the following drawings:

Drawing Number & Revision	Drawing Title
LM601-492-SS, (Rev MLM)	Television Satellite & Distribution TV
M017-MLM23-003, (Rev A)	Electronic Equipment Room - Racks Layout Modification Drawing

18.7.5.1.2 The Contractor must provide Canada with any OEM documentation such as operator manual, technical manual, maintenance manual, service manual, guides, MSDS, etc.

18.7.5.2 Certification

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

18.7.5.3 Training

Not used.

18.8 NON-DIRECTIONAL BEACON REPLACEMENT

18.8.1 Identification

18.8.1.1 The objective of this item is to remove the existing Non-Directional Beacon (NDB) system and replace it with a new Contractor Supplied System.

18.8.1.2 This specification must be coordinated with the other specification work items in subsection 18.

18.8.2 References

18.8.2.1 Documents

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

Drawing/Document No. Revision / Date	Title / Description
108-H-23_25	Martha L. Black General Arrangement – 3 sheets
LM601-280-WI, (Rev MLM)	NDB Wiring Diagram
M017-MLM23-003, (Rev A)	Electronic Equipment Room - Racks Layout Modification Drawing
M017-MLM23-008, (Rev A)	NDB Removal Drawing

18.8.2.2 Regulations and Standards

All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in

accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section.

Standards & Regulations Revision / Date	Title / Description
FSM 7.B.3	CCG Fleet Safety Manual, Entry into Confined Spaces
FSM 7.B.4	CCG Fleet Safety Manual, Hot work
FSM 7.B.5	CCG Fleet Safety Manual, Lock-out / Tag-Out
TP 127E	Ships Electrical Standards
70-000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment

18.8.2.3 Equipment Data

18.8.2.3.1 Government Supplied Materiel (GSM)

Note: These make and models are provided as an indication only. Equivalent equipment may be provided by Canada, pending the Canada procurement process.

Description	Manufacturer	Part Number	Quantity
NDB Transmitter	Nautel	VR125TS	1
NDB Antenna Tuning Unit (ATU)	Nautel	ATU500SRLOS	1
NDB Antenna	Comrod	AS-1R	1
NDB Remote Control Panel	Nautel	ECMP3	1
NDB Remote Monitoring Interface	Nautel	VR-Link 2	1

Description	Manufacturer	Part Number	Quantity
Antenna Mounting Support	Gystech	N/A	1
Feeder Cable Isolator	Gystech	N/A	1

18.8.2.3.2 Contractor Supplied Materiel (CSM)

The Contractor must supply and install all materials, equipment and parts required to perform the specified Work – unless clearly stated otherwise.

18.8.3 Technical Description

18.8.3.1 FSR Services

The Contractor must obtain the services of an FSR trained and certified by the NDB equipment manufacturer to conduct the commissioning, final set to work activities and training related to the NDB installation. The Contractor must include an allowance of \$10,000.00 to cover the cost of services to be provided by the FSR. The \$10,000.00 allowance must form part of the overall bid and must be adjusted up or down by means of PSPC 1379 process upon receipt of the final FSR invoice supported by copies of all related documentation and invoices to verify actual expenses.

Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses.

18.8.3.2 Equipment Removal

The Contractor must remove and return to Canada the equipment listed in the Table below IAW with drawing M017-MLM23-008.

Note: The Contractor must provide the TA with the opportunity to verify that the equipment and cables have been removed IAW with the specification.

Sollicitation No. - N° de l'invitation

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

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Description	Location	Detail
NDB Transmitter	Electronics Equipment Room	Nautel ND500R
NDB Antenna	Top of wheelhouse	Valcom V-425-CL
NDB Antenna Tuning Unit	Top of wheelhouse	Nautel NX-500
NDB Remote Control Unit	Wheelhouse	Nautel NAX-31

Sollicitation No. - N° de l'invitation

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

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Client Ref. No. - N° de réf. du client

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Figure 18.8-1: NDB Antenna on top of the enclosure



Figure 18.8-2: NDB ATU Inside enclosure

Sollicitation No. - N° de l'invitation

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

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Client Ref. No. - N° de réf. du client

File No. - N° du dossier

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Figure 18.8-3: NDB Remote Control Unit

Sollicitation No. - N° de l'invitation

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

F7049-210340/A

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Client Ref. No. - N° de réf. du client

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

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*Figure 18.8-4: NDB Antenna and ATU enclosure***18.8.3.3 Cable Removal**

18.8.3.3.1 The Contractor must remove the cables listed in the table below.

18.8.3.3.2 The Contractor must label the circuit RR-101-19 as a SPARE after the cable removal. It will be used as the breaker for the installation of the Simplified Voyage Data Recorder (SVDR) as per Specification work item 18.5.

Note: The Contractor must provide the TA with the opportunity to verify that the equipment and cables have been removed IAW with the specification.

Cable Label/Type	Source	Destination
C16 Coax	NDB Transmitter Electronics Equipment Room	NDB ATU Top of Wheelhouse
C15 Multi pair	NDB Transmitter Electronics Equipment Room	NDB ATU Top of Wheelhouse
N/A Feeder Cable	NDB ATU Top of Wheelhouse	NDB Antenna Top of Wheelhouse
C17 Multi-pair	NDB Transmitter Electronics Equipment Room	NDB Remote Control Unit Wheelhouse – Chart Table
RR-101-19 Power cable	NDB ATU Top of Wheelhouse	Panel RR-101 Circuit #19
N/A Power cable	NDB Transmitter Electronics Equipment Room	AC Outlet in Rack Circuit RR-101-11

18.8.3.4 Port side enclosure refurbishment

18.8.3.4.1 The Contractor must clean up any rust on the antenna's flange.

18.8.3.4.2 The Contractor must clean up any rust inside the enclosure.

18.8.3.4.3 The Contractor must replace the disrupted insulation after the new antenna and new ATU have been installed.

18.8.3.4.4 Refer to Figure 18.8-5 and figure 18.8-6 below for existing damage inside the enclosure.



Figure 18.8-5: Existing NDB ATU to be removed



Figure 18.8-6: Existing ATU Isolator

18.8.3.5 Equipment Installation

- 18.8.3.5.1 The Contractor must install the NDB Transmitter (Nautel P/N VR125TS) in Rack #3 in the communications Room, and IAW the modification drawing M017-MLM23-003, and the OEM instructions. Refer to Figure 18.8-7.



Figure 18.8-7: Nautel VR125TS

- 18.8.3.5.2 The Contractor must install the NDB Antenna Tuning Unit (ATU) (Nautel, P/N ATU500SRLOS) inside the enclosure on top of wheelhouse, and IAW the OEM instructions. The grounding stud must be properly grounded. Refer to Figure 18.8-8.



Figure 18.8-8 : ATU500SRLOS de Nautel

- 18.8.3.5.3 The Contractor must install the NDB Antenna (Comrod P/N AS1R) on top of the existing enclosure using the Canada supplied Antenna support. It must be installed IAW the OEM instructions.
- 18.8.3.5.4 The Contractor must install the NDB Remote Control (Nautel P/N ECMP3) on the chart table at a location to be agreed upon with the TA prior to installation work. The installation must be IAW the OEM instructions. Refer to Figure 18.8-9.



Figure 18.8-9 : ECMP3 de Nautel

- 18.8.3.5.5 The Contractor must install the NDB Remote Monitoring Interface (Nautel P/N VR-Link) in the EER IAW drawing M017-MLM23-003, and IAW the OEM instructions. Refer to figure 18.8-10.



Figure 18.8-10: Nautel VR-Link 2

18.8.3.6 Cable Installation

The Contractor must supply and install the cables (**CSM**) listed below IAW drawing LM601-280-WI Rev MLM.

Cable Label / Type	Source	Destination
NDB-01 LMR-400-UF-FR	NDB Transmitter RF OUT	NDB ATU RF IN
NDB-02 2C-16AWG	NDB Transmitter ATU 24Vdc Supply out	NDB ATU PWR IN
NDB-03 2PR-18AWG Shielded	NDB Transmitter ATU RS-485	NDB ATU RS-485 IN
NDB-04 2PR-18AWG Shielded	NDB Transmitter RS-232 Serial Connection	NDB Remote Site Monitoring RS-232 Input
NDB-05 2PR-18AWG Shielded	NDB Remote Site Monitoring RS-485 ECMPA	NDB Remote Control

Cable Label / Type	Source	Destination
		RS-485
NDB-06 3C-14AWG	NDB Remote Site Monitoring AC Power Input	EER Rack #4 Power Bar
NDB-07 3C-14AWG	NDB Transmitter AC Power Input	Communications Room Rack #3 Power Bar
NDB-08 Ground strap	NDB Transmitter Ground Stud	EER Rack #4 – Grounding point
NDB-09 Copper	NDB ATU Ground Stud	Grounding stud on Deck
NDB-10 Feeder cable	NDB ATU RF Output	NDB Antenna
NDB-11 CAT6A	NDB Remote Site Monitoring LAN Port	Electronics Equipment Room Rack #3 (Network)
NDB-12 TBD	NDB Remote Control PWR input	Local power Chart Table

18.8.3.7 Wiring Terminations

- 18.8.3.7.1 The Contractor must complete the wiring terminations for all cables IAW drawing LM601-280-WI Rev MLM.
- 18.8.3.7.2 Any wire terminating into a terminal block or terminal strip must be terminated using crimped ferrules.

18.8.3.8 Locations

Wheelhouse, Top of the wheelhouse, and the Electronics Equipment Room.

18.8.3.9 Interferences

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

18.8.4 Proof of Performance

18.8.4.1 Inspection Points

18.8.4.1.1 HOLD POINT 1: The Contractor must provide the TA with the opportunity to verify that equipment has been removed IAW this statement of work.

18.8.4.1.2 Cables continuity test is not required; however, all cables which have been installed by the Contractor that are found defective (fail continuity test) or damaged must be replaced by the Contractor at their expense (material and labour).

18.8.4.2 Testing / Trials

18.8.4.2.1 The Contractor must provide the TA with 5 days notice of completion of all hardware and cabling installation, specified herein, to allow for the coordination of an Installation Check (IC), testing, and commissioning activities. The Contractor shall not energize any system before the completion of these activities.

18.8.4.2.2 Canada and the FSR will perform an Installation Check (IC) of all Work specified herein to ensure conformity with this specification. The Contractor is responsible for all necessary corrections.

18.8.4.2.3 The Contractor must undertake to rectify defects and deficiencies in the Contractor's installation or repair work, as soon as practicable. The Contractor is responsible to schedule such repairs at its own risk and cost.

18.8.4.2.4 The Contractor must reschedule unsatisfactory inspections after the required repairs have been completed.

18.8.4.3 Commissioning

18.8.4.3.1 All commissioning and final set to work test activities related to the affected system(s) must be conducted by the FSR.

18.8.5 Deliverables

18.8.5.1 Documentation

18.8.5.1.1 The Contractor must supply final Redline As-Fitted drawings, in accordance with the Documentation section of the General Notes, for the following drawings:

Drawing Number & Revision	Drawing Title
M017-MLM23-003	Electronics Equipment Room Racks Layout Modification Drawing
LM601-280-WI (Rev MLM)	NDB Wiring Diagram

18.8.5.1.2 The Contractor must provide Canada with any OEM documentation such as operator manual, technical manual, maintenance manual, service manual, guides, MSDS, etc.

18.8.5.1.3 The Contractor must supply (two (2) copies – one (1) unprotected electronic and one (1) hard copy) of the commissioning and testing report to the TA, signed and dated by the attending FSR. This report must include all the tests performed during the commissioning with their short description, applicable parameters, as well as the result and values collected during each test.

18.8.5.2 Certification

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

18.8.5.3 Training

18.8.5.3.1 The FSR must provide one (1) training course of eight (8) hours duration to be held onboard after the final installation and commissioning of the gyrocompass system.

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The training shall be provided to the ship's personnel involved in the operation of the system. The training must encompass the items outlined in the operator manual as supplied by the manufacturer.

19.0 **SECURITY EQUIPMENT**

19.1 **INTEGRATION OF THE PROPULSION GENERATORS INTO THE EASY GEN SYSTEM**

19.1.1 **Identification**

- 19.1.1.1 The objective of this specification item is to perform the Integration of the propulsion generators to the Easy Gen power management system, as detailed herein.
- 19.1.1.2 For this Specification Item, the Work must be performed by a fully accredited MADSEN Field Service Representative (FSR) familiar with the operation, service and maintenance of the easy gen.
- 19.1.1.3 For the bidding purposes, the bid must include an allowance of \$300,000 to cover the cost of services and Material of the MADSEN FSR for execution of the work in this section. The \$300,000 allowance must form part of the overall bid and must be adjusted, up or down, by PSPC 1379 process upon receipt of the final TSR invoice supported by copies of all related documentation to verify actual expenses.
- Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 Process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses.
- 19.1.1.4 The bid must also include price for a total of 50 hours of work, by the Shipyard personnel, assisting this FSR. This price must be adjusted up or down by means of PSPC 1379 process based on actual hours spent assisting the FSR. For this purpose, the submitted invoice must be supported by timesheets signed by the FSR, confirming the actual time worked, and other related documents, if necessary.

19.1.2 **References**

19.1.2.1 Document

Drawing/Document Number/ Revision	Drawing/Document Title
405965	CCGC Martha Black - Woodward control upgrade
DMCA00049640	Installation Planning Instructions (Wartsila)

19.1.2.2 Specification Equipment data

Brand	Model	#Series	Arrangement	
WOOWARD	Easy gen 3500 XT p2		405965	

19.1.3 Technical Description

- 19.1.3.1 The Easy Gen power management. system (Woodward). onboard the ship control the governor of the three (3)propulsion generator and the auxiliary generator. This system has been install and approved by ABS in 2018 and is ready to receive the new Wartsila engine.
- 19.1.3.2 The MADSEN FSR must perform the Integration of the new Wartsila propulsion generators to the Easy Gen.
- 19.1.3.3 The technician must provide all materials, parts and specialized equipment to accomplish this work.
- 19.1.3.4 The FSR must remove the old engine from the easy gen system and integrate the new engine. The details for the connection are in the Wartsila document DMCA00049640 section 10 included in the item 12.4 of this SOW.
- 19.1.3.5 The FSR must modify the PMS PLC to have a soft modbus link to the PLC and collecting the information
- 19.1.3.6 The FSR must provide all the connections for Wartsila engine IO (KW feedback, breaker feedback, raise and lower, AVR, Etc)

19.1.3.7 The FSR must modify the lights and feedbacks on the ECR mimics

19.1.3.8 The Madsen FSR, in collaboration with Wartsila FSR and ABB FSR, must tune and calibrate the new engines

19.1.3.9 The FSR must be present during the installation and the sea trials.

19.1.4 **Proof of performance**

19.1.4.1 Inspection

Inspection points must be discussed with the ABS inspector prior to the start of work. It is the contractor's responsibility to call the ABS inspector at the appropriate time.

19.1.4.2 Tests

The FSR must do the calibration of the system and must be present during the sea trials to do the final calibration of the system. GCC Representative and ABB must be present during the tests

19.1.5 **Deliverables**

19.1.5.1 Documentation

The contractor must provide the IA and TA with a copy of the technician's reports and must update all documents related to the control system # 405965

19.2 ENGINE ROOM ALARM & MONITORING SYSTEM UPDATE

19.2.1 Identification

- 19.2.1.1 The objective of this item is for the Contractor to provide the services of TECHSOL Marine Inc. to update the existing engine room's Alarm and Monitoring System (AMS) to include the new propulsion generators.

NOTE: TECHSOL Marine Inc. is the OEM of the existing engine room monitoring system.

- 19.2.1.2 The Contractor/FSR must obtain the necessary ABS approvals, manufacture and/or procure, and supply the necessary equipment and components for the system upgrade.

- 19.2.1.3 For bidding purposes, the bid must include an allowance of \$30,000.00 to cover the cost of the services of TECHSOL Marine's (FSR) to perform the work in this section. The \$30,000 allowance must form part of the overall bid and must be adjusted, up or down, by PSPC 1379 process upon receipt of the final invoice from the FSR supported by copies of all related documentation to verify actual expenses.

Reasonable cost of travel and living expenses must be billed at cost without added overhead or profit. The associated cost will be addressed by way of PSPC 1379 process upon receipt of the related invoice supported by copies of all associated bills and documentation to verify actual expenses.

- 19.2.1.4 In addition to including the cost of labour, material and equipment related to the part of work to be performed by the TECHSOL Marine's (FSR), the bid must include price for a total of 50 hours of work, by the Shipyard personnel to assist the FSR. This price must be adjusted up or down by means of PSPC 1379 process based on actual hours spent assisting the FSR. For this purpose, the Contractor must submit invoice supported by timesheets signed by the FSR, confirming actual time worked, and other related documents, if necessary.

19.2.2 References

19.2.2.1 Documents

The following drawings and documents are applicable to the vessel and are to be considered as Guidance Drawings:

Drawing/Document Number/ Revision	Drawing Title
P032204-AM_DWG_RXX_COMM	Basic diagram - Alarm system
DMCA00044134	Engine mo dbus TCP list (Wartsila)
5660-85052-01	Cable list (Wartsila)
DMCA00049640	Installation Planning Instructions (Wartsila)

19.2.2.2 Regulations and Standards

19.2.2.2.1 All materials and work must meet the ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and purpose on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with the applicable Acts, Regulations, Standards, Rules, Codes and Guidelines.

19.2.2.2.2 Any TCMSS approvals, required for the design, material, and work, over and above the required ABS approvals, must be met as and when required.

19.2.2.2.3 The following listed Standards and Regulations apply, as the minimum but not in any order of priority, to the Work carried out in this section. The Contractor must ensure all Work, completed in this section, meet these Standards and Regulations as well as any other applicable Federal/Provincial Regulations and/or Standards not specifically listed here.

Standards & Regulations – Revision / Date	Title / Description
IEEE-45 (2002)	Recommended Practice for Electrical Installation on Shipboard

Standards & Regulations – Revision / Date	Title / Description
UL 1309 – 21 April 2017	Standard for Safety for Marine Shipboard Cable
Current Edition	ABS Classification Society Standards (Rules and Regulations) for vessel construction for vessels of the same type as this vessel
CSA C22.2 – No. 0-10 (2014)	General Requirements – Canadian Electrical Code Part II
TP 127E (2002)	Ship Safety Electrical Standards
CAN/CSA C22.2 No. 60529-2005 (R2015)	Degrees of protection provided by enclosures (IP Code)

19.2.3 **Technical Description**

- 19.2.3.1 All the work detailed in this Specification section must be performed by Techsol Marine Inc. FSR:
- 19.2.3.2 The FSR must remove all required wiring in connection with the AMS system for the old Alco engines.
- 19.2.3.3 The new wiring are include in Item 12.4 of this SOW
- 19.2.3.4 The FSR must provide all materials, and labor, to connect the new Wartsila engines to the engine room alarm monitoring system. If need The FSR must supply a detailed cable plan; and identify the new cables and cables that are to be reused, and include their list for inspection, testing and retagging.
- 19.2.3.5 The FSR must do all configurations, record keeping and required adjustments to the alarm and monitoring system, in order to achieve an operational propulsion system

19.2.3.6 The FSR must provide all the required software and labor to modify the system programming to incorporate the new engines alarm pages. Image 19.2.3.6 shows what the new alarm system page might look like.

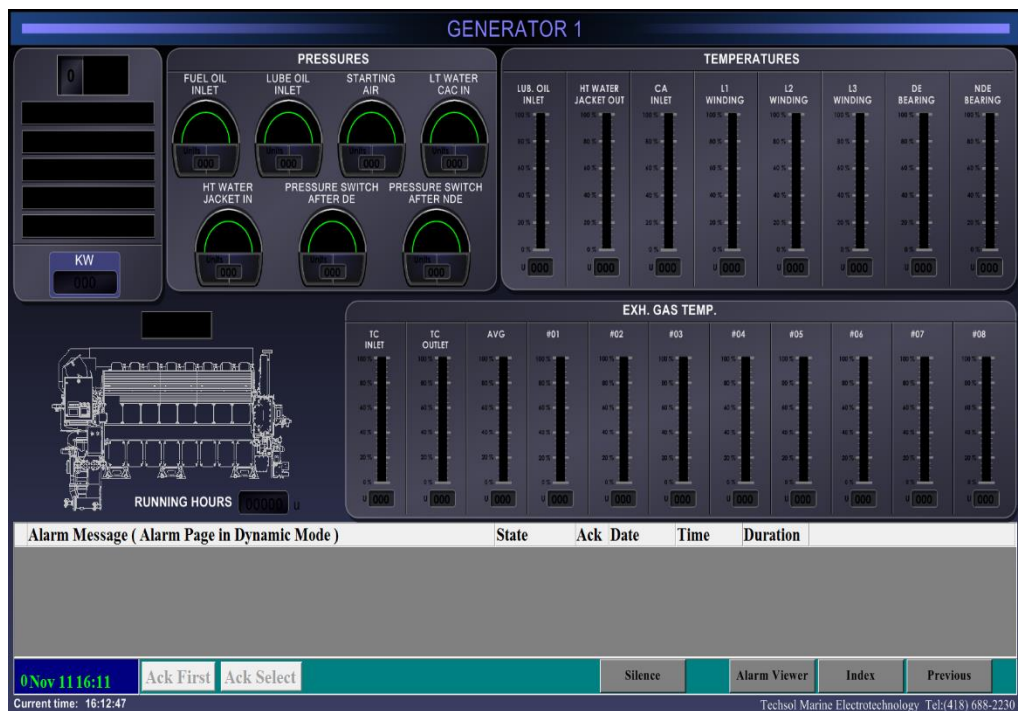


Figure 39.2.1 Generator Screen

19.2.3.7 The FSR must include an 8-hour block of work for minor modifications to the alarm system.

19.2.4 Proof of Performance

19.2.4.1 Inspection

- q) All components of the new installation must be inspected by IA and TA.

19.2.4.2 Testing

19.2.4.2.1 The Contractor/FSR must perform a functional test of all components and new alarm points.

19.2.4.2.2 The Contractor/FSR must observe all relevant hold points, and provide CCG with the opportunity to attend and witness tests, when required. The Contractor must provide CCG with at least Ten (10) calendar days' notice in order to allow for travel arrangements.

19.2.4.2.3 The Contractor must provide CCG with the opportunity to attend any FAT testing required by ABS. The Contractor must provide CCG with at least Ten (10) calendar days' notice in order to allow for travel arrangements.

19.2.4.2.4 The Contractor/FSR must provide a simple and effective simulation method to test the operation and safety features of this alarm System while the vessel is in port during Testing & Commissioning.

19.2.4.3

19.2.5 Deliverable

19.2.5.1 Documentation

19.2.5.1.1 The contractor/FSR must provide a report detailing all work performed.

19.2.5.1.2 The Contractor/FSR must update P032204-AM_DWG_RXX_COMM and provide one hard copy and one electronic copy of this document.

19.2.5.1.3 The Contractor/SFR must provide a System Manual for the newly upgraded Propulsion Control System.

19.2.5.1.4 Generic components' manuals, combined in a binder, will not be accepted.

19.2.5.1.5 The System Manual must be designed in accordance with the general principles described in Section 9.2 of document IEEE 45 (2002 Edition). The System Manual must include clearly identified sections designed to provide accurate information on the entire propulsion system. It must include as a minimum:

- General system overview and functional description for the system and components
- Handling, installation, storage and transit (how to prepare it for use)
- Operating Instructions
- Block diagrams and operational logic of the systems
- Trouble Identification Charts (how to restore operating condition)
- Maintenance instructions and schedules
- Test procedures to evaluate the operation and safety features of the complete system
- Illustrated parts list and descriptions (including critical spare parts list)
- Modification instructions (how to change spare parts), and
- Disposal instruction

19.2.5.1.6 To facilitate comprehension, the descriptive text must be accompanied as much as possible, by schematics, diagrams and/or photos providing a visual representation of the various elements presented.

19.2.5.1.7 Files must not be electronically protected or include Intellectual Property (IP) markings. CCG must be able to freely update all elements as needed to incorporate future changes.

19.2.5.2 Certification

19.2.5.2.1 The Contractor must submit to CCG all applicable class approvals and certifications, as well as FSR stamped documentation.

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

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20.0 NOT USED

21.0 **TEST TRIAL AND OTHERS**

21.1 **COMMISSIONING OF THE PROPULSION SYSTEM**

21.1.1 **Identification**

21.1.1.1 The objective of this specification is to provide a framework for the commissioning of the various propulsion related systems of the *CCGS Martha L. Black*, with the assistance of multiple subContractors to complete the commissioning tasks prior to completing the full range of dockside and sea trials.

21.1.2 **References**

21.1.2.1 Documents

Drawing/Document No. Revision / Date	Title / Description
Wärtsilä project documents	
DMCA00049640-Rev-a4	Installation Planning Instructions- Martha Black
DBAE591721	Commissioning Manual - <i>ML Black</i>
DBAE850253 RevA	Martha L Black ITP
ABB project documents	
3AFV6106125	Dock Trial Test Specification for CCGS T1100
3AFV6106242	Sea Trial Specification for CCGS T1100 Rev A

21.1.3 **Technical description**

21.1.3.1 General

21.1.3.1.1 Due to the Scope of work required for *CCGS Martha L. Black*, the Contractor must ensure that assets are in place to return the various propulsion systems and

interfaces to service. To facilitate this, Canada will provide a Wärtsilä Site Manager to the Contractor for the duration of the project under the existing Wärtsilä Propulsion Generator Replacement Contract. The contract and amendments are available at

<https://achatsetventes.gc.ca/donnees-sur-l-provisionnement/appels-d-offres/PW-ML-044-26020>

- 21.1.3.1.2 In addition to the Scope of work for the replacement of the propulsion generator sets, the Wärtsilä Site Manager will also be required to coordinate the development and execution of the final commissioning of the vessel with the Contractor's Project Manager.
- 21.1.3.1.3 Commissioning of the various systems on the vessel will require coordination of the following companies and inspectors who will comprise the integration team:
- Contractor - Project management and support for seconded representatives;
 - Wärtsilä Canada - Propulsion Generator Replacement and Site Manager
 - ABB - Integration and calibration of the cyclo converter and propulsion controls installed in 2019;
 - Techsol - Alarm and surveillance system upgrade,
 - Madsen - Integration and calibration of Easy Gen (Woodward regulator),
 - DNVGL - Inspectors of a classification society;
 - TCMS - Transport Canada Regulatory Inspectors;
 - ABS - Inspection company in delegation
 - AT - CCG Inspectors;
 - CA - PSPC Contracting Authority.
- 21.1.3.1.4 The Contractor must ensure during the course of the project that each party listed above meets its individual requirements for commissioning of all systems, this includes but is not limited to required support personnel, required services, and required prerequisites for commissioning.
- 21.1.3.1.5 The Contractor, in conjunction with the Wartsila Site Manager, must develop an Integrated Commissioning Plan to be provided to the TA, DNVGL and ABS for

review at least twenty (20) working days prior to commencing any commissioning tasks; this will allow time to review and develop hold points for the on-site inspector.

- 21.1.3.1.6 The Contractor must ensure that all parties are notified of the progress of commissioning on a daily basis to ensure that all relevant parties are present as required.
- 21.1.3.1.7 As commissioning progresses, the Contractor must adjust his schedule to accommodate delays or advances in system testing.
- 21.1.3.1.8 Each time a system is declared operational, subsequent systems may come on line. As subsequent systems come on line, the detached representative of the old system must be present to ensure proper interaction with the subsequent systems.
- 21.1.3.1.9 The Contractor must ensure that the requirements of Section G6 - Tests, Dockside Trials and Sea Trials are met in conjunction with the requirements of these specifications.
- 21.1.3.1.10 The Contractor must ensure that the dockside and sea trials include all necessary system testing, testing and inspection of individual parts of the integration team.
- 21.1.3.2 Commissioning of Wartsila
 - 21.1.3.2.1 The Contractor must ensure that the Wartsila commissioning process is followed as directed by the Wartsila Detached Representative services are provided under contract with Canada as outlined in items 12.4 - Propulsion Generator Replacement,
 - 21.1.3.2.2 Wartsila's seconded representative is responsible for executing Wartsila's commissioning plan, including all required configurations, measurements, record keeping, and adjustments to the propulsion generators, to achieve an operational propulsion system.
 - 21.1.3.2.3 The Contractor must retain the services of two (2) FSR working under the direction of Wartsila's seconded representatives for the duration of commissioning and all tests and trials performed on the vessel. The Contractor must provide a unit cost per day for an additional person to assist with commissioning, and must indicate the

final personnel to be on board as determined by the Contractor in consultation with the Wärtsilä Site Manager.

- 21.1.3.2.4 Canada must ensure that the seconded Wärtsilä representative provides the integration team with the commissioning requirements described in section 21.1.3.1 within two (2) weeks of contract award to allow for effective integration with other system commissioning plans.
- 21.1.3.3 ABB - Integration and calibration of cyclo-converter , installation of AVR and installation of pre-magnetization transformers. (item 12.5 and 12.6)
- 21.1.3.3.1 The Contractor must ensure that the ABB commissioning process is followed as directed by the Detached Representative.
- 21.1.3.3.2 The ABB Detached Representative is responsible for executing ABB's commissioning plan, including all required configurations, measurements, record keeping, and adjustments to the cycloconverters, to achieve an operational propulsion system.
- 21.1.3.3.3 The Contractor must retain the services of two (2) ABB Detached Representative, FSR for the duration of the cycloconverter commissioning and all tests and trials performed on the vessel.
- 21.1.3.3.4 Canada must ensure that the seconded ABB representative provides the integration team with the commissioning requirements described in Section 21.1.3.1 within two (2) weeks of contract award to allow for effective integration with other system commissioning plans.
- 21.1.3.4 Madsen - Integration and calibration of Woodward controllers
- 21.1.3.4.1 The Contractor must provide for the services of one Madsen Detached Representative FSR (Item 19.2) for supervision of the commissioning of the Woodward Regulator System. The actual cost must be adjusted up or down using PSPC 1379 Process.
- 21.1.3.4.2 Madsen's FSR is responsible for executing Madsen's commissioning plan, including all required configurations, measurements, record keeping, and

adjustments to the Woodward controller system, to achieve an operational propulsion system.

21.1.3.4.3 The Contractor must retain the services of one Madsen Detached Representative for the duration of the commissioning of the Woodward Regulator System and all tests and trials performed on the vessel.

21.1.3.4.4 The Contractor must ensure that the Madsen Detached Representative provides the integration team with the commissioning requirements described in Section 21.1.3.1 within two (2) weeks of contract award to allow for effective integration with other system commissioning plans.

21.1.3.5 Techsol Marine - AMS Update

21.1.3.5.1 The Contractor must provide for the services of one Techsol Marine Detached Representative to update the alarm and monitoring system (Item 19.1). The actual cost must be adjusted up or down using 1379 Process.

21.1.3.5.2 The Techsol Marine representative is responsible for all required configurations and adjustments to the alarm and monitoring system in order to achieve an operational propulsion system.

21.1.3.5.3 The Contractor must retain the services of one Techsol marine representative for the commissioning of the AMS system and all tests and trials performed on the vessel.

21.1.3.5.4 The Contractor must ensure that the Techsol Marine Detached Representative provides the integration team with commissioning requirements within two (2) weeks of contract award to allow for effective integration with other system commissioning plans.

21.1.4 Proof of performance

21.1.4.1 Inspections

21.1.4.1.1 The Contractor must ensure that all parties are notified of the progress of commissioning on a daily basis to ensure that all relevant parties are present as required for inspections in accordance with the Integrated Commissioning Plan.

21.1.4.1.2 The Contractor must publish and distribute to all integration team members an inspection schedule based on input from all integration team members. This master inspection list must be revised and redistributed as necessary to ensure all parties are present for inspections.

21.1.4.2 Test and trials

21.1.4.2.1 All tests and trials must be performed in accordance with the Detached Representative Commissioning Plans, the Integrated Commissioning Plan, and these specifications.

21.1.5 Deliverables

21.1.5.1 Documents

21.1.5.2 The Contractor must ensure that all detached representatives complete commissioning reports for their respective systems. At a minimum, the reports must include the following:

- Checklist for commissioning;
- Final system parameter folders;
- Reporting of component failures, damage and corrective actions;
- Final Commissioning Report from the Seconded Representative indicating compliance with the Commissioning Checklist and that the system is fully operational.

21.1.5.2.1 The Contractor must provide copies of all commissioning reports to the TA, DNVGL and ABS.

21.1.5.2.2 It is the Contractor's responsibility to ensure that an ABS official attends the tests and approves the items by signing the Ship's Hull and Machinery Inspection Record.

21.2 STABILITY TESTS

21.2.1 Identification

21.2.1.1 The purpose of this item is to perform stability testing of the CCGS Martha Black.

21.2.2 References

21.2.2.1 Document

Drawing/Document No. Revision / Date	Title / Description
Book-I	Intact trim and stability conditions
5660-152-005 Rev	Inclining Experiment Procedure

21.2.2.2 Regulations and Standards

All materials and work must meet ABS (applicable RO) and Transport Canada Marine Safety and Security (TCMSS) requirements for approval and use on the vessel. The Contractor must identify and coordinate any specific requirements in accordance with applicable laws, regulations, standards, rules, codes and guidelines.

The standards and regulations listed below apply, at a minimum but not in any order of priority, to work performed in this section.

Standards & Regulations - Revision / Date	Title / Description
TP7301	Vessel Stability
F1321-92	Standard Guide for Conducting a Stability Test
ABS-Guidance note	In-service hull stability verification July 2018

21.2.3 Technical description

21.2.3.1 Stability tests

- 21.2.3.1.1 At the first technical progress meeting, the Contractor must indicate the method used to control the movement of the vessel's weight and center of gravity. The Contractor must record any weight movement on the vessel, as well as any permanent weight removed or added to the vessel as part of the work.
 - 21.2.3.1.2 The Contractor must provide all materials and labor required to perform the testing. This includes, but is not limited to, weights, crane, small boat (zodiac) and naval architect.
 - 21.2.3.1.3 Prior to the commencement of work the Contractor must develop a procedure for stability testing and must submit it to ABS for approval.
 - 21.2.3.1.4 The Contractor must include in his price the services of the naval architect who will identify and calculate the non-original weights that have been added to the vessel.
 - 21.2.3.1.5 The Contractor must remove all weights on the foredeck from the vessel.
 - 21.2.3.1.6 The Contractor must remove all small boats, if applicable (Zodiac 733, Zodiac 472 and barge) from the vessel.
 - 21.2.3.1.7 The Contractor must provide a unit price to provide a 20ft long container to be used for temporary storage of vessel owned property. This container will be used for storage while the light condition test is conducted. Along with the container, the Contractor must provide labor for the handling of the goods from the vessel to the container prior to testing and from the container to the vessel upon completion of the work. The final quantity of container to be provided will be adjusted using a PWGSC1379
 - 21.2.3.1.8 The Contractor must provide a unit price for the storage of 40m3 of diesel fuel. The final quantity will be adjusted using a PWGSC1379 form.
 - 21.2.3.1.9 The Contractor must include in his price 10 freeboard measurement readings.
 - 21.2.3.1.10 The Contractor must conduct an inclining experiment, following the procedure described in document 5660-152-005 Rev- Inclining Experiment Procedure, in the presence of an ABS inspector and the naval architect, after completion of the work
-

and before delivery of the vessel. The results of the inclining experiment will form the basis for the stability and trim booklet.

- 21.2.3.1.11 The Contractor must prepare and provide a stability test report
- 21.2.3.1.12 The Contractor must provide a report of the draft mark surveys. These surveys must be taken using a land surveyor's instrument.
- 21.2.3.1.13 The Contractor must produce and provide a plan for the positioning of the draft marks.
- 21.2.3.1.14 The stability test and lightship verification must be conducted in accordance with ASTM F1321-92 and the ABS inspector's instructions.
- 21.2.3.1.15 The Contractor must refer to Section G5.4 of these specifications for documentation requirements for stability testing.

21.2.4 Proof of performance

21.2.4.1 Tests

- 21.2.4.1.1 All testing must be done to the satisfaction of the ABS inspector

21.2.5 Deliverables

21.2.5.1 Documentation

- 21.2.5.1.1 The Contractor must prepare and provide four (4) TCMS/ABS approved hard copy stamped copies of the CCGS *Martha L. Black* Stability Test Report, in both Imperial and Metric units, of the upgraded vessel. These reports must be delivered to the Technical Authority prior to the end of the contract.
 - 21.2.5.1.2 The Contractor must provide the Technical Authority with an electronic version of the stability test report via email, FTP server or USB device and in PDF file format. This must be a scanned copy of the ABS approved stability test report and must be delivered prior to the end of the contract.
 - 21.2.5.1.3 The Contractor must provide a report of the draft mark surveys. These surveys must be taken using a land surveyor's instrument.
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Buyer ID - Id de l'acheteur

F7049-210340/A

041MD

Client Ref. No. - N° de réf. du client

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

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21.2.5.1.4 The Contractor must produce and provide a plan for the positioning of the draft marks.