

CCGS SIR JOHN FRANKLIN Alongside Refit April 2020

at Victoria Coast Guard Base

Specification No:
F1782-20C186

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G1.0 GENERAL

G 1.0 GENERAL NOTES

G 1.1 Identification

G 1.1.1 Identification

G 1.1.1.1 These General Notes describe the CCG requirements applicable to all accompanying Technical Specifications.

G 1.1.2 Vessel Details

| | |
|----------------------|--|
| Name: | CCGS SIR JOHN FRANKLIN |
| Official No.: | 842730 |
| IMO No.: | 9781839 |
| Type: | Fisheries Science Research Vessel |
| Ice Class: | PC 7 |
| Year Built: | 2019 |
| Notation | LR ✱100A1, Fisheries Science Research Vessel, Ice Class (PC 7), ✱LMC, UMS, NAV1 IBS |
| Port of Registry | Ottawa |
| Flag of Registry | Canada |
| Owner | Department of Fisheries and Oceans |
| Builder | Seaspan – Vancouver Shipyards |
| Hull Number | 190 |
| Date Keel Laid | 07 August 2015 |
| | |
| Gross Tonnage | 2,975 |
| Net Tonnage | 892 |
| Length Overall (MLD) | 63.39 m |
| Breadth Overall | 16.034 m |
| Design Displacement | 3,259 MT |
| Deadweight | 792.8 MT |
| Propulsion | 3 x Caterpillar 3512C 12-cylinder 1630kW diesel electric with 1 Indar 2250kW electric motor driving a 3.8m fixed pitch propeller. One bow thruster fitted. |

G 1.1.3 Equipment

G 1.1.3.1 Not Used.

G 1.2 References**G 1.2.1 Regulations**

G 1.2.1.1 All regulations, standards, publications, and procedures listed below are to be used as reference. The Contractor will ensure all work completed in the specification is done to all pertinent federal and provincial regulations and standards. CCG procedures are to be used as a guide if no other regulation takes precedence.

G 1.2.1.2 In the following table the last column indicates if the document will be supplied to the Contractor by CCG or if it must be procured by the Contractor. “N/A” means that the document is not relevant to this specification.

| FSM Procedures | Title | Supplied by |
|-------------------------------|--|--------------------|
| FSM | Fleet Safety Manual (Latest Edition) including: 7.A.12 Potable Water Quality 7.B.2 Fall Protection 7.B.3 Entry Into Confined spaces 7.B.4 Hotwork 7.B.5 Lockout and Tagout 7.B.6 Electrical Safety – Working on Energised Electrical Conductors or Circuit Parts 10.A.7 Contractor Safety and Security | CCG |
| Publications | | |
| TP 127 | Ships Electrical Standards | Contractor |
| TP 14231 | Marine Occupational Health and Safety Program | Contractor |
| IEEE 45 | Institute of Electrical and Electronics Engineers, Recommended Practice for Electrical Installations on Shipboard | Contractor |
| Other Documents | | |
| EKME#3049715v4 | CCG Welding Specification-eng (Mar 2014) | CCG |
| F20200403 - COVID-19-NSOP-511 | Minimum Screening Process for Coast Guard Personnel Accessing a Contractors Facility During an Infectious Disease Outbreak such as COVID-19 | CCG |
| S62-190-631.00-001_OFSV 190 | OFSV 190 Coatings and Surface Treatment Schedule, Rev AB | CCG |

| | | |
|-----------------------------|--|-----|
| S62-10-30 | Survitec Zodiac Liferaft Owner's Manual_2014_[OFSV000373] | CCG |
| S62-13-02 | Caterpillar 3512C 3516C Generator Sets Operation and Maintenance Manual_2015 | CCG |
| S62-13-03 | Caterpillar 3512C Marine Engine Parts Manual_2013 | CCG |
| S62-16-24 | Holland Marine Services Amsterdam Petsea Reverse Osmosis SW-Y 80 90 Instruction and Operation Manual_2014_[OFSV000286] | CCG |
| S62-18-132 | Entertainment Distribution System System Design Specification_Rev AB_2019_[190-433.10-005] | CCG |
| S62-190-631.00-001_OFSV 190 | Coatings and Surface Treatment Schedule_Rev AB | CCG |

| Standards | | |
|--------------------|---|------------|
| CSA W47.1 | Certification of Companies for Fusion Welding of Steel Structures Division 2 Certification | Contractor |
| CSA W59 | Welded Steel Construction – Metal Arc Welding | Contractor |
| 18-080-000-SG-001 | Welding of Ferrous Materials | Contractor |
| ISO 9712:2005 | International Standards for NDT | Contractor |
| ISO 8501-1:2007 | Preparation of steel substrates before application of paints and related products | Contractor |
| ISO 10816-1:1995 | Mechanical vibration -- Evaluation of machine vibration by measurements on non-rotating parts -- Part 1: General guidelines | Contractor |
| NEMA 250-2003 | Enclosures for Electrical Equipment (1000 Volts Maximum) | Contractor |
| SSPC | Society for Protective Coatings | Contractor |
| IACS No.47 | Shipbuilding and Repair Quality Standard | Contractor |
| Regulations | | |
| ABS | Steel Vessels Under 90 Meters in Length (2019), Part 7 – Rules for Survey After Construction | Contractor |
| CSA 2001 | Canada Shipping Act 2001 | Contractor |
| C.R.C., C. 1432 | Hull Inspection Regulations | Contractor |
| C.R.C., c. 1436 | Life Saving Equipment Regulations | Contractor |
| SOR-2016-43 | Potable Water on Board Trains, Vessels, Aircraft and Buses Regulations | Contractor |
| SOR-2017-14 | Vessel Fire Safety Regulations | Contractor |

| | | |
|----------------------|--|------------|
| SOR/90-264 | Marine Machinery Regulations | Contractor |
| MOHS | Maritime Occupational Health and Safety | Contractor |
| CLC | Canada Labour Code (R.S.C., 1985, c. L-2) | Contractor |
| WorkSafe BC | Occupational Health and Safety (OHS) Regulations | Contractor |
| SOLAS 1974 | SOLAS 1974 as amended, Regulation II-2/3.4 & II-2/9 | Contractor |
| Load Lines | 1966/1988 - International Convention on Load Lines, 1966, as Amended by the Protocol of 1988 | Contractor |
| R.S.C., 1985, c. L-2 | Canada Labour Code | Contractor |

G 1.2.2 Guidance Drawings

G 1.2.2.1 The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes. Once listed, a drawing name is not repeated in this list – see specific specification section.

| Drawing Number | DRAWING TITLE |
|--------------------|---|
| S62-190-077 | Fire Control and Safety Plan_Rev 3 |
| 190-077.00-003 | Fire Zone Drawing As-Built |
| 190-101.00-009 | Profile and Decks (Mid Zone) As-Built |
| 190-151.00-001 | Deckhouse Structure As-Built |
| S62-190-304.00-541 | Cable Node Plan_Rev AB |
| S62-190-304.00-003 | OFSV Cable Schedule_Rev AB |
| S62-190-201.10-001 | Machinery Arrangement_Rev AB |
| S62-190-201.20-001 | Equipment Removal Routes_Rev AB |
| 190-324.10-235 | Electrical System One Line Diagram As-Built |
| 190-432.00-004_RAB | Integrated Communication System Single Line Diagram Asbuilt |
| 190-432.20-510 | Integrated Communication System Cable Diagram Asbuilt |
| 190-433.10-002_RAB | Entertainment Distribution System Block Diagram Asbuilt |
| 190-501.00-001 | Material Standard for Pipes, Valves and Fittings As-Built |
| 190-512.10-205 | Single Line Diagram Ventilation System Asbuilt |
| S62-190-526.00-001 | Deck Scuppers and Drains System Diagram_Rev AB |
| 190-528.10-001 | Black and Grey Water System Diagram As-Built |
| 190-533.10-002 | Domestic Fresh Water System Diagram As-Built |
| S62-190-583.20-001 | Lifesaving Equipment Plan_Rev AB |
| 190-601.00-001 | General Arrangement As-Built |
| 190-601.00-007 | joiner ceilings rev 0 |
| S62-190-602.00-001 | Hull Designation and Markings_Rev AB |
| 190-621.00-002 | Joiner Bulkhead Layout 02 Level, REV 6 |
| 190-624.10-003 | Joiner Door Schedule and Details Asbuilt |
| 190-625.00-001 | Windows and Portlights Schedule As-Built |

| | |
|---------------------------------------|---|
| 190-635.00-003 | Insulation Arrangement As-Built |
| 190-635.00-002 | Insulation Details Booklet As-Built |
| 190-637.00-002 | Sheathing Arrangement and Details REV 13 |
| 190-637.10-002 | Ceiling arrangements and details REV.13 |
| 190-637.10-003 | Lining and Ceiling Plan Sht1to6 Rev5 |
| 190-641.00-002 | Officers Accommodation Arrangement As-Built |
| 190-644.00-002 | Toilet and Shower Modules As-Built |
| S62-190-661.00-002 | Office Arrangement_Rev AB |
| 70860-15 | SEASPAN OSFV WINDOW LAYOUT DRAWING |
| | |
| Cabin Re-Alignment Design Drawings | |
| 1183-601 | General Arrangement |
| 1183-602 | Reflected Ceiling Plan |
| 1183-603 | Finishing Schedule RA |
| 1183-604 | Strip Out |
| 1183-610-01 | Bunk |
| 1183-610-02 | Desk Drawers |
| 1183-610-03 | Desktop |
| 1183-610-04 | Shelf |
| 1183-610-05 | Dresser |
| 1183-610-06 | Wardrobe |
| 1183-610-07 | Office Safe Cabinet |
| 1183-620-01 | Port Fwd Cabin |
| 1183-620-02 | Port Aft Cabin |
| 1183-620-03 | Stbd Aft Cabin |
| 1183-620-04 | Stbd Fwd Cabin |
| 20-106-512-03 | Cabin HVAC Layout |

Tanks

G 1.2.2.2 Listed are the tanks found on board the CCGS Sir John Franklin with their Location by frame number and capacity (Where available). These are to be used as reference only and will not supersede any specification.

| No. | Tank Designation | Location | Volume (m ³) |
|-----|----------------------------|----------|--------------------------|
| | WATER BALLAST TANKS | | |
| 1 | WB_FP.C | 01 DECK | 13.1 |
| 2 | WB_2.P | 01 DECK | 38.8 |
| 3 | WB_2.S | 01 DECK | 38.8 |
| 4 | WB_3.P | 01 DECK | 46.6 |

| | | | |
|-----------|--|--------------------|-------|
| 5 | WB_3.C | 01 DECK | 36.6 |
| 6 | WB_3.S | 01 DECK | 44.0 |
| 7 | WB_STAB.C | MAIN DECK | 80.1 |
| 8 | WB_4.P | 01 DECK | 31.5 |
| 9 | WB_4.S | MAIN DECK | 31.5 |
| | | | |
| | FUEL OIL STORAGE TANKS | | |
| 10 | FO_1.P | MAIN DECK | 28.6 |
| 11 | FO_1.S | MAIN DECK | 28.6 |
| 12 | FO_2.P | MAIN DECK | 59.7 |
| 13 | FO_2.S | MAIN DECK | 61.8 |
| 14 | FO_3.P | MAIN DECK | 13.3 |
| 15 | FO_3.S | MAIN DECK | 18.7 |
| 16 | FO_4.P | MAIN DECK | 64.4 |
| 17 | FO_4.S | MAIN DECK | 64.4 |
| 18 | FO_DAY.P | MAIN DECK | 9.7 |
| 19 | FO_DAY.S | MAIN DECK | 9.7 |
| 20 | FO_SETT.C | MAIN DECK | 19.3 |
| | | | |
| | MISC FUEL OIL TANK | | |
| 21 | FO_OVER.S | MAIN DECK | 3.2 |
| | | | |
| | FRESH WATER TANKS | | |
| 22 | FW.P | 01 DECK | 22.5 |
| 23 | FW.S | 01 DECK | 22.5 |
| | | | |
| | CAPACITY OF VOID SPACE | | |
| 24 | VOID_1.C | 01 DECK | 22.2 |
| 25 | VOID_2.C | 01 DECK | 57.1 |
| 26 | VOID_4.C | MAIN DECK | 55.1 |
| 27 | VOID_5.C | MAIN DECK | 36.9 |
| 28P & 28S | VOID_6.C | MAIN DECK | 89.5 |
| 29 | VOID_7.C | MAIN DECK | 118.4 |
| 30P & 30S | VOID_8.C | MAIN DECK | 22.2 |
| | | | |
| | CAPACITY OF MISCELLANEOUS TANKS | | |
| 31 | OW.P | 01 DECK | 19.8 |
| 32 | SLUDGE.S | MAIN DECK | 19.8 |
| 33 | SEABAY.P | 01 DECK | 18.7 |
| 34 | SS.P | EXHAUST CASING TOP | 4.1 |

| | | | |
|----|--------------------------------|----------------|-----|
| 35 | GW.S | WHEELHOUSE TOP | 4.1 |
| | | | |
| | PERMANENT BALLAST TANKS | | |
| 36 | VOID_2.S | | 3.5 |
| 37 | VOID_8.S | | 4.9 |
| 38 | VOID_9.S | | 1.8 |

G 1.2.3 Abbreviations

| | |
|-------------|--|
| ABS | American Bureau of Shipping |
| ACM | Asbestos Containing Material |
| CA | Contract Authority (PWGSC) |
| CCG | Canadian Coast Guard |
| CFM | Contractor Furnished Material and/or equipment |
| CLC | Canada Labour Code |
| CSA | Canadian Standards Association |
| CWB | Canadian Welding Bureau |
| DFO/CCG | Department of Fisheries and Oceans, Canadian Coast Guard |
| DFT | Dry Film Thickness |
| EDS | Entertainment Distribution System |
| FSSM or FSM | Fleet Safety Manual (CCG) |
| FSR | Manufacturer's Field Service Representative |
| FTP | Fire Test Procedures Code |
| GSM | Government Supplied Material and/or equipment |
| HC | Health Canada |
| IACS | International Association of Classification Societies |
| ICS | Integrated Communications Systems |
| IEEE | The Institute of Electrical & Electronic Engineers Inc. |
| ITS – ME | Integrated Technical Services, Marine Engineering |
| ITS – E&I | Integrated Technical Services, Electronics & Informatics |
| LOA | Length Overall |
| LAN | Local Area Network |
| MSDS | Material Safety Data Sheet |
| NDT | Non Destructive Testing |
| OEM | Original Equipment Manufacturer |
| OHS | Occupational Health and Safety |
| PSPC | Public Services and Procurement Canada |
| SSMS | Safety & Security Management System |
| SOLAS | Safety Of Life At Sea Convention |
| RO | IACS societies that are Recognized Organization as defined by the Canada Shipping Act 2001, Part 4, policy on authorized classification societies. |
| TA | Technical Authority -CCG Superintendent, Marine Engineering Western Region, or her delegated Representative. |
| TBS | Treasury Board of Canada Secretariat |

| | |
|------|--------------------------------------|
| TCMS | Transport Canada Marine Safety |
| TI | Technical Inspector – CCG delegated. |
| VCA | Vessel Condition Assessment |
| WCB | WorkSafe British Columbia |

G 1.2.4 List of GSM Material

G 1.2.4.1 A GSM material List will be added as Appendix 1 to Annex A.

G 1.3 Conditions and Definitions

G 1.3.1 The following conditions and definitions are applicable to all work contained in the Specifications and are intended to outline the quality of workmanship and practice that is the minimum acceptable level:

- a) the word "install" means that the Contractor must connect mechanically and electrically and provide the labour and materiel to complete the installation;
- b) the word "reinstall" means a piece of equipment that the Contractor has effected repairs on and is to be returned/installed in its original location and be mechanically and electrically connected. The Contractor must provide the labour and materiel to complete the reinstallation;
- c) the word "remove" means that the Contractor must provide all labour and materiel to remove the unit, equipment, materiel, or system in its entirety. Part of the removal process is to blank openings, restore insulation and paint;
- d) the word "relocate" means that the Contractor must provide all labour and material to remove the unit, piece of equipment, or system and to install the same unit, piece of equipment, or system in the new location;
- e) the term "or equivalent" means a substitute which has equal characteristics i.e. (size, materiel type, life, weight, input, and output) as approved by the TA. A comparison of the general specifications must be provided to the TA for the equipment specified and the "or equivalent" (i.e. old compared to the new);
- f) the term "overhaul" as applied to any mechanical equipment, structure or system comprises: disassembly into component parts; cleaning examination of parts for defects; gauging of parts for wear; reporting of parts worn beyond specification limits or otherwise defective and reassembly followed by specification adjustments; tests; and functional trials;

- g) the word "disconnect" means the Contractor must mechanically and electrically disconnect the piece of equipment of all piping, wiring, seatings and other attachments permitting the removal of the unit as a whole;
- h) the word "disassemble" means that the Contractor must provide all labour to take apart, piece by piece, the equipment, machinery or system to be examined or repaired;
- i) the word "reassemble" means that the Contractor must provide all labour and material to put together, piece by piece, the equipment, machinery or system on completion of examination or repair;
- j) the words "PSPC Work Arising" means the Procedures for Design Change or Unscheduled Work, as defined in the Solicitation and Contract, and includes any additional work required on a system, sub-system or equipment which the original specification did not specify;
- k) the word "calibrate" means the adjustment of readings and measurements to a known standard;
- l) the word "check" means that the Contractor must provide labour to find faults by sighting, feeling or listening. The checking of any equipment does not involve the disturbance or removal of parts, components or sub-assemblies;
- m) the word "examine" means that the Contractor must provide labour for the process of systematically examining, checking and testing equipment, records or administrative procedures to detect actual or potential defects or errors;
- n) the word "test" means that the Contractor must provide labour to conduct the operation of a unit in relation to a stated standard or procedure;
- o) the words "set-to-work" means the tuning, alignment and adjustment of equipment/systems required subsequent to satisfactory installation. Inspection to make the equipment/systems ready for technical acceptance trials;
- p) the word "trials" is an element of QA that means an action(s) by which the Contractor proves by a visual or instrumental presentation that the equipment or system satisfies the requirements of the specified trials agenda; and
- q) the term "functional test" means operation of a piece of equipment in all its normal operating modes and throughout its operating range to establish that it will perform its designed function within normal operating parameters as indicated in the manufacturer's documentation.

- r) The words “Close-up Survey” mean a survey where the details of structural components are within the close visual inspection range of the Surveyor, i.e., normally within reach of hand.

G 1.4 Miscellaneous Information

G 1.4.1 Occupational Health and Safety

- G 1.4.1.1 The Contractor and all sub-contractors must follow Occupational Health and Safety (OHS) procedures in accordance with applicable federal and provincial OHS regulations ensuring that Contractor activities are carried out in a safe manner and do not endanger the safety of any personnel. The Contractor and Contractor’s employees will not have access to the vessel’s washrooms, crew mess facilities, or galley. The Contractor must provide the necessary amenities as required by specification item S 1.6.
- G 1.4.1.2 When the Contractor has Care and Custody of the vessel, the Contractor’s Safety Management System, must be in effect and must be in accordance with the applicable OHS regulations and procedures.
- G 1.4.1.3 When the Contractor works on the vessel while in the Care and Custody of the Canadian Coast Guard, the Safety Management System of CCG must be followed.
- i) The Contractor and the Contractor’s employees, including any sub-contractors must attend a safety orientation meeting of the vessel prior to the commencement of any work in order to familiarize the Contractor’s employees with ship specific hazards and permit systems for work protocols as well as procedures for Security, Hazard Prevention, Hazard Intervention and Pre-Job Safety Assessments. The Contractor will have access to an uncontrolled copy of the Fleet Safety Manual (FSM).
- ii) The Contractor must comply with the FSM and shipboard work instructions, in addition to the applicable Canada Labour Code regulations, while performing work involving the following;
- Hot Work;
 - Work Aloft;
 - Confined Space Entry;
 - Gas Freeing for Entry and Hot Work;
 - Lock Out/Tag Out;
 - Pre-Job Safety Assessments

- iii) For the purpose of the Lock Out/Tag Out procedure the Contractor must supply locks and locking devices for the Contractor's employees in addition to those provided by the Chief Engineer for the ship's crew.
- iv) The Contractor and Contractor's employees will not have access to the vessel's washrooms and crew mess facilities. The Contractor must provide the necessary amenities for the Contractor's and sub-contractors employees as required.

G 1.4.1.4 The Contractor must identify a specified person who is responsible for the safety management of the work site. The Safety Manager must insure that daily safety rounds are carried out and that safety issues are identified and safety precautions are maintained.

G 1.4.1.5 Areas that pose a hazard as a result of the specification work are to be secured and clearly identified by the Contractor with signage to advise and protect all personnel from the hazard in accordance with applicable regulations.

G 1.4.1.6 The Contractor must follow the Covid-19 requirements set out in the document 20200403 – COVID-19-NSOP-511.

G 1.4.1.7 The Contractor must present all Covid-19 related requirements to the CGG to be implemented by the TA and applicable CG Staff.

G 1.4.2 Lead Paint and Paint Coatings

G 1.4.2.1 The Contractor must not use lead based paints.

G 1.4.2.2 CCG ships 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 may release this lead from the coatings. The CCG will provide copies of all available lead testing results.

G 1.4.3 Asbestos Containing Materials (ACM)

G 1.4.3.1 The Contractor must use insulation that contains 0% ACM.

G 1.4.3.2 The Contractor will be supplied the most recent copy of the vessel's Inventory Of Hazardous Materials, by CCG prior to Assumption of Custody.

G 1.4.3.3 Handling of any asbestos containing materials must be performed by trained personnel and/or a company certified in the removal of asbestos in accordance with Federal, Provincial and Municipal regulations.

G 1.4.3.4 The Contractor must provide the TA with disposal certificates for all asbestos containing material removed from the vessel indicating that the disposal was in accordance with Federal, Provincial and Municipal regulations in effect.

G 1.4.3.5 The vessel maintains an Inventory Of Hazardous Materials under RO's Register which states in Part A.1A Summary of Asbestos Status: Material Declarations confirms that no asbestos has been used in the construction of this vessel. The Contractor must provide an "Observation Report (OR)" with reference to any concerns or intentions in regards to asbestos containing materials not already specified. Any approved work resulting from the OR will follow the Additional Work Procedures.

G 1.4.4 Confined Spaces

G 1.4.4.1 Prior to commencing work in any confined space, the Contractor must ensure that a qualified person issues a "Gas Free Certificate" for that space. Certificates must specify, "Safe for persons" or "safe for hot work" as appropriate. Contractor must adhere to the safety management system requirements as determined in the Pre-Work Meeting. All copies of certificates generated are to be provided to the TA in accordance with the Documentation section of the General Notes.

- i) With the ship in care and custody of the CCG, the issuance of confined space entry certificates must be in accordance with FSM requirements. The Contractor must conduct space testing and must issue their own confined space entry certificates and hot work permits for the contracted work.
- ii) For other work outside the Contract, the Chief Engineer will issue permits under the requirements of the Fleet safety Manual (FSM) section 10.A.7 Contractor Safety and Security (ship in CCG custody), and the FSM sections 7.B.3 and 7.B.4 for Entry into Confined Spaces and Hotwork.

G 1.4.4.2 Any entry into confined spaces onboard the vessel during the contract period must be conducted in accordance with the safety management system as determined in the Pre-Work Meeting.

G 1.4.5 Hot Work

G 1.4.5.1 The Contractor must, as a minimum, ensure the following items are followed when conducting hot work while in their care and custody:

- a) The compartment(s) affected must be certified gas free by a qualified person. Certificates must specify, "Safe for persons" or "safe for hot work" as appropriate. The Contractor must post a copy of all certificates at the entrance to the affected spaces. With the ship in care and custody of the CCG, the posted certificates must be issued by the Chief Engineer.

- b) With the ship in care and custody of the CCG, the issuance of Hot Work Permits must be in accordance with FSM requirements. The Contractor must issue their own hotwork permits for the contracted work.
- c) The Contractor must remove from the vicinity all portable combustible materials within 2m of hot work;
- d) The Contractor must use protective material must be used to prevent the spread of sparks, protecting electrical cables and other services;
- e) The Contractor must provide fire sentries in each space and in the adjacent space where welding, grinding, or burning is being carried out on bulkheads, deck-heads or decks. Fire sentries must be provided with an appropriate fire extinguisher (Contractor supplied) and must be trained in its use. The fire sentry must maintain a watch in his designated area for at least thirty (30) minutes after any hot work has been completed.

G 1.4.5.2 Any hot work carried out onboard the vessel during the contract period must be conducted in accordance with the FSM.

G 1.4.6 Contractor Welding Requirements

G 1.4.6.1 All welding must be done in accordance with the requirements of the document CCG Welding Specification, EKME#3049715v4. The requirements include:

- iii) All welding contractors for steel work must be certified by the CWB to CSA Standard W47.1 Division 1 or 2.
- iv) All welding contractors for aluminum work must be certified by the CWB to CSA Standard W47.2 Division 1 or 2.
- v) All welding procedure specifications and/or welding procedure data sheets must be reviewed and approved by the CWB prior to use.
- vi) All welding personnel must be approved by the CWB prior to their commencing any welding work.
- vii) All performance and procedure qualification testing must be fully witnessed and documented by the CWB.
- viii) All Contractors must submit their welding personnel qualification records and approved welding procedures to the TA prior to commencing any welding work. All welding procedures, including welding procedure specifications and welding procedure data sheets, must include an indication of acceptance by the

Contractor (by signature, seal or other appropriate means) and a stamp of acceptance by the CWB.

- ix) For structural steels > 3 mm in thickness, welding must meet the requirements of CSA Standards W47.1 and W59, except as modified by this Specification.
- x) For structural aluminum > 3 mm in thickness, welding must meet the requirements of CSA Standards W47.2 and W59.2, except as modified by this Specification.

G 1.4.6.2 Weld Design must be to the Rules of a Classification Society that is an approved Recognized Organization by Transport Canada Marine Safety and Security. Unless otherwise approved by the Delegated Representative, the following conditions must be met:

- i) All groove welds in butt joints must be full penetration; and,
- ii) All corner joints must be full penetration groove welds combined with single continuous fillet weld.

G 1.4.6.3 A weld design schedule must be submitted to the Delegated Representative in drawing form for review prior to commencing any welding work

G 1.4.7 Work Aloft

G 1.4.7.1 Any work aloft onboard the vessel during the maintenance/refit period must be conducted in accordance with the FSM. Notices must be placed to prevent operation of Radars while personnel are working aloft on the mast or on the wheelhouse top.

G 1.4.8 Electrical Equipment

G 1.4.8.1 With the ship in care and custody of the CCG, the Lock Out/Tag Out procedure of the FSM must be followed. For each circuit worked on by the Contractor, locks and locking devices must be applied by both the Contractor and by the CCG.

G 1.4.8.2 When working on electrically operated equipment, the following precautions must be taken at a minimum:

- a) All electrical equipment undergoing work must be isolated at the main power and alternate distribution panel;
- b) Electrical lock-outs must be used to isolate the equipment and electrical caution tags posted at the main power and distribution panel on those switches supplying equipment under maintenance and verification made at the terminals to ensure power is not present.

- c) Only after completion of the work must the lock-outs and electrical caution tags be removed and the switches engaged.

G 1.4.8.3 Any lock-out requirements onboard the vessel during the contract period must be conducted in accordance with the safety management system.

G 1.4.8.4 The TA must be notified of all such ongoing work.

G 1.4.8.5 All electrical installations or renewals must be in accordance with the following Marine Standards:

- i) TP 127 – Ship Safety Electrical Standards
- ii) IEEE Standard 45 – Recommended Practice for Electrical Installation on Shipboard.

G 1.4.9 Workplace Hazardous Materials Information System (WHIMS)

G 1.4.9.1 The Contractor must provide the TA with Material Safety Data Sheets (MSDS) for all Contractor and sub-contractor supplied WHIMS controlled products. MSDS sheets are to be the formats requested in the Documentation section of the General Notes.

G 1.4.9.2 All MSDS sheets must be maintained in accordance with OHS procedures.

G 1.4.9.3 The TA will provide the Contractor with access to MSD sheets for all controlled products on the ship for all specified work items on request.

G 1.4.10 Smoking in the Work Space

G 1.4.10.1 The Contractor must ensure compliance with the Non- Smokers' Health Act. The Contractor must ensure that there is absolutely no smoking onboard the vessel by their employees, sub-contractors, including the employees of any sub-contractors.

G 1.4.10.2 The ship has one smoking lounge in the port aft cabin on the Upper Deck. CCG crew only are allowed to smoke in this cabin.

G 1.4.11 Touch-up / Disturbed Paint

G 1.4.11.1 The Contractor must prepare and coat all touch-up work in accordance with the paint specification provided for the particular area involved in accordance with the Coatings and Surface Treatment Schedule.

G 1.4.12 Contractor Furnished Materials (CFM) and Tools

G 1.4.12.1 The Contractor must ensure replacement material such as jointing, packing, insulation, small hardware, oils, lubricants, cleaning solvents, preservatives, paints,

coatings etc. are in accordance with the equipment manufacturer's drawings, manuals and/or instructions.

G 1.4.12.2 Where no particular item is specified or where substitution must be made, the Contractor must submit an Observation Report indicating the substitution or item not specified to the TA. The Contractor must provide information about materials used, certificate of grade and quality of various materials to the TA prior to use.

G 1.4.12.3 The Contractor must provide all equipment, devices, tools and machinery such as crange, staging, scaffolding, hoarding, and rigging necessary for the completion of the work in this specification.

- i) A CCG mobile shore crane and a forklift may be available to lift loads for the contractor. This is contingent on availability of the CCG operator.
- ii) If contracted crane services are required, unless specifically required to be bid on in a technical specification item, it will be by 1379 work arising action.
- iii) There are loading restrictions at the north end of the wharf where the ship will be tied up. These are detailed in a separate document.

G 1.4.12.4 The Contractor must deliver and store all new **CFM** equipment at their facility. The **CFM** must be stored in a secure, environmentally controlled space in accordance with the equipment storage section of this specification.

G 1.4.13 Government Supplied Materials (GSM) & Tools

G 1.4.13.1 All tools are Contractor supplied unless otherwise stated in the technical specifications.

G 1.4.13.2 Where tools are supplied by the TA they must be returned by the Contractor in the same condition as when they were borrowed. Borrowed tools must be inventoried and signed for by the Contractor on receipt and return to the TA.

G 1.4.13.3 Any **GSM** not specifically stated in the Technical Specification must be received by the Contractor and stored in accordance with the Equipment Storage section of this specification. These activities are to be covered by the PSPC Work Arising, Procedures for Design Change or Additional Work.

G 1.4.14 Storage

G 1.4.14.1 Equipment (i.e. covers, cowlings and other items that may need to be removed and stored) must be stored in accordance with the equipment manufacturer's or equipment vendor's specific storage instructions. The Contractor must make these instructions available to the TA.

G 1.4.14.2 All equipment and items must be stored in such a manner so as to be easily accessible for inspection. No items are to be stored directly on floors.

G 1.4.15 Regulatory Inspections and/or Class Surveys

G 1.4.15.1 The Contractor must contact, coordinate, schedule, and be completely prepared for all regulatory inspections and surveys by the applicable authority: i.e. ABS, HC, Environment Canada, or others as indicated by individual specifications.

- i) The Contractor must include all IACS certification of CFM equipment such as valves. Canada will be responsible for IACS certification for GSM equipment.

G 1.4.15.2 Documentation generated by the above inspections and/or surveys indicating that the inspections and/or surveys were conducted (i.e. original signed and dated certificates) must be provided to the TA in accordance with the “Documentation” Section of these General Notes.

G 1.4.15.3 The Contractor must not substitute inspection by the TA for the required regulatory inspections.

G 1.4.15.4 The Contractor must provide timely advance notification (minimum of 2 working days) of scheduled regulatory inspections to the TA so they may witness the inspection.

G 1.4.15.5 Fees associated with ABS, HC, Environment Canada, or any other Inspection required by the specification will be invoiced directly to CCG unless otherwise indicated in a specific specification item. The Contractor must arrange for inspections as specified in the specification. The Contractor has the responsibility to ensure that inspections are scheduled in an efficient manner, i.e. with the minimum number of site visits. The Contractor must coordinate with the TA when scheduling inspections. Note: For this refit we do not require inspection by HC or Environment Canada.

G 1.4.16 Contractor Inspections

G 1.4.16.1 The Contractor must afford the opportunity for the TA to conduct an inspection with the contractor on the condition and location of items to be removed prior to either carrying out the specified work or gaining access to a location to carry out the work.

G 1.4.16.2 The Contractor must take a before picture of conditions prior to removing any items. These photos are to be in accordance with the Documentation section of the General note, named according to the specification section that resulted in removing those items.

- G 1.4.16.3 Prior to the close out of any item under this specification, the Contractor must afford the TA the opportunity to verify the work has been completed in accordance with the specification. At that time the contractor must have available all photo's, documents, reports, and trials in relation to the item being closed out as completed

G 1.4.17 Restricted Areas

- G 1.4.17.1 The Contractor must not enter the following areas except to perform work as required by the specifications: all cabins, offices, workshops, Engineers' office, Wheelhouse, Control Room, all washrooms, Galley, Mess Rooms, Lounge areas and any other areas restricted by signage.
- G 1.4.17.2 The Contractor must give the TA 24 hours advance notice prior to working in any accommodation areas or office spaces. This will allow CCG adequate time to move personnel and secure the areas.

G 1.4.18 Contractor Inspections

- G 1.4.18.1 The Contractor must afford the opportunity for the TA to conduct an inspection with the Contractor on the condition and location of items to be removed prior to either carrying out the specified work or gaining access to a location to carry out the work.
- G 1.4.18.2 The Contractor must take a before picture of conditions prior to removing any items. These photographs are to be in accordance with the Documentation section of the General note, named according to the specification section that resulted in removing those items.
- G 1.4.18.3 Prior to the close out of any item under this specification, the Contractor must afford the TA the opportunity to verify the work has been completed in accordance with the specification. At that time the Contractor must have available all photographs, documents, reports, and trials in relation to the item being closed out as completed.

G 1.4.19 Recording of Work in Progress

- G 1.4.19.1 The TA may record any work in progress using various means including, but not limited to photography and video, digital or film.

G 1.4.20 Access for Maintenance, Installation, and Removal.

- G 1.4.20.1 The layout of newly installed machinery and equipment must be designed and constructed to permit ready access for routine maintenance, operational checks and operational inspections without disturbance of other machinery, equipment or structure.

- G 1.4.20.2 The Contractor must determine best routes for installing and removing equipment. All lifting points currently fitted on the ship must be treated as uncertified, and must be certified before use by the Contractor.
- G 1.4.20.3 Temporary lifting points installed by the Contractor must be removed prior to transfer of custody with welds ground flush, and paint coatings applied in accordance with the Coatings and Surface Treatment Schedule.
- G 1.4.20.4 Manufacturer's recommended removal clearances must be allowed for.
- G 1.4.20.5 After equipment installation and/or removal the Contractor must make good all equipment relocations, blemishes, and penetrations and must return the affected areas of the ship to the As-Delivered working condition.

G 1.4.21 Assembly of Components

- G 1.4.21.1 The Contractor must ensure that during installation of specified equipment, that parts and assembled equipment are cleaned of smudges, spatter or excess solder, weld metal and metal chips or any other foreign material which might detract from the intended operation, function, or appearance of the equipment. (This would include any particles that could loosen or become dislodged during the normal expected life of the equipment). All corrosive material must be removed. This cleaning must take place before the parts are assembled into the equipment.
- G 1.4.21.2 Covers, cowlings and components damaged by the Contractor must be replaced with a new CFM cover, cowling, or component.
- G 1.4.21.3 Where torque specifications are not provided by the manufacturer, standard SAE nut and bolt torques must be used.

G 1.4.22 Protection of Equipment

- G 1.4.22.1 The Contractor must take measures to ensure that surfaces and components of equipment installed on the vessel are protected against damage, soiling, and contamination as a result of contracted work.
- G 1.4.22.2 All electrical and electronic equipment and components must be protected during the contract against physical damage, internal damage, and by the effects of adverse temperatures or other environmental conditions.
- G 1.4.22.3 The Contractor must protect equipment that could be damaged as a result of movement of materials and equipment nearby. The Contractor must also protect equipment from nearby sources of contamination including but not limited to burning, welding, grinding and painting.

- G 1.4.22.4 Any damage to surfaces, equipment, furnishings or decor incurred prior to acceptance must be returned to As Delivered condition by the Contractor.
- G 1.4.22.5 All openings in machinery and/or systems prior to connections being made must be kept covered by suitable inserts or covers at all times.
- G 1.4.22.6 The Contractor must obtain and follow instructions from its sub-Contractors for any special protection required for their equipment during the project work. Such instructions must be made available to the TA.
- G 1.4.22.7 Physical protection including but not limited to plastic sheets, fireproof covers, heavy weight material covers, wood plugs, wood encasements and heaters must be used as required.
- G 1.4.22.8 The Contractor must protect the vessel from the possibility of vermin infestation (insect/mammal/bird). If an infestation does occur during the contract period the Contractor must bear all costs to ensure the vessel is made vermin free before the vessel's departure and contract completion.

G 1.5 Documentation

- G 1.5.1 Documentation is identified as a deliverable in the specification items requesting them.

G 1.5.2 Data Book

- G 1.5.2.1 The Contractor must provide all documentation generated as a result of specified deliverables, in electronic format, as part of the Contractors QA program. All documentation must be provided to the TA, in two copies, each on a separate flash drive, in accordance with the formats described in this specification item.
- G 1.5.2.2 All copies of documents generated as a result of specified deliverables will be referred to as the "Data Book".
- G 1.5.2.3 The Contractor must provide to the TA all the files generated as part of the Data Book must be received prior to the contract being considered complete. The files must be in hard format (CD-ROM, DVD-ROM, Flash Drive / Memory Stick). Each specification item is to have its own folder named according to the specification item. For example "G1.0 General Notes".
- G 1.5.2.4 Any documentation, media, and reports, that are the result of Additional Work, are also to be included as part of the Data Book.

G 1.5.3 File Naming

- G 1.5.3.1 File naming must be in the following format: *Specification#.# – Date (yyyy-mm-dd) – File Name Describing Information*. For Example: “G1.0 – 2013-12-01 – Details of file naming.pdf”.

G 1.5.4 E-mails

- G 1.5.4.1 Any files sent to the CA/TA by e-mail must be named as per the “File Naming” section of this specification. All files that are e-mailed must have in the subject name: “Contract# - DATA BOOK – Date – Specification #”. For Example: ***F1782-20C186 – DATA BOOK – 2020-11-30 – G1.0 General Notes*** . Files sent by e-mail must also be included in the “Data Book”.

G 1.5.5 File Formatting

- G 1.5.5.1 All documentation, reports, test results, certificates, or data obtained by the Contractor in paper form must be scanned into unprotected (preferably searchable) Adobe PDF formatted files and named according to the File Naming section of this specification.
- G 1.5.5.2 All reports, test results, certificates, or raw data obtained by the Contractor in electronic format must be converted to unprotected Adobe PDF formatted files and named according to the “File Naming” section of this specification. Both the original and the converted copy are to be provided as part of the Data Book.

G 1.5.6 Photographs

- G 1.5.6.1 All photographs obtained by the Contractor as requested in the specification must be provided in .JPG formatted files at a resolution of at least 640 x 480 and named according to the “File Naming” section of this specification.

G 1.5.7 Measurements, Calibrations, and Readings.

- G 1.5.7.1 All measurements, calibrations and readings recorded, must be signed by the person taking the measurements, dated and scanned into electronic format as part of the Data Book.
- G 1.5.7.2 Recorded dimensions must be to a precision of three decimal places (unless otherwise stated) in the measuring system currently in use on the vessel.
- G 1.5.7.3 The Contractor must provide to the TA current and valid calibration certificates for all instrumentation used in the Test and Trials Plan showing that the instruments have been calibrated in accordance with the manufacturer’s instructions. These copies are to be provided as part of the Data Book under any specification where measurements are required.

G 1.5.8 Test Inspection Records and Certificates

- G 1.5.8.1 Test Inspection Records and Certificates are identified as a deliverable in the individual specification item requesting them.
- G 1.5.8.2 Test Inspection Records and Certificates must be included as a separate section in the DATA BOOK and indexed/arranged in numeric order by specification number.
- G 1.5.8.3 The Contractor is responsible for maintaining a complete and accurate record of all tests and trials conducted on the vessel and on each piece of equipment. Prior to the commencement of a trial, all relevant documentation and associated test sheets, including shop test data, must be complete and attached to the trials agenda.
- G 1.5.8.4 All tests and trials data must be legible both in hard copy and electronic format. If necessary, handwritten records may require transcription into electronic format in order to be acceptable. The original must be signed by ABS, the TA, the Contractor and where necessary by the sub-Contractors and/or FSR's who witnessed the tests. All the Data must be submitted to the TA in accordance with the "Documentation" section of these General Notes.

G 1.6 Drawings

- G 1.6.1 This section, to be referred to as the Drawings section of the General Notes, is intended to be used as reference for the minimum standards when specified deliverables are to be drawings.
- G 1.6.2 The Contractor must have on staff or through a sub-Contractor a person qualified and experienced in the use of AutoCAD who will create or modify drawings that result from the work.
- G 1.6.3 The Contractor must comply with the Canadian Coast Guard National CAD Standards titled "*Computer Aided Design (CAD) using AUTOCAD*" provided.
- G 1.6.4 Drawing disks must be clearly labeled with the Contract Number, file names and drawing numbers. If a complete listing exceeds the label size, a "readme.txt" file in ASCII format must be provided with each disk. A printed copy of the Readme file must accompany each disk. Disks must be labeled As-Fitted drawings for those drawings that have been approved and finalized.
- G 1.6.5 Final As-Fitted prints/plots must not contain markings or corrections by hand (i.e. marker, pen, pencil, etc.). Drawings containing mark-ups must be revised and re-printed/plotted.
- G 1.6.6 The Contractor must prepare all the working drawings necessary for the project requirements and modernization work.

- G 1.6.7 The Contractor must furnish all drawings required by sub-Contractors, trades and other consultants.
- G 1.6.8 Schematic drawings of systems must include all pertinent system information, including sizes, dimensions, labeling, equipment locations, and all information relating to system fittings.
- G 1.6.9 The Contractor must have in place a complete system of documenting and controlling all drawing revisions affected by the work of this project. Drawing numbering system and titles must match the original drawings for clarity and include a revision number with date.

G 1.6.10 Guidance Drawings

- G 1.6.10.1 All technical guidance drawings are issued to the Contractor for guidance purposes only. It is the responsibility of the Contractor to develop working drawings and to ensure that all such drawings receive applicable regulatory approval. The Contractor is to note that not all technical guidance drawings supplied are As-Fitted drawings. It is the responsibility of the Contractor to physically verify all affected items.
- G 1.6.10.2 All departures from the provided guidance drawings and project specifications must be clearly indicated by the Contractor and written approval obtained from the TA before carrying out such alterations or departures.
- G 1.6.10.3 Specification deviations must be documented using an Observation Report.

G 1.6.11 As Fitted Drawings

- G 1.6.11.1 The As-Fitted Drawings are identified as a deliverable in the specification item requesting them.
- G 1.6.11.2 Upon completion of specified work, the Contractor must transfer the mark-ups from any working drawings where installation changes were made to drawings affected by the project work. These drawings become the As-Fitted drawings for the project work. The Contractor is responsible for providing updated vessel drawings affected by the project work to the TA prior to completion of the contract. The affected drawings must be submitted in the following formats:
 - a) Two (2) electronic copies of the latest revision of each As-Fitted drawing.
- G 1.6.11.3 Any plotted drawings must be on standard ANSI paper sizes.

G 1.6.11.4 Marked up drawings are to be AutoCAD drawings where original AutoCAD drawings are provided. If no AutoCAD drawings were provided then scanned files (raster format) must be supplied to CCG in one of the following formats:

- a) DXF format;
- b) TIFF format;
- c) PDF format.

G 1.7 Manuals

G 1.7.1 This section, to be referred to as the Manuals section of the General Notes, is intended to be used as reference for the minimum standards when specified deliverables are to be manuals.

G 1.7.2 General

G 1.7.2.1 Instruction Manuals must be individually bound in a hard cover 3 ring book format with a page size of 8 1/2" x 11". Drawings of a larger size must be concertina folded to suit. The covers must have the following information printed thereon:

- a) CCGS Sir John Franklin;
- b) Equipment Identification;
- c) Equipment Manufacturer;
- d) Date.

G 1.7.2.2 Plastic tabbed indices must be provided for all sections of the manuals. Major equipment components must be subdivided into separate sections of the manuals.

G 1.7.2.3 A master index must be provided at the beginning of each binder indicating all items included in each section.

G 1.7.2.4 A list of names, addresses and telephone numbers of contacts associated with the equipment manufacturers must be provided that can be used after the project completion for maintenance and information data purposes.

G 1.7.2.5 A copy of the final reviewed and approved As-Fitted drawing(s) must be provided within the maintenance manual.

G 1.7.2.6 One (1) electronic copy of each manual must be provided in accordance with the Data Book section of this specification.

- G 1.7.2.7 Two (2) paper copies of manuals and data sheets must be supplied in English for all Contractor Furnished Equipment items.

G 1.7.3 Operation Manuals – As-Fitted

- G 1.7.3.1 Operation manuals must include the following items:

- a) General description of equipment operating sequence;
- b) Step by step procedure to follow in commissioning the equipment;
- c) Schematic wiring diagram for the fitted equipment; and
- d) All pertinent equipment performance criteria.

- G 1.7.3.2 Where software/hardware systems are fitted, the operation manual must include the full software documentation manual in paper form for the system and an electronic copy in accordance with the Documentation Section. The minimum software documentation must include:

- a) System level diagrams describing the overall scheme of the software/hardware system;
- b) The functional specifications, which must describe in detail the functional capabilities of the system and each software components; and
- c) Project specific program listings including all comments describing the details of the code functions.

G 1.7.4 Maintenance Manuals – As-Fitted

- G 1.7.4.1 Maintenance manuals are to include:

- a) Manufacturer's maintenance instructions for each item of the equipment requiring maintenance activity;
- b) Instructions are to include installation instructions, part numbers, part lists, master drawings and exploded views with part identification for all mechanical, electrical and electronic parts, name of suppliers;
- c) Summary list of each item of the equipment requiring lubrication, indicating the name of the equipment item, location of all points of lubrication, type of lubricant recommended, and frequency of lubrication; and
- d) Troubleshooting sections must be included for all equipment in the maintenance manual under a separate heading.

G 1.8 Identification**G 1.8.1 Nameplates**

- G 1.8.1.1 Nameplates are identified as a deliverable in the individual specification item requesting them.
- G 1.8.1.2 All nameplates must be in English, except where required in English and French by TCM, or ABS, for reasons of emergency operation.
- G 1.8.1.3 Lettering must be clear and concise with the minimum use of abbreviations. Primary information must be given in larger size lettering than secondary information.
- G 1.8.1.4 The type of nameplates must suit the location in the vessel as specified below:
- G 1.8.1.5 Plastic:
 - a) Laminated plastic nameplates, black with white core engraved through to the center core, must be provided for all devices located on the exterior surfaces of switchboards, MCC's, or local control panels. Nameplates must be secured to the equipment with machine screws.
 - b) New nameplates to be fitted on the existing equipment must be consistent in size and lettering with those already fitted or those being replaced.
 - c) Nameplates indicating feeder circuits must identify each circuit by name and number and the fuse size or trip element rating.
 - d) The Following Labels must be of laminated plastic, red with white core engraved through to the center core:
 - Safe Working Loads,
 - Warning/Caution labels,
 - Circuit Breakers with shunt trips requiring completion of remote circuits prior to being operated,
 - Equipment with multiple power sources,
 - Circuit breaks having a potential power source connected to both sides
 - Indication of any other potentially hazardous condition.

G 1.8.1.6 Engraved on Metal:

- a) Must be used in machinery spaces and where exposed to the weather or susceptible to covering by paint, oil or grease. Nameplates exposed to weather must be stainless steel or brass. Engraved metal nameplates must be of stainless steel or brass with lettering accentuated by means of black wax unless otherwise noted, and secured with stainless steel or brass machine screws.
- b) A complete list of nameplates, detailing size of plate, size of lettering and inscription must be submitted to the TA for review prior to ordering and/or manufacturing.

G 1.8.2 Wire Labelling

G 1.8.2.1 Wire Labelling is identified as a deliverable in the individual specification item requesting them.

G 1.8.2.2 All permanently installed cables must be tagged with the circuit designation at all points of connection and on both sides of bulkheads, decks, etc. Tags must be of metal compatible with the armor or cable sheathing. Both ends of the tags must be strapped to the cable with compatible metal strap after all painting has been completed. Straps must pass through holes in the tags so that tags are positively secured. Strap ends must be permanently folded and crimped. Adhesives of any kind will not be acceptable.

G 1.8.2.3 All wiring in panels specified to be labelled must be labeled with the Cable Number and their conductor # unless otherwise specified in equipment installation drawings.

G 1.9 Piping

G 1.9.1 All materials used for potable water systems are to be suitable for that use and for the intended pressure and temperatures.

G 1.9.2 All piping to be as per the Material Standard for Pipes, Valves and Fittings.

G 1.9.3 The Contractor must ensure that new pipe joint methods are compatible with existing vessel methods and equipment. Specialized tools required for pipe connections are to be supplied to the CCGS Sir John Franklin if the equipment does not already exist on board.

G 1.9.4 Transition joints between old and new piping are to exceed the strength of the original piping.

G 1.9.5 Piping to be well supported at regular intervals and supported such that no rattling of pipes occur during use or when shut off.

G 1.9.6 The Contractor must maintain fire ratings accordingly as piping transitions through fire zones.

G 1.9.7 Hot water piping to be insulated with minimum ½” W.T. Armaflex “Class O” or equivalent insulation.

S 1.0 SERVICES

S 1.1 GENERAL – ALONGSIDE CREWED REFIT

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

S 1.1.2 All staging, crantage, screens, lighting, and any other support service, equipment, and material necessary to carry out the work identified in these specifications must be Contractor supplied unless specifically noted otherwise.

S 1.2 BERTHING – ALONGSIDE CREWED REFIT AT VICTORIA COAST GUARD BASE

S 1.2.1 With the ship alongside at the Victoria Coast Guard Base, the berthing and mooring facilities, fenders and mooring lines, gangways, shore power, and security of the ship alongside will be the responsibility of the CCG.

S 1.3 MOORING LINES

S 1.3.1 Mooring lines will be provided and maintained by CCG.

S 1.4 GANGWAYS

S 1.4.1 The gangways will be supplied and maintained by CCG.

S 1.4.2 Any movement of the gangways required by the Contractor will be at the expense of the Contractor.

S 1.5 ELECTRICAL POWER

S 1.5.1 Alongside at the Victoria Coast Guard Base, the supply of electrical shore power will be the responsibility of CCG.

S 1.5.2 The shore power requirement is for 600 Volt Alternating Current, 60 hertz, 3 Phase, 200 Ampere electrical power, through the vessel’s shore power system.

S 1.5.3 Temporary lighting and power required by the Contractor must be CFM and must meet provincial regulations for safe work conditions and there must be sufficient

number of lights set up to provide safe passage through the accommodation and machinery spaces.

S 1.6 POTABLE WATER SUPPLY

S 1.6.1 With the refit alongside at the Victoria Coast Guard Base, the replenishment of potable water will be the responsibility of CCG.

S 1.7 FIRE MAIN CHARGING

S 1.7.1 With the refit alongside at the Victoria Coast Guard Base, charging of the fire main will be the responsibility of CCG.

S 1.8 BLACK AND GREY WATER SERVICES

S 1.8.1 With the refit alongside at the Victoria Coast Guard Base, black and grey water services will be the responsibility of CCG.

S 1.9 GARBAGE REMOVAL

S 1.9.1 The Contractor must provide a garbage container or dumpster of 6 cubic meters located adjacent to the vessel.

- i) Garbage generated by the Contractor must be removed from the vessel daily including week-ends and holidays.
- ii) Garbage generated by ship's personnel will be placed in the container by CCG.
- iii) Ship's personnel will comply with any recycling programs that the Contractor has in place, provided the appropriate containers are made available.

S 1.9.2 The Contractor must supply a green bin for food waste. The green bin must also be emptied daily.

S 1.10 CRANAGE

S 1.10.1 Not used.

S 1.11 DECK PROTECTION – ALONGSIDE CREWED REFIT

S 1.11.1 Deck protection on all accommodation decks will be installed and maintained by CCG. This refers to the alleyways only.

S 1.11.1 The Contractor must provide protection for decks and carpeted areas being worked on other than the alleyways. This must include any cabin spaces being worked in.

S 1.11.2 The Contractor must protect decks in machinery spaces from damage to structure and coating systems during the process of specified work. Damage to the coating systems or structure of machinery spaces decks must be repaired by the Contractor. Any coatings are to be applied according to manufacturer's specifications.

S 1.11.3 Removal and storage of components related to the specification that may be subject to damage during the work period, such as deck plates, grating, etc. must be the responsibility of the Contractor.

S 1.12 WORKSITE INSPECTIONS – ALONGSIDE CREWED REFIT

S 1.12.1 During the work period, the Contractor must maintain their work areas in the vessel in a clean condition, free from debris and remove garbage daily.

S 1.12.2 Upon completion of the contract, the Contractor must return the vessel to the As-Delivered state of cleanliness.

S 1.12.3 Prior to the completion of the Acceptance Document, the Contractor's QA Representative, and the TA must perform an inspection of the vessel to view all areas where work was performed by the Contractor.

S 1.12.4 Copies of all photos, documentation, and inspection sign off sheets must be provided in accordance with the Documentation section of the General Notes.

S 1.13 FIRE PROTECTION – ALONGSIDE CREWED REFIT

S 1.13.1 Protection against fire 24 hours/day and 7 days/week throughout the contract period will be provided by CCG.

S 1.13.2 The isolation, removal, installation and reactivation of the shipboard fire detection and suppression systems or any components thereof is not intended in this specification. Should such work be required it must be done by a qualified technician. The CCG may contract for servicing or repairs of the fire detection and suppression systems separately from this contract. However if such work is directly required by a specification item it must be the responsibility of the Contractor and must be included in the Contractor's bid.

S 1.13.3 The Contractor must note that failure to take the necessary precautions while performing work on the vessel's fire suppression system(s) could result in the accidental discharge of the fire suppression agent(s). The Contractor must recharge and certify at their cost, container(s) or systems that are discharged as a result of the contractor's or subcontractor's activities

S 1.14 WORKSITE FACILITIES – ALONGSIDE CREWED REFIT

- S 1.14.1 The Contractor must supply 2 portable toilets and portable hand washing facility located ashore for use of their staff. The Contractor must service and empty the toilets regularly during the refit period. Washroom facilities on board the ship are for the use of CCG crew only.

S 1.15 SECURITY & ACCESS

- S 1.15.1 The Contractor must follow the Victoria Coast Guard Base procedures with regard to parking, company vehicles allowed on site, and staff access to the base.
- S 1.15.2 Security rounds at all times, including after hours, will be the responsibility of CCG in accordance with the FSM section 8.B.1. This does not include any fire watch that is required to be done by the contractor in specific specification items.

S 1.16 PROJECT FACILITIES

- S 1.16.1 Not used.

S 2.0 OPTIONAL RELOCATION OF VESSEL

- S 2.1.1 If the Contractor chooses to relocate the vessel to their facility the following sections S 2.2 to S 2.10 apply.

S 2.2 BERTHING – ALONGSIDE CREWED REFIT AT CONTRACTOR'S FACILITY

- S 2.2.1 The berthing and mooring facilities must be suitable for a vessel of this size in local weather / tide / sea conditions. Fenders must be supplied by the Contractor to prevent the vessel from contacting the wharf in said local conditions.
- S 2.2.2 The length of the dock must be a minimum of 90% of the keel length of the vessel.
- S 2.2.3 During the contract period, when the ship is afloat, the ship must be berthed at the Contractor's wharf at a safe and secure location with a minimum clearance of 0.45 meters (1.5 feet) under the vessel at extreme low tide to ensure the vessel will not touch bottom.
- S 2.2.4 The Contractor must responsible for all movements of the vessel, including berthing and mooring of the vessel for the contract period and arrangements and costs for line handlers, tugs, and pilots.

S 2.3 MOORING LINES

S 2.3.1 The Contractor must provide the labour required to secure the vessel alongside the facilities.

S 2.3.2 The Contractor must provide CFM mooring lines while vessel is secured alongside the Contractor's facilities. The ship's mooring lines must not be used.

S 2.4 GANGWAYS

S 2.4.1 The Contractor must supply 2 means of access to the vessel and escape from the vessel while in possession of the vessel.

S 2.4.2 The Contractor must supply all labour and services required for the installation and removal of all gangways, complete with handrails, safety nets, and lighting for the duration of the contract while the vessel is moored.

S 2.4.3 Any movement of the gangway required by the Contractor is the responsibility of the Contractor.

S 2.4.4 The Contractor must provide gangways in accordance with ROS, Worksafe BC, and Canada Labour laws and regulations.

S 2.5 ELECTRICAL POWER

S 2.5.1 The Contractor must supply 600 Volt Alternating Current, 60 hertz, 3 Phase, 200 Ampere electrical power, through the vessel's shore power system, for the duration of the contract.

S 2.5.2 The Vessel's shore power cable and associated plug connection may be used by the Contractor. However, the Contractor is responsible to replace the entire length of cable with an equal quality, size, and length of cable should the shore power cable be damaged during the contract period. Damage to the shore power cable also includes damage to the plug-in connections which must be replaced if damaged. Splicing any section of the cable is not acceptable.

S 2.5.3 The Cable condition must be inspected at the start and completion of the work period. The Contractor and the TA must record in writing all defects prior to the start of the contract period and all parties must sign the original document. Photos must be taken of general condition and close-ups of existing damage. All photos and documents are to be provided to the TA in accordance with the Documentation section of the General Notes.

S 2.5.4 The Contractor must ensure the correct phase rotation on a 3 phase system is established prior to energizing the ship's distribution system from shore. Any changes to the ship's power system to accommodate the Contractor supplied shore power connections must be returned to the original setup by the Contractor upon the

disconnection of the Contractor supplied power cable and equipment. All work must be carried out by certified electricians.

- S 2.5.5 When connected to shore power, it must be connected to a Contractor supplied kilowatt-hour meter. The Contractor must read the kilowatt-hour meter when the connection is made and once again when the power is disconnected. Both readings of the meter must be witnessed by the TA and recorded.
- S 2.5.6 If temporary lighting is required for any of the work, the temporary power system must be feed through a Contractor supplied kilowatt-hour meter. The Contractor must read the kilowatt-hour meter when the connection is made and once again when the power is disconnected. Both readings of the meter must be witnessed by the TA and recorded.
- S 2.5.7 Temporary lighting and power must meet provincial regulations for safe work conditions and there must be sufficient number of lights set up to provide safe passage through the accommodation and machinery spaces.
- S 2.5.8 The Contractor must supply a price quote per kilowatt-hour for electrical power for the duration of the work period. The final price for this item must be determined at the end of the contract once the meter has been read The final power consumption total must be adjusted up or down with a credit or extra to the Contract.
- S 2.5.9 For the purposes of this contract the bidders are to quote for 10,000 kilowatt-hours.

S 2.6 GARBAGE REMOVAL

- S 2.6.1 The Contractor must provide a garbage container or dumpster of 6 cubic meters located adjacent to the vessel.
- iv) Garbage generated by the Contractor must be removed from the vessel daily including week-ends and holidays.
 - v) Garbage generated by ship's personnel will be placed in the container by CCG.
 - vi) Ship's personnel will comply with any recycling programs that the Contractor has in place, provided the appropriate containers are made available.
- S 2.6.2 The Contractor must supply a green bin for food waste. The green bin must also be emptied daily.

S 2.7 HEATING

- S 2.7.1 The Contractor must supply the heating required onboard and around the vessel to facilitate specified work.

S 2.8 WORKSITE INSPECTIONS

- S 2.8.1 Before the Contractor starts any work on the vessel the Contractor's Quality Assurance Representative and the TA must walk through each space and area where work is to take place, including access and removal routes and areas adjacent to those where the work is to be done as a result of this specification. The Walk-through must occur during vessel demobilization and the Contractor's Quality Assurance Representative must identify all items that are to be removed or secured prior to the Contractor assuming Care and Custody of the Vessel.
- S 2.8.2 The Contractor's Quality Assurance Representative must take digital pictures of each area showing the outfit therein. Each picture must be dated and named as to the location on the vessel and that it represents As-Delivered conditions. These photos must be in the format; as well as named, in accordance with the Documentation section of the General Notes. A Copy of these photos must be provided to the TA within 48 hours of the start of contract on a memory stick, CD, or DVD.
- S 2.8.3 During the work period, the Contractor must maintain work areas in the vessel, in a clean condition, free from debris and remove garbage daily.
- S 2.8.4 Upon completion of the contract, the Contractor must return the vessel in a clean are ready state for human habitation.
- S 2.8.5 Prior to the completion of the Acceptance Document, the Contractor's QA Representative, and the TA must perform an inspection of the vessel to view all areas where work was performed by the Contractor.
- S 2.8.6 Copies of all photos, documentation, and inspection sign off sheets must be provided in accordance with the Documentation section of the General Notes.

S 2.9 FIRE PROTECTION

- S 2.9.1 The Contractor must ensure protection against fire 24 hours/day and 7 days/week throughout the contract period.
- S 2.9.2 The Contractor must isolate the vessel's fixed fire suppression system for the duration of the contract period to prevent accidental discharge.
- S 2.9.3 The Contractor must ensure the isolation, removal, installation and reactivation of the shipboard fire detection and suppression systems or any components thereof, is performed by a qualified technician. When the shipboard fire detection or fire suppression system is deactivated or disabled by the Contractor during the contract period, the system must be recertified by a qualified technician prior to the end of the

work period, as fully functional. A signed and dated original copy of the certificate must be delivered according to the Documentation section of the General Notes.

- S 2.9.4 The Contractor must note that failure to take the necessary precautions while performing work on the vessel's fire suppression system(s) could result in the accidental discharge of the fire suppression agent(s). The Contractor must recharge and certify at his cost, container(s) or systems that are discharged as a result of the Contractor's or subcontractor's activities.

S 2.10 PROJECT FACILITIES

- S 2.10.1 The Contractor must provide 1 secure office space. The space must have 3 separate desks; 2 for the TA and delegates, and 1 for the CA. The space is for the exclusive use of Government personnel, must be within suitable distance to rest rooms, and must be environmentally controlled. The space must be available from 1 week prior to the work commencing to 2 weeks after vessel acceptance.
- S 2.10.2 Each desk must include a minimum of 1 chair; and have a minimum of 2 electrical plugin sockets per desk.
- S 2.10.3 There must be a telephone that has a direct outside telephone line. The cost of long distance calls must be directly billed to CCG. Cellular services are not acceptable.
- S 2.10.4 Each desk must be provided with 1 wired Ethernet LAN connection with direct internet access. The Contractor must supply a broadband high speed internet service to this connection.
- S 2.10.5 Contractor must provide 3 reserved parking spots adjacent to building with offices specified. Parking spaces are for the exclusive use of Government Personnel; 2 spots for the TA and 1 for the CA and are to be available 24-7 from 1 week prior to work commencing to 1 week after vessel acceptance.

The Contractor must supply and maintain a washroom facility that is accessible to the CCG personnel for the duration of the contract.

S 2.11 SECURITY

- S 2.11.1 Security rounds at all times, including after hours, will be the responsibility of CCG in accordance with the FSM section 8.B.1. This does not include any fire watch that is required to be done by the contractor in specific specification items.

10.0 SAFETY AND SECURITY

10.1 LIFERAFTS ANNUAL INSPECTION

10.1.A Identification

- A.1 The intent of this specification is to have the annual inspections completed on all 4 of the vessels liferafts.

10.1.B Reference

B.1 Equipment Data

B.1.1 2 x 37 Person Davit Launched Liferafts

- i) Manufacturer: Survitec Group
- ii) Model: CCG 37 DL PA RND
- iii) Part Number: X0953
- iv) Weight: 290 kg
- v) Emergency Packs: TC A
- vi) Date of Manufacture: November 2014
- vii) Serial Numbers: XDC6FS27K415 & XDC6FS28K415

B.1.2 1 x 37 Person Throw Overboard Type Liferaft

- i) Manufacturer: Survitec Group
- ii) Model: CCG 37TO SR PA 1PL/1BL
- iii) Part Number: Z0949
- iv) Weight: 312 kg
- v) Emergency Pack: TC A
- vi) Date of Manufacture: November 2014
- vii) Serial Number: XDC6FS29K415

B.1.3 1 x 4 Person C-Class Inflatable Liferaft

- i) Manufacturer: Survitec Group

- ii) Model: 04 COASTAL CCG LPC
- iii) Part Number: DRZ35007
- iv) Emergency Pack: Coastal
- v) Date of Manufacture: May 2016
- vi) Serial Number: XDC8FY87E616

B.2 Drawings and Documents

- B.2.1 All Drawings and Documents are listed in the General Notes.

B.3 Regulations and Standards

- B.3.1 All Regulations and Standards are listed in the General Notes. The Contractor must ensure all work completed in this section meets these Regulations and Standards as well as any other pertinent Federal/Territorial Regulation.

10.1.C Statement of Work

- C.1 The Contractor must sub-contract the inspection and recertification of the liferafts to an Approved RO service facility that meets the requirements of the Original Equipment Manufacturer (OEM) certification.
- C.2 The Crew of the CCGS Sir John Franklin will remove the liferafts and their hydrostatic releases from their stowed positions on the vessel and place them on the dock alongside the vessel.
- C.3 The Contractor must arrange for transportation of the liferafts via commercial bonded carrier to and from the sub-contractor's premises for servicing / inspection.
- C.4 The Contractor must return the liferafts and their hydrostatic releases to the vessel prior to the conclusion of the contract.
- C.5 The Contractor must provide the TA with 24 hours advance notice before delivery of the liferafts to the vessel. This is to provide the crew with the opportunity to prepare for the lifting and stowage of the liferafts on the vessel.

10.1.D Proof of Performance

D.1 Inspection Points – Not Used

D.2 Testing/Trials

- D.1.1 The Inspection and testing must be completed as per ABS requirements.

D.3 Certification

- D.1.1 The Contractor must provide the liferaft certificates to the TA prior to the conclusion of the contract.

D.4 Documentation

- D.1.1 Documentation must be in accordance with the Documentation section of the General Notes.
- D.1.2 The Contractor must provide all test certificates, and endorsement of safe operation required by ABS for certification to the TA prior to the conclusion of the contract.
- D.1.3 The Contractor must provide a list of the work that was performed on each liferaft to the TA.

D.5 Spares – Not Used

11.0 HULL AND RELATED STRUCTURES

11.1 CHANGE LOAD LINE MARKS

11.1.A Identification

- A.1 ABS rules state that the L – R on the Load Line Markings (Plimsol Mark) must be removed and replaced with A – B to indicate the vessel is now classed by ABS.

11.1.B References

B.1 Equipment Data

- B.1.1 The vessel was built to Lloyd's Register of Shipping regulations and was originally classed as such. It therefore was marked L – R.

B.2 Drawings

- B.2.1 All Drawings and Documents are listed in the General Notes.

B.3 Regulations and Standards

- B.3.1 All Regulations and Standards are listed in the General Notes. The Contractor must ensure all work completed in this section meets these Regulations and Standards as well as any other pertinent Federal/Territorial Regulation.

11.1.C Statement of Work

C.1 Hot Work

- C.1.1 The Contractor must include and maintain a fire watch in each space adjacent to any hot work, in accordance with General Notes G 1.4.5.
- C.1.2 The Contractor must grind off the L – R markings on the Port and Starboard side of the vessel.
- C.1.3 The Contractor must punch the outline of the A – B on both the Port and Starboard side of the vessel. Letters must be 115mm tall and 75mm wide. Markings must be in accordance with the International Load lines Convention and ABS requirements and done in the presence of the ABS surveyor.

C.2 Painting

- C.2.1 The Contractor must paint the areas affected by the installation and removal of the markings. Painting must be as per paint manufacturer's recommendations and S62-190-631.00-001_OFSV 190 Coatings and Surface Treatment Schedule_Rev AB.

11.1.D Proof of Performance

D.1 Inspection Points

- D.1.2 The Contractor must afford the ABS surveyor and the TA an opportunity to witness the installation of the new Load Line Markings. The Contractor and the TA must agree on inspection points and schedule prior to the start of the work.

D.2 Testing/Trials – Not Used

D.3 Certification – Not Used

D.4 Documentation – Not Used

D.5 Training – Not Used

11.2 CABIN RE-ALIGNMENT

11.2.A Identification

- A.1 The main intent of the cabin re-alignment is to provide private cabins for the electrical officer and logistics officer and to increase the total vessel capacity by one person.
- A.2 The Contractor must supply new furniture and reconfigure the existing aft cabins on the 02 Level. The affected spaces are:
 - i) 02A28: Double Stateroom, Frames 40 to 51.5, Port Side, and Washroom 02A26
 - ii) 02A17: Ship's Office, Frame 45 to 55, Starboard Side
 - iii) 02A23: Chief Scientific Officer's (Chief Scientist) Dayroom/Cabin, Frames 40 to 49, Starboard Side, and Washroom 02A19
 - iv) 02A25: Locker, Frames 40 to 43, Starboard Side

11.2.B References

B.1 Equipment Data

- B.1.1 The existing furniture in the cabins is fabricated from aluminium.
- B.1.2 The existing joiner bulkheads are Joiner Systems Inc. BPS-25-01 25mm dry lining panels and BPS-50-01 50mm dry divisional panels with a B0 fire rating.
- B.1.3 The existing deck head/ceiling panels are Joiner Systems Inc. C-512 PCM 25mm with a B0 fire rating.

B.2 Drawings

- B.2.1 All Drawings and Documents are listed in the General Notes.

B.3 Regulations and Standards

- B.3.1 All Regulations and Standards are listed in the General Notes. The Contractor must ensure all work completed in this section meets these Regulations and Standards as well as any other pertinent Federal/Territorial Regulation.

11.2.C Statement of Work

C.1 Lock-Out

- C.1.1 The Contractor must lock-out electrical power, domestic water, and sewage during construction and then must re-establish operational power, water, and sewage upon completion of the work.

- C.1.2 The Contractor must consult the crew before locking out or shutting down any systems.
- C.1.3 Contractor must block/cap ventilation after disassembly and during the main work in the affected work areas. The ventilation system in the unaffected areas of the ship must not be down for the duration of the project.
- C.1.4 Contractor must blank, cap, or plug the plumbing systems in the affected work areas after disassembly to allow the systems to be restored while the work is progressing. The vacuum system and domestic systems in the unaffected areas of the ship must not be down for the duration of the project.
- C.1.5 Contractor must isolate the electrical systems in the affected work areas. Electrical feeds supply more than just the affected cabins. Unaffected areas of the ship must not be down for the duration of the project. Power to be removed at the junction boxes for the work areas.

C.2 Strip-Out

- C.2.1 The Contractor must strip out any insulation in way of hot work.
- C.2.2 The ship's crew will remove existing lockers, desks, and filing cabinets prior to work period. Contractor must strip-out the bunks in the affected spaces. Mattresses to be retained for use on the new bunks.
- C.2.3 The Contractor must supply all new lights, wall sockets, light switches, and other electronic wall mounted sockets. Existing items must be returned to CCG. The existing isolation transformers and GFCI receptacles in the washrooms are to be reused.
- C.2.4 The Coast Guard will supply 86 25mm bulkhead panels and 29 50mm bulkhead panels. All panels are 550mm wide and 2090mm tall. Coast guard will supply 15.15m of top and bottom track (shoe) for the 50mm panels. Contractor must re-use existing bulkhead panels and top and bottom track to complete the job.
- C.2.5 The Coast Guard will supply 74 standard overhead (ceiling) panels. Standard panels are 2400mm x 200mm. The Coast Guard will supply 4 overhead panels at 1984mm x 200mm and 7 overhead Panels at 2353mm x 200mm. Contractor must re-use existing overhead panels and top and bottom track to complete the job.
- C.2.6 The Contractor must strip out and dispose of the existing floor coverings in the affected spaces. Contractor to test adhesion of deck screed coat. If required removal and replacement of deck screed will be by 1379 additional work procedures.

- C.2.7 The Contractor must remove the deck head panels on the 01 Level to access the piping systems of the affected washrooms. Existing furniture and structure are to be protected during this work and all the areas are to be returned to same or better condition upon completion of the work.
- C.2.8 The Contractor must remove and relocate one exterior window (portlight) on the port side between frames 46 and 47. Windows must be located as shown on the design drawings. See C.10 Hot Work.
- C.2.9 The Contractor must remove and relocate 2 joiner doors. Double Cabin door 02-46-2 and Storage Locker door 02-41-1. See C.3.10 Arrangement and Outfit.
- C.2.10 The Contractor must strip-out Bathroom 02A26 and relocate it to the starboard side as shown in the design drawings.
- C.2.11 The Contractor must strip out and cap off the deck scupper in Storage Locker 02A25.

C.3 Arrangement and Outfit

- C.3.1 The Contractor must finish the aft cabins on the 02 Level accommodation space in accordance with the provided design drawings.
- C.3.2 All outfit and furnishings are to be as per the design drawings. No alternate equipment or materials are acceptable without consultation with the TA.
- C.3.3 The Contractor must fabricate a new bathroom for the new port side double cabin. Contractor to supply all bathroom fixtures.
- C.3.4 All new cabinets, desks, bunks, and other furniture that are shown in the design drawings are GSM and were constructed by ProNautic of Victoria.
- C.3.5 The Contractor must use ProNautic of Victoria at (250) 655-6388 or equivalent for installation of all cabinets, desks, bunks, and other furniture.
- C.3.6 The Contractor must use ProNautic of Victoria or equivalent for relocation and installation of joiner bulkheads, linings, deck heads panels, flooring, bathroom fittings, and other furnishings on the 02 Level as per the design drawings. All surfaces are to be finished as shown on the design drawings and according to the finishing schedule.
- C.3.7 The new furniture is designed to have square bases that must sit level on a base or plinth as shown in the design drawings. The plinths are to be supplied and adapted by the Contractor and must provide level surfaces at even keel.
- C.3.8 Light switches must be located between 46 and 50 inches off the deck in the locations noted on the design drawings.

- C.3.9 Contractor must install 4 new right hand in joiner doors as shown on the design drawings. These are the 2 doors for the ship's office, the entry door for the starboard aft cabin, and the entry door for the port aft cabin. Joiner doors to be GSM.
- C.3.10 Contractor must relocate 2 joiner doors as shown on the design drawings. Double Cabin door 02-46-2 to be moved forward to between frames 48 and 50. Storage Locker door 02-41-1 to be moved from the starboard side to the port side between frames 45 and 47.

C.4 Deck Covering

- C.4.1 Contractor must supply and install new flooring in affected areas. Flooring must be marine vinyl flooring. Colours and pattern of interior deck finish must be as shown on the design drawings and finishing schedule. Flooring must be intended for use on ships and in compliance with SOLAS and the FTP Code.
- C.4.2 Decks must be prepped prior to coating as per manufacturer's recommendations. Deck coverings must be installed in accordance with the manufacturer's recommendations.
- C.4.3 Deck covering must be laid under furniture except where the furniture is built-in to the vessel structure. Cove base must be installed around boundaries, including built-in furniture as shown on the design drawings.

C.5 Insulation

- C.5.1 The Contractor must insulate the areas affected by the hot work to at least the same standard as the existing arrangement.
- C.5.2 The Contractor must maintain all structural fire insulation in accordance with SOLAS Structural Fire Protection Regulations as shown in 190-077.00-003 Fire Zone Drawing.
- C.5.3 The Contractor must inspect the existing insulation after the vessel has been stripped out. Any areas found to be damaged or not properly insulated will be repaired by 1379 additional work procedures.
- C.5.4 Insulation must be installed per manufacturer's recommendations.

C.6 Sheathing & Lining

- C.6.1 The Contractor must fully compartmentalize the 02 Level accommodations with a joiner and partition panel system. The joiner bulkheads, linings, and deck head panels must be arranged as per the design drawings and must integrate mechanically and aesthetically with the existing joiner and partition system.

- C.6.2 All exposed interior bulkheads, shell plating, and deck plating must be hidden behind the joiner and partition panel system.
- C.6.3 Bulkhead linings and deck head panels must be installed according to manufactures instructions. They must be as per the design drawings and finishing schedule.
- C.6.4 All ducts, pipes, electrical cables, etc. must be installed behind linings. The one exception is the existing exposed vent duct for the ocean lab fume hood in the Ship's Office.
- C.6.5 Linings and deck head panels in way of stiffeners must be supported by a system of metal furring.
- C.6.6 Contractor must ensure openings are installed and labelled to access any controls such as valves or power supplies located behind the linings. Toilets and showers must have plumbing access panels installed. Plumbing access panels must have a minimum opening of 450mm x 1170mm. Where possible the plumbing access panels should match the existing access panels on the vessel which are 450mm x 1775mm.

C.7 Piping

- C.7.1 The Contractor must branch off the existing pipe runs for the hot, cold, BW, and GW lines to the affected washrooms on the 02 Level and transit them through watertight connections to the new locations. BW, hot and cold piping runs can tie into the existing piping in the deck head. Greywater piping must be installed through new deck penetrations.
- C.7.2 Contractor to install Pro-Press ball valves in the potable water system to enable isolation of the affected cabins.
- C.7.3 The Contractor must install all new piping for hot, cold, BW, and GW in the affected heads. This includes 3 sinks, 3 toilets, and 3 showers. New piping must tie into the existing lines. All piping and associated valves and fittings must be as per 190-501.00-001 Material Standard for Pipes, Valves and Fittings As-Built.
- C.7.4 The Contractor must ensure pipe transits have type approval from a TC approved RO and meet the fire rating of the bulkheads and decks through which they pass.
- C.7.5 The Contractor must provide cleanouts as determined through on-site detail development in consultation with the TA.

C.8 HVAC

- C.8.1 The Contractor must modify and install all ductwork as required and as shown on the design drawing 20-106-512-03 Cabin HVAC Layout.

- C.8.2 Each washroom must have a toilet exhaust. Existing toilet exhausts to be reused. Contractor to supply 1 new toilet exhaust.
- C.8.3 Each cabin must have a supply of fresh air and a reheat with individual thermostat. Note, starboard side already has 2 reheats with thermostats. 1 in the office and 1 in the chief scientist cabin. These are to be relocated to the new starboard cabins. Additional reheats are not required on the starboard side. Port side only has 1 existing reheat and 1 thermostat. An additional reheat and thermostat will be required on the port side. New reheat and thermostat will be GSM.
- C.8.4 Washrooms adjacent to exterior bulkheads have a heater fitted. The existing heater in the portside washroom, 02A26, must be relocated to the new port side washroom.

C.9 Electrical/ Electronics

- C.9.1 The Contractor must wire switches, lights, GFCI outlets, desk lights, etc. as per the design drawings. All electrical components, fixtures, and cabling to be provided by the Contractor.
- C.9.2 The Contractor must relocate the SSAS button in the ship's office to the Commanding Officer's cabin, 02A02. Contractor must remove the existing wiring and rewire in the new location.
- C.9.3 The Contractor must install new emergency lighting in the new port side cabin. The Contractor must wire the new emergency lights to the existing emergency lighting system.
- C.9.4 The Contractor must keep network cables as far away as possible from power cables. Where cables do cross, they are to do so as close to 90° as possible.
- C.9.5 There must be 1 fire detector in each cabin. The Contractor must install and wire 1 new fire detector in the new port side cabin. New fire detector to be GSM. The Contractor must relocate the 3 existing fire detectors if required. The Contractor must re-label the fire panel to reflect the new layout.
- C.9.6 The Contractor must update the ship's documents for cabin names to match the new layout, and where feasible and visible, update panel labels.
- C.9.7 There must be 1 ICS phone in each cabin, 1 in the ship's office, and 1 in the photocopier room. The Contractor must install 1 new ICS phone in the new port side cabin and 1 new ICS phone in the photocopier room. The Contractor must relocate the 4 existing ICS phones as required. 2 new ICS phones to be GSM.

- C.9.8 There must be 1 ICS speaker in each cabin and 1 in the ship's office. The Contractor must install 1 new ICS speaker in the new port side cabin. The Contractor must relocate the 4 existing ICS speakers as required. New ICS speaker to be GSM.
- C.9.9 There must be 1 EDS box in each cabin. The Contractor must install 1 new EDS box in the new port side cabin and 1 new EDS box in the new starboard side cabin. The Contractor must relocate the 2 existing EDS boxes as required. EDS boxes to be connected to the TVs with an HDMI cable. 2 new EDS boxes to be GSM.
- C.9.10 The Contractor must relocate the contents of the EDS entertainment system rack in the Ship's Office to the Control Lab, 01A37, on the 01 Level. EDS entertainment system to be relocated to the lowest shelf on the spare science rack. Contractor must remove the existing wiring and rewire in the new location. Contractor to dispose of the empty EDS entertainment system rack.
- C.9.11 There must be 2 Ethernet LAN drops in each cabin (desk & EDS TV system) and 2 in the ship's office (printer & office desk). The Chief Scientist cabin has an additional Ethernet LAN drop for the Science/Navigation display. The Contractor must supply and install 2 new Ethernet LAN drops in the new port side cabin and 2 new Ethernet LAN drops in the new starboard side cabin. The Contractor must relocate the 7 existing Ethernet LAN drops. Contractor to supply all cabling, terminations, and wall plates. All cabling must be Bergen CAT6A or RO approved equivalent. Zenitel to provide drawing updates to assist the Contractor with correct wiring connections. These drawing updates are to be GSM.
- C.9.12 The Contractor must supply and install 1 new TV in the new port side cabin and 1 new TV in the new starboard side cabin. New TVs must be of current manufacture and have a minimum of 24" diagonal screen, 1080p resolution, 2 HDMI ports, and be fully compatible with the EDS system.
- C.9.13 The Contractor must supply and install all cabling required for the EDS boxes, ICS phones, ICS speakers, and Ethernet LAN drops.
- C.9.14 The ICS programming and the EDS system must be updated for the additional equipment. Updates to be performed by Zenitel and will be GSM.

C.10 Hot Work

- C.10.1 The Contractor must include and maintain a fire watch in each space adjacent to any hot work, in accordance with General Notes G 1.4.5.
- C.10.2 The Contractor must install 2 new GSM exterior Beclawat windows as well as the one exterior window previously removed. Windows must be located as shown on the design drawings. Windows must be installed according to the manufacturer's

recommendations as shown on the following drawing: 70860-15 SEASPAN OSFV WINDOW LAYOUT DRAWING.

- C.10.3 The Contractor must repair the bulkhead plate and deck plate in way of all removed transits and make the repairs flush.
- C.10.4 The Contractor must repair and make flush to the surrounding surface all HVAC and vent penetrations that are no longer required.
- C.10.5 The Contractor must make flush to the surrounding all areas where piping holes and penetrations, as well as supports and equipment are removed or relocated.
- C.10.6 The Contractor must fill in the existing port side exterior window opening between frames 46 and 47. All aspects of the repair must meet the requirements of IACS No.47.
- C.10.7 The Contractor must repair and make flush to the surrounding surface the area of the removed deck scupper in the storage locker.

C.11 Painting

- C.11.1 The Contractor must paint the areas affected by the installation and removal of the windows. Painting must be as per paint manufacturer's recommendations and S62-190-631.00-001_OFSV 190 Coatings and Surface Treatment Schedule_Rev AB.

C.12 Lamacoids

- C.12.1 The Contractor must reuse and install all pipe and electrical identification lamacoids where possible.
- C.12.2 The Contractor must supply and install new lamacoids to identify all new electrical circuits, piping, and valves.

C.13 As-Fitted Drawings

- C.13.1 The Contractor must red line mark-up the following drawings. Obsolete information must be noted. Revision clouds must be used on sections of the drawings to denote new equipment. AutoCAD copies of all drawings will be provided by CCG.

| Drawing Number | DRAWING TITLE |
|--------------------|--|
| 190-324.10-235 | Electrical System One Line Diagram As-Built |
| 190-512.10-205 | Single Line Diagram Ventilation System Asbuilt |
| S62-190-526.00-001 | Deck Scuppers and Drains System Diagram_Rev AB |
| 190-528.10-001 | Black and Grey Water System Diagram As-Built |
| 190-533.10-002 | Domestic Fresh Water System Diagram As-Built |

11.2.D Proof of Performance**D.1 Inspection Points**

- D.1.1 Contractor must consult ships crew before locking out or unlocking any circuits or systems.
- D.1.2 The Contractor must give the TA sufficient notice to witness inspections as noted.
- D.1.1 The Contractor must afford the TA an opportunity to inspect work that will become obscured behind lining panels prior to installing panels.
- D.1.2 The Contractor must afford the TA an opportunity to inspect painting prior to covering with insulation or lining panels.
- D.1.3 The Contractor must afford the TA an opportunity to witness all welding carried out during the installation of the new portholes. The contractor and the TA must agree on inspection points and schedule prior to the start of the work.
- D.1.4 The Contractor must carry out weld inspections in accordance with the CCG Welding Specification CT-043-eq-eg-001.

D.1 Testing/Trials

- D.1.1 The Contractor must 100% test all exterior welds to demonstrate watertight integrity. Tests to be in the presence of the TA and RO.
- D.1.2 The Contractor must test water supplies, water drains and sewage lines and demonstrate that the piping is functional and there are no signs of leakage. The freshwater lines must be pressurized to 80 psi and pressure held for 1 hour. Drains and sewage lines to be tested by pouring 10 litres of water in each line. Tests to be in the presence of the TA.
- D.1.3 The Contractor must vacuum test all vacuum toilet lines.
- D.1.4 The Contractor must Meggar test all modified electrical circuits.
- D.1.5 The Contractor must test all communication cables (Ethernet LAN cables) to ensure they were not damaged during installation or relocation.
- D.1.6 The Contractor must function test the 02 Level fire detection system for the TA and RO.

D.2 Certification

- D.1.5 The Contractor must provide copies of all company or individual welding certificates indicating compliance with CSA regulations referenced. All certificates must be

provided to the TA in accordance with the Documentation section of the General Notes.

- D.1.6 The Contractor must provide copies of the NDT technician's or company's certification in accordance with ISO 9712:2005 International Standards for NDT.

D.1 Documentation

- D.1.7 The Contractor must submit to the TA a report of all NDT test results in accordance with the Documentation section of the General Notes.

- D.1.8 The Contractor must provide copies of all approved welding procedures in accordance with the Documentation section of the General Notes.

D.1 Training – Not Used

12.0 PROPULSION AND MANEUVERING

12.1 DIESEL GENERATOR SERVICE

12.1.A Identification

- A.1 The intent of this specification is to inspect and service the vessel's 3 Main Diesel Generator units.
- A.2 The Diesel Generator units must be serviced by the OEM's Field Service Representative (FSR) in accordance with the manufacturer's published procedures.

12.1.B Reference

B.1 Equipment Data

- B.1.1 3 x Diesel Generator Units
 - i) Manufacturer: Caterpillar Inc.
 - ii) Model: 3512C HD-DEP/LSA 52.2
 - iii) Part Number: 3512C
 - iv) Serial Numbers: SLM00627, SLM00628, SLM00631

B.2 Drawings and Documents

- B.2.1 All Drawings and Documents are listed in the General Notes.

B.3 Regulations and Standards

- B.3.1 All Regulations and Standards are listed in the General Notes. The Contractor must ensure all work completed in this section meets these Regulations and Standards as well as any other pertinent Federal/Territorial Regulation.

12.1.C Statement of Work

- C.1 The Contractor must sub-contract the inspection and service of the Diesel Generator Units to Caterpillar's Field Service Representative (FSR). Historically this has been Finning Canada.
- C.2 The FSR must perform the following service on each of the 3 Diesel Generator Units:
- a) Engine Protective Devices – Check
 - b) Generator Winding Insulation – Test
 - c) Rotating Rectifier – Inspect/Test
 - d) Varistor – Check-Inspect
 - e) Generator Set Alignment – Check (two bearing generator)
 - f) Generator Set Vibration – Test/Record
 - g) Generator Bearing – Inspect
 - h) Engine Mounts – Inspect
 - i) Auxiliary (seawater) Water Pump – Inspect
 - j) Engine Valve Lash – Check
 - k) Fuel Injector – Inspect/Adjust
 - l) JW/SW Heat Exchanger – Inspect and Clean. After coolant is drained the thermostats in both the main and aftercooler circuit must be tested. JW system must be pressure tested after completion of service.
- C.3 All service must be performed in accordance to manufacturer's published procedures as laid out in the Caterpillar workshop manual and Caterpillar service circulars (not provided). Note: Caterpillar Service Information System (SIS) is the primary tool for delivering parts and service information.
- C.4 Any defect found during the service will be addressed via PWGSC 1379 Work Arising procedure.

12.1.D Proof of Performance**D.1 Inspection Points**

- D.1.1 Contractor must consult with ABS to determine any required inspections. TA to be informed of any required ABS inspections.

- D.1.2 The ship will not depart on trials until the Chief Engineer and Captain are satisfied that the Diesel Generator Units are in a condition for safe departure from the dock.

D.2 **Testing/Trials**

- D.1.1 The Contractor must, under the direction of the FSR, test each of the Diesel Generator Units for correct functionality as per OEM manuals.
- D.1.2 The Diesel Generator Units must be run in accordance with OEM Manuals, and advice of the FSR.
- D.1.3 The FSR must attend the ship for one full day for engine set-up and trials alongside.

D.3 **Certification – Not Used**

D.4 **Documentation**

- D.1.1 Documentation must be in accordance with the Documentation section of the General Notes.
- D.1.2 The Contractor must provide a list of all materials used.
- D.1.3 The Contractor must provide all test certificates, and endorsement of safe operation required by ABS for certification to the TA prior to the conclusion of the contract.
- D.1.4 The Contractor must provide readings taken during the trials and any FSR reports in the final documentation.

D.5 **Spares – Not Used**

13.0 POWER GENERATION SYSTEMS

13.1 NOT USED

14.0 POWER DISTRIBUTION SYSTEMS

14.1 NOT USED

15.0 AUXILIARY SYSTEMS

15.1 NOT USED

16.0 DOMESTIC SYSTEMS

16.1 R/O UNIT REPLACEMENT

16.1.A Identification

- A.1 The Contractor must remove one of the existing Reverse Osmosis Assemblies (R/O Unit) including all associated pumps, filters, and membranes.
- A.2 The Contractor must purchase, install, and test one new R/O Unit including all required components for a functional system.

16.1.B Reference

B.1 Equipment Data

- B.1.1 The existing equipment is:
 - i) Manufacturer: PETER TABOADA, S.L.
 - ii) Model: PETSEA RO SW-Y 80/90
 - iii) Part Number: PR01070135
 - iv) Serial No. PS0425 081402
 - v) Equipment Tag: 533.10-A0008 Reverse Osmosis Plant #2
 - vi) Capacity: 8000 – 9000 L/day
 - vii) Recovery: 12.22 – 13.89% (60 Hz)
 - viii) Feeding Flow: 2.7 m³/h (60Hz)
 - ix) Filter Inlet Maximum Pressure: 6 kg/cm²
 - x) Plant Inlet Minimum Pressure: 0.7 kg/cm²
 - xi) Working Pressure: 54,.49 – 58.63 kg/cm² (60 Hz)
 - xii) Operating Maximum Pressure: 70 kg/cm²
 - xiii) Design Temperature: 18° C
 - xiv) Seawater Temperature: Minimum 10 °C – maximum 30 °C

- xv) Design Salinity Parameters: 38.000 ppm
- xvi) Electrical Feed: 3 phase 600V 60Hz 20 amp
- xvii) Dimensions: Length: 1.150 m; Width: 1.025 m; Height: 1.650 m
- xviii) Weight: 410 kg

B.2 Drawings and Documents

- B.2.1 All Drawings and Documents are listed in the General Notes.

B.3 Regulations and Standards

- B.3.1 All Regulations and Standards are listed in the General Notes. The Contractor must ensure all work completed in this section meets these Regulations and Standards as well as any other pertinent Federal/Territorial Regulation.

16.1.C Statement of Work

- C.1 The Contractor must lock out / tag out, and disconnect, the 600 Volt three phase supply circuit Panel P607S, breaker 6.

C.2 Strip-Out

- C.2.1 The crew of the CCGS Sir John Franklin will disassemble and remove the existing Plant #2 (inboard) R/O Unit from the Domestic Machinery Space and retain it for use as a spare.



Photograph 1: Existing RO Unit

C.3 New Reverse Osmosis Unit

- C.3.1 The Contractor must supply a new Lifestream Watersystems Inc. R/O Unit Part No. SW6500 563, or equivalent.
- C.3.2 The new R/O Unit must be capable of desalinating 12 m³ of potable water from seawater a day @ 25°C with 38,000 ppm Seawater.
- C.3.3 The R/O Unit must be new and unused and of current manufacture. It must be of commercial marine quality, in full compliance with the specifications and suitable for the intended use.
- C.3.4 The R/O Unit must be certified by the American Bureau of Shipping.
- C.3.5 The R/O Unit must be able to connect to the existing supply and product lines.
- C.3.6 The R/O Unit must use 600VAC three phase electrical power from breaker P607S. Canada will replace the existing supply breaker and wiring by 1379 additional work procedures to match the power requirements of the contractors selected R/O unit if current draw exceeds existing installation.
- C.3.7 The R/O Unit must have connections for: raw seawater feed, brine discharge, product discharge, potable water inlet, and cleaning solutions in and out.
- C.3.8 The R/O Unit must have cleaning connections and isolating valves for flushing.
- C.3.9 The R/O Unit must have a Prefiltration system to remove particulate matter which could damage the high pressure pump and/or foul the reverse osmosis membranes. The Prefiltration system must be capable of being backwashed. The Prefiltration system must have a minimum of 20 micron and 5 micron disposable cartridge filters. Spare filters to be supplied with the installation.
- C.3.10 The R/O Unit must have an Automatic Backwash System that automatically flushes the R/O membranes and valve parts exposed to seawater with potable water when the unit is shut off. Chlorine removal filter required (activated carbon filter).
- C.3.11 The R/O Unit must have a Remineralizing Filter fitted with the ability to bypass and backflush.
- C.3.12 The R/O Unit must have a Media Filter complete with manually operated backflush valves/connections.
- C.3.13 The R/O Unit must have a pulsation dampener installed on the outlet of the high pressure pump to reduce the pressure pulsations to the R/O membranes. Spare pulsation dampener to be supplied with the installation.

- C.3.14 The R/O Unit must have an automatic solenoid diverter valve on the product to storage/waste line to ensure the water quality routed to the vessel's storage tanks.
- C.3.15 The R/O Unit must be provided with a local control console that at a minimum provides control operation of the Reverse Osmosis system and controls, Ancillary components, and PLC Operation. This includes local controls for boost pump/freshwater flush start/stop independent of the high pressure pump. Local control console to provide indication of RO system faults. Local control console must have a Salinity meter which can display the measured total dissolved solids and temperature of the product water. Hour meter must be fitted to the local control console.
- C.3.16 The local control console must be protected by a splash resistant enclosure rated to NEMA 4 or IP66 or higher. Enclosures must provide a degree of protection to personnel against incidental contact to a level of NEMA 12 or IP52 or higher. All other electrical components must be protected against moisture to NEMA 4 or IP66 or higher.
- C.3.17 The R/O Unit must have a Booster Pump. The Booster Pump must operate automatically with the main control center of the system. The pump must be designed for seawater service and constructed of 316 SS. 4 liters of Pump Oil to be supplied with the installation.
- C.3.18 The R/O Unit must include pressure gauges for the seawater supply line, the booster pump supply and discharge, the R/O feed, the high pressure pump supply and discharge, and the outlet of the R/O membranes. High pressure gauges must be stainless steel, glycerine filled All gauges with the exception of the boost pump suction must be mounted in a central location on the control console.
- C.3.19 The R/O Unit must be provided with flow meters to measure the flow of the reject brine and product. There must be panel-mounted flow indicators for monitoring operations.
- C.3.20 R/O membrane housing end plates must be fitted with sample lines to allow each membrane product to be sampled individually.
- C.3.21 The R/O Unit must be provided with a Membrane Cleaning System and supplied with a Membrane Care Kit and an extra Membrane for Cold Water.
- C.3.22 Product water line from the R/O Unit to be fitted with a two position three-way valve to direct water produced overboard or storage tanks.

- C.3.23 All motors must be Totally Enclosed, Fan-Cooled (TEFC) and Epoxy Coated. Motor to have a minimum F class insulation. Electric motors and skid to be electrically bonded/grounded to the ship's hull.
- C.3.24 The R/O Unit must have the following minimum safety features to prevent damage of components:
- i) The HP pump must be protected from low suction conditions by a stainless steel pressure switch on the suction side of the pump.
 - ii) The HP pump must be protected from high discharge pressure by a stainless steel pressure switch on the high pressure side of the pump.
 - iii) The system must be protected from overpressure by a stainless steel relief valve at the outlet of the high pressure pump.
 - iv) Product water produced must have an automatic bypass valve to protect the membrane if there is restriction on the product water flow. (Product water must bypass into brine overboard discharge if the product water outlet is restricted)
- C.3.25 The R/O Unit must have the following automatic features included:
- i) All system sensors and shut-down relays must be operational in the automatic mode.
 - ii) All ancillary process related equipment must be automatically switched "on" with plant start up.
 - iii) PLC operation.
- C.3.26 The R/O Unit including the controls, pump and motor drive assembly, control center and membrane pressure vessels must be mounted on a steel frame (a skid). The steel frame must be completely coated with a corrosion proof paint.

C.4 Reverse Osmosis Unit Installation

- C.4.1 The Contractor must install the new R/O Unit in the Domestic Machinery Space.
- C.4.2 The Contractor must install vibration mounts below the steel skid that is supplied with the new R/O Unit.
- C.4.3 The Contractor must fabricate and weld steel brackets to support the R/O Unit. The brackets must be prepped and painted in accordance with the Coatings and Surface Treatment Schedule.
- C.4.4 The Contractor must bolt the R/O Unit securely in place to the new brackets.

- C.4.5 The Contractor must connect all connections (raw seawater feed, brine discharge, product discharge, potable water inlet) of the new R/O Unit to the existing piping systems. Existing piping sizes:
- i) Brine Overboard Line: 1”.
 - ii) Supply from sea chest 1.5” reduces down to 1.25” at the boost pump suction.
- C.4.6 The Contractor must install potable water piping to connect to the automatic backwash system on the R/O Unit.
- C.4.7 The Contractor must electrically connect the electrical supply to the new R/O Unit to provide power to the complete R/O Unit and ancillary components.
- C.4.8 The Contractor must integrate the R/O Unit alarm terminals with the existing alarm and monitoring system under the direction of CG. Voltage free “dry contact” required to implement the alarm.
- C.4.9 No ferrous piping is allowed in the installation. Seawater piping must be 316SS. Piping connections must be butt weld or Viega Stainless Steel Propress 316. If required, piping modifications must be butt weld 316 SS or SS Propress. No socket weld or threaded fittings with the exception of the connections on the OEM R/O Unit.
- C.4.10 Brine overboard is 90/10 CuNi. If required, modifications to be butt weld or slip-on brazed fittings.
- C.4.11 All piping must be suitable supported.

16.1.D Proof of Performance

D.1 Inspection Points

- D.1.1 The Contractor must demonstrate to the TA, before acceptance, the function of the R/O Unit.

D.2 Testing / Trials

- D.2.1 The Contractor must commission the R/O Unit in accordance with Original Equipment Manufacturers (OEM) recommendations. The Contractor must perform all tests recommended by the OEM in accordance with manufacturer’s guidelines.
- D.2.2 Product water sample must be taken for laboratory analysis according to the Fleet safety manual sampling requirements. Results to be supplied to the vessel and the TA prior to acceptance.

D.2.3 All piping modified during the installation to be pressure tested and witnessed by the TA prior to installation in the vessel.

D.2.4 Electrical installation to have ground bond test and insulation tested. Results to be recorded and delivered to the vessel and the TA.

D.3 Certification

D.3.1 ABS certification to be supplied by the Contractor.

D.4 Documentation

D.4.1 The Contractor must provide a completed OEM recommended commissioning check list to the TA.

D.4.2 The Contractor must provide a record of all electro-mechanical checks in Microsoft Excel 2010 (.xlsx) format.

D.4.3 The Contractor must provide a complete set of operating manuals with diagrams, electrical schematics and preventive maintenance instructions for the new R/O Unit. The manuals must detail individual components, as well as the system as a whole.

D.5 Training

D.5.1 Not Used

17.0 DECK EQUIPMENT

17.1 NOT USED

18.0 VESSEL COMMUNICATIONS AND NAVIGATION

18.1 NOT USED

19.0 INTEGRATED CONTROL SYSTEMS

19.1 NOT USED

20.0 SCIENCE, OCEANOGRAPHIC, AND HYDROGRAPHIC EQUIPMENT

20.1 NOT USED

21.0 CONTROL SYSTEMS

21.1 NOT USED