

# **Annex A**

CCGS AMUNDSEN DRY DOCK

**F7049-200177**

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## **G      GENERAL NOTES**

### **G 1      INTRODUCTION**

- G 1.1      These project requirements are provided to the Contractor to define the objectives, performance, engineering standards and requirements for the refit of the CCGS Amundsen for the Canadian Coast Guard, Department of Fisheries and Oceans Canada.
- G 1.2      It is the Contractor's responsibility to ensure that:
- a) The execution of the work specified herein meets the requirements described and those of Regulatory Bodies.
  - b) All items and equipment supplied are deemed necessary to ensure the seaworthiness and safe operation of the vessel, as required for a vessel of this class.
- G 1.3      Sections of this Specification package define the individual work items for which the Contractor must address as part of the refit project for the CCGS Amundsen.
- G 1.4      The ship will be unmanned for most of the contract period. The crew will not be lodged on board the ship during the work period. The crew will be onboard the 2 first weeks for demobilisation and support the transfer of custody of the ship to the Contractor. The Crew will be back onboard for the last 4 weeks of the contract including trials period. The ship must be habitable during these two periods and include accommodations, galley services, sewage systems, potable water, and the ship's alarm and monitoring system. During this period, unless otherwise specified, there will be 32 crew members on board. The custody of the ship will be entrusted to the Coast Guard only once the sea trials are completed.
- G 1.5      A minimum crew of 10 will be present during the complete duration of the work. Four (4) weeks prior to the completion of work there will be 15 "full crew" members present. These crew members will not be accommodated on board.
- G 1.6      The work carried out onboard by the some of the crew members will be mainly to support supervision of the work, inspection tasks but also to overhaul of the DP2 propulsion diesel engine as well as perform various maintenance tasks. The crew must not interfere in the execution of the work in these specifications.
- G 1.7      The ship must be operational at the end of the work period.
- G 1.8      The Contractor must provide a firm price for the supply of 4 portable toilets (Sani-bleu or equivalent) for the whole contract period. The price must include delivery and collection, complete cleaning (maintenance) and emptying of the tanks every 2 days. The final price will be adjusted upward or downward depending on usage with a PWGSC 1379 Form. The toilets must be of an insulated type for the cold autumn - winter period. They must be

installed on the flight deck aft of the vessel. The Technical Authority (TA) will request it at least 48 hours in advance for installation and 48 hours notice will be given to the Contractor for the removal of the four toilets from the vessel. When the vessel is unmanned by crew during the refit, then The Contractor must include the cost for arranging portable toilets of their own.

- G 1.9 CCG have a contract awarded for the overhaul of the DA3 generator for which the work must be completed during the same period. The Contractor will have to coordinate works of the spec item 13.1 with the overhaul works from WAJAX. Access to the vessel by WAJAX must be authorized by the Contractor at any time. Coordination of the presence of WAJAX onboard will be arranged between the Contractor and CCG following the presentation of the schedule of work. If necessary, crane services (handling of the delivery truck to the ship) must be available for this work with 24 hours notice (see section S 22). Handling times will be approved by the Inspection Authority (IA) on a daily basis (if applicable) and a report will be sent to the TA on a weekly basis. Refer to section S 22 for detailed management and pricing procedures.
- G 1.10 CCG have a contract awarded to Wartsila for Project and Site Management for the duration of the retractable thrusters and dynamic positioning replacement (see section 12.9.A.9). Access to the vessel by the Wartsila personnel must be authorized by the Contractor at any time. The Contractor must establish a schedule of work and coordinate the presence of Wartsila when the works on the retractable thrusters and dynamic positioning take place. The schedule of work and plan of coordination must be communicated to the TA a month prior to ship's arrival.
- G 1.11 CCG have a contract awarded to ABB for the implementation dynamic positioning features to the new propulsion control system. Access to the vessel by the ABB personnel must be authorized by the Contractor at any time. CCG will establish schedule of work and coordinate the presence of ABB on-site with the Contractor in due time.
- G 1.12 All materials and tooling required must be supplied by the Contractor unless specified as CCG furnished.

## G 2 **VESSEL PARTICULARS**

### G 2.1 **Main characteristics**

Name:	CCGS Amundsen
Type:	Medium / Fluvial Icebreaker – Type 1200
Class:	
Ice class:	Lloyd's Register _100A1 Ice Class 1A Super _LMC Arctic Shipping Pollution Prevention Regulations
Arctic Class:	4
Voyage Class	Unlimited more than 200nm

Year Built:	1979
Built Shipyard	Burrard Yarrows Corporation, Vancouver, B.-C.
Principle Dimensions:	
Length overall:	98.2 m
Breadth (molded):	19.5 m
Loaded Draft:	7.2 m
Minimum Draft	Forward : 5.6 m ; Aft : 6.4 m
Light Displacement	5709 MT
Loaded Displacement:	8322 MT
Power:	13 2000 kW (6x diesel ALCO 251F, V16 of 2200 kW/ea)
Propulsion:	Diesel electric (2x DC electric motor 5073 kW/ea)

## G 2.2 Equipment – [Not Used]

Equipment	Make	Model	Serial #
	[Not Used]		

### G 3 **REFERENCES**

#### G 3.1 **Acts, regulations, standards, publications and procedures**

G 3.1.1 The latest edition, at the time of contract signing, of all Acts, regulations, standards, publications, and procedures listed below are to be used as reference. The Contractor will ensure all work completed in the specification are done to all pertinent federal and territorial regulations and standards. CCG procedures are to be used as a guide if no other regulation takes precedence.

Document No.	Title	Included Yes/No
	Technical specifications (This Specification document and annexes)	Yes
	Design plans – electronic format	Yes
	Applicable CCG Standards and Guidelines – electronic format	Yes
171-09529-67	Annual monitoring of hazardous materials management	Yes
DFO 9415	Welding of Aluminum and Aluminum Alloys	Upon request
DFO 5737	Fleet Safety Manual	Yes
30-000-000-ES-TE-001	Colour Coding Standard for Piping Systems	Yes
18-080-000-SG-003	Paints and Coatings Standard	Yes
	1200 Icebreaker Coating paint schemeV5	Yes
CT-043-EQ-EG-0001-E	CCG Welding specification	Yes
CA-014-000-NU-TD-002	CCG Specification for Electronic Technical Data Deliverables	Yes
ASTM F1321-14	Standard Guide for Conducting a Stability Test (Lightweight Survey and Inclining Experiment) to determine the Light Ship Displacement and Centers of Gravity of a Vessel	No
ASTM G82-98 (2014)	Standard Guide for Development and Use of a Galvanic Series for Predicting Galvanic Corrosion Performance	No
CAN/CGSB-1.193-99	High-Build Epoxy Marine Coating	No
CAN/CGSB 1.61-2004	Exterior and Interior Marine Alkyd Enamel	No
CGSB 3.11-2017	Naval Distillate Fuel, 2002-11-01	No

978-1-100-25421-0	Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems - Environment Canada	No
CAN/CGSB 4.155-M88	Flammability of Soft Floor Coverings - Sampling Plans	No
CAN/CGSB 51.53-95	Poly(Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts	No
CAN/ULC-S102-03	Method of Test for Surface Burning Characteristics of Building Materials and Assemblies	No
CAN/ULC-S109-03	Flame Tests of Flame-Resistant Fabrics and Films	No
Canada Shipping Act, 2001	Marine Hull and Machinery Regulations of the Canada Shipping Act which apply to research vessel as defined under General Notes of Section G 2	No
CSA C22.1 SB-06	Canadian Electrical Code, Part I (20th Edition), Safety Standard for Electrical Installations	No
CSA C22.2--No 0-M91 (R2006)	General Requirements - Canadian Electrical Code, Part II	No
CSA CAN3-Z299.3-85 (R2002)	Quality Assurance Program – Category 3	No
CSA W47.1 039	Fusion Welding of Steel Company Certification	No
CSA W47.2-11 M1987 (R2015)	Certification of Companies for Fusion Welding of Aluminum	No
IEC 60092-504 Ed. 3.0 en : 2001	Electrical installations in ships - Part 504: Special features - Control and instrumentation	No
CAN/CSA-C22.2 No 60529-05	Degrees of Protection Provided by Enclosures (IP Code)	No
CEI 60533 Second edition	Electrical and electronic installations in ships – Electromagnetic compatibility	No
IEEE 45.1-2017	Recommended Practice for Electrical Installations on Shipboard--Design	No
IEEE 315-1975 (1993)	Standard for Graphic Symbols for Electrical and Electronics Diagrams	No
ISO 4406 – 1999	Hydraulic fluid power — Fluids — Method for coding the level of contamination by solid particles	No
ISO 18413:2002	Hydraulic fluid power -- Cleanliness of parts and components -- Inspection document and principles related to contaminant collection, analysis and data reporting	No

ISO/TR 10949:2002	Hydraulic fluid power -- Component cleanliness -- Guidelines for achieving and controlling cleanliness of components from manufacture to installation	No
ISO/TS 16431:2002	Hydraulic fluid power -- Assembled systems -- Verification of cleanliness	No
ISO 15748-1:2002	Ships and marine technology -- Potable water supply on ships and marine structures -- Part 1: Planning and design	No
ISO 15748-2:2002	Ships and marine technology -- Potable water supply on ships and marine structures -- Part 2: Method of calculation	No
ISO 2081 – 1986	Metallic coatings -- Electroplated coatings of zinc on iron or steel	No
	ABS and Lloyd's Classification Society Rules for the Classification of Ships	No
DORS/2010-120	Maritime Occupational Health and Safety Regulations	No
Guide PMBok 5 <sup>th</sup> edition	A Guide to the Project Management Body of Knowledge (PMBOK® Guide)–Fifth Edition	No
	Provincial Department of Labor Industrial Health Regulations respecting removal and disposal of Asbestos	No
SNAME	Rules/Guidelines for Shop and Installation Trials – latest edition	No
SNAME (3-47)*1989	Rules/Guidelines for Sea Trials – latest edition	No
SOLAS	Recommendations	No
TP 3177	Standard for the Control of Gas Hazards in Vessels	No
TP 11469 E	Guide to Structural Fire Protection	No
ABS	Ships Standards	No
TP 11469 E	Guide to Structural Fire Protection – 1993	No
TP 1861 E	Standards for Navigation Lights, Shapes, Sound Signal Appliances and Radar Reflectors (1991)	No
TP 2072 E	Deck Cargo Safety Code (1974)	No
TP 7301	Stability, Subdivision and Load Line Standards (1975)	No
06/1989	Transport Canada Marine Safety Bulletin 06/1989 – “Grounding Safety in Drydock”	No
UL 1309	Standard for Safety for Marine Shipboard Cable	No
ASME B31.1	Power Piping	No
ASME B31.3	Process Piping	No

### G 3.2 Technical reference document

The Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes. Please refer to the list of drawing enclosed in the document **Amundsen liste dessins - drawing list**.

#### G 3.2.1

### G 3.3 Tanks

G 3.3.1 Listed are the tanks found on board, their Location by frame number and capacity (Where available). These are to be used as reference only and will not supersede any specification.

TANK ID # / No. ID RÉ.	COMPARTMENT / RÉSERVOIR	FRAMES / MEMBRURES	CAPACITY / CAPACITÉ (m³)	AREA / SURFACE (m²)
<b>FUEL OIL</b>				
127	NO. 1 D.B FUEL OIL P.	123 - 165	76.99	618.6
128	NO. 1 D.B FUEL OIL S.	123 - 165	84.40	689.6
121	NO. 2 D.B FUEL OIL P.	97 - 123	101.55	715.3
122	NO. 2 D.B FUEL OIL S.	97 - 123	112.00	776.3
113	NO. 3 D.B FUEL OIL P.	61 - 93	140.13	976.3
114	NO. 3 D.B FUEL OIL S.	61 - 93	140.13	976.3
221	F.O. CENTRE FWD. DEEP P.	146 - 165	99.64	368.1
222	F.O. CENTRE FWD. DEEP S.	146 - 165	139.92	351.4
316	FUEL OIL DAY	123 - 127	42.53	161.1
215	FUEL OIL SETTLING P.	123 - 127	70.11	257.2
216	FUEL OIL SETTLING S.	123 - 127	70.11	251.0
219	F.O. FWD LOWER WING P.	138 - 158	57.83	340.8
220	F.O. FWD LOWER WING S.	138 - 158	57.83	340.8
319	F.O. FWD UPPER WING P. (FULL)	138 - 165	192.75	541.8
	F.O. FWD UPPER WING P. (OPERATIONAL)	138 - 165	86.30	
320	F.O. FWD UPPER WING S. (FULL)	138 - 165	202.06	541.8
	F.O. FWD UPPER WING S. (OPERATIONAL)	138 - 165	87.26	
202	FUEL OIL AFT. DEEP P.	18 - 30	104.27	433.1
203	FUEL OIL AFT. DEEP S.	18 - 30	104.27	455.9
213	FUEL OIL FWD E.R. WING P.	95 - 123	107.39	642.3
214	FUEL OIL FWD E.R. WING S.	95 - 123	107.39	642.3
208	FUEL OIL AFT E.R. WING P.	61 - 95	134.19	769.2
209	FUEL OIL AFT E.R. WING S.	61 - 95	134.19	769.2
304	HELICOPTER FUEL	4 - 11	28.00	62.9
<b>LUB OIL</b>				
104	FWD ENGINE ROOM INNER	114 - 123	10.65	n/a
105	FWD ENGINE ROOM OUTER	114 - 123	10.65	n/a
-	PROPULSION MOTOR ROOM	30 - 33	3.72	n/a
<b>FRESH WATER</b>				
311	FEED WATER TANK P.	27 - 30	16.40	80.3
312	FEED WATER TANK S.	27 - 30	16.40	80.3
305	FRESH WATER TANK P.	13 - 27	68.76	214.5

TANK ID # / No. ID RÉS.	COMPARTMENT / RÉSERVOIR	FRAM ES / MEMBRUR ES	CAPACITY / CAPACITÉ (m³)	AREA / SURF ACE (m²)
WATER BALLAST (S.W.)				
329	FORE PEAK W.B.	183 - FWD	112.28	727.6
301	AFT PEAK W.B.	AFT - 0	101.29	568.2
326	FWD TRIM W.B.	176 - 183	181.80	879.3
201	AFT TRIM W.B.	0 - 18	113.47	813.3
FLUME TANKS (S.W.)				
318	FLUME TANK UPPER (FULL)	127 - 138	275.49	585.8
	FLUME TANK UPPER (OPERATIONAL)	127 - 138	132.00	
217	FLUME TANK LOWER (FULL)	127 - 138	267.69	634.7
	FLUME TANK LOWER (OPERATIONAL)	127 - 138	187.98	
FLUME TANKS (F.O.)				
318	FLUME TANK UPPER (FULL)	127 - 138	261.72	585.8
	FLUME TANK UPPER (OPERATIONAL)	127 - 138	125.40	
217	FLUME TANK LOWER (FULL)	127 - 138	254.31	634.7
	FLUME TANK LOWER (OPERATIONAL)	127 - 138	178.58	
ENGINEERS TANKS				
659	BOILER FUEL OIL	84 - 87	3.04	17.6
-	PURIFIER L.O. STORAGE PORT	109 - 112	3.04	n/a
-	SLUDGE	107 - 115	1.82	n/a
-	BOILER FEED	95 - 100	1.64	n/a
-	HELICOPTER FUEL SUMP	13 - 16	0.14	n/a
-	LUB OIL	103 - 104	0.23	n/a
-	LUB OIL	104 - 105	0.23	n/a
-	LUB OIL	83 - 84	1.60	n/a
826	EMERGY. GENERATOR F.O.	72 - 76	3.80	30.3
-	GREY WATER RETENTION	142 - 144	0.54	n/a
-	PROP MOTOR L.O. CIRC.	40 - 43	0.45	n/a
-	HOT F.W. HEADER	102 - 104	3x 100gal.	n/a
123	DIRTY LUB OIL	112 - 116	4.77	37.8
124	DIESEL ENGINE J.W. RET.	116 - 120	4.55	37.6
106	D.B. #4 BILGE RETENTION P.	39 - 61	47.67	425.1
107	D.B. #4 BILGE RETENTION S.	39 - 61	47.67	425.1

306	FRESH WATER TANK S.	13 - 27	68.76	214.5
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**G 3.4 Abbreviations**

ABS: American Bureau of Shipping	
ACM: Asbestos Containing Material	MCA: Matériaux contenant de l'amiante
CFM: Contractor Furnished Material and/or Equipment	MFE: Materials Provided by Contractor
CLC: Canada Labour Code	CCT: Code canadien du travail
CSA: Canadian Standards Association	ACNOR: Association canadienne de normalisation
CWB: Canadian Welding Bureau	BCS: Bureau canadien du soudage
DFO/CCG: Department of Fisheries and Oceans, Canadian Coast Guard	MPO/ GCC: Ministère des Pêches et des Océans, Garde côtière canadienne
DP: Diesel Propulsion (Main Engine)	DP: Diesel Propulsion (Moteur Principal)
DA: Diesel Auxiliary (Ship Service Generator)	DA: Diesel Auxiliaire (Générateur Service Navire)
FSR: Manufacturer's Field Service Representative	RSF: Représentant de service du fabricant
FSM: Fleet Safety Manual	MSF : Manuel de sécurité de la flotte
GSM: Government Supplied Material and/or Equipment	MFG: Matériel fourni par le Gouvernement
HC: Health Canada	SC: Santé Canada
IEEE: The Institute of Electrical & Electronic Engineers Inc.	IEEE: Institute of Electrical and Electronic Engineers
MSDS: Material Safety Data Sheet	FS: Fiche signalétique
NDT: Non Destructive Testing	END: Essais non destructifs
OEM: Original Equipment Manufacturer	FEO: Fabricant d'équipement d'origine
OHS: Occupational Health and Safety	SST: Santé et sécurité au travail
PWGSC: Public Works and Government Services Canada	TPSGC: Travaux publics et Services gouvernementaux Canada
RO: Recognized Organization as defined by Canada Shipping Act.	OR: organismes reconnus par la Loi sur la marine marchande du Canada
SSMS: Safety and Security Management System	SGSS: Système de gestion de la sécurité et de la sûreté
TBS: Treasury Board of Canada Secretariat	SCT: Secrétariat du Conseil du Trésor du Canada
TA: Technical Authority - CCG Superintendent, Marine Engineering Central Region, or her delegated Representative.	AT: Autorité technique – Représentant du propriétaire (GCC)
TCMS: Transport Canada Marine Safety	SMTC: Sécurité Maritime de Transports Canada
TI: Technical Inspector – CCG delegated	AI: Autorité de l'Inspection – Inspecteur technique (GCC)
VCS: Vessel Condition Survey	EEN : Examen de l'état d'un navire
VLE: Vessel Life Extension	PVN: Prolongement de vie d'un navire
WCB: Workers' Compensation Board	CNESST: Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST)
WHMIS Workplace Hazardous Materials Information System	SIMDUT: Système d'information sur les matières dangereuses utilisées au travail

**G 4        CONDITIONS AND DEFINITIONS****G 4.1        General technical**

G 4.1.1        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:

**G 4.2        Equipment operational conditions - [Not Used]****G 5        MISCELLANEOUS PROVISIONS****G 5.1        COVID-19**

G 5.1.1        Reference documents :

5323-2020-13	COVID-19 - Health Screening Questionnaire for Canadian Coast Guard Personnel and Visitors Accessing Canadian Coast Guard Facilities and Vessels
5404-2020-08	COVID-19 - Information Concerning the Use of Non-medical Masks at Work
6102-515	Issuance of Contractor Designation Letters during the COVID-19 pandemic

G 5.1.2        Due to the Covid-19 pandemic, the Contractor must comply with CCC 12-2020 "COVID-19 - Health Screening Questionnaire for Canadian Coast Guard Personnel and Visitors Accessing Canadian Coast Guard Facilities and Vessels" during an outbreak of an infectious disease such as Covid-19.

G 5.1.3        The Contractor must ensure that all its employees and subcontractors wear non-medical masks while on board the vessel. The Contractor must provide these masks to its employees and subcontractors. The Contractor must also provide hand sanitizer for use by employees and subcontractors.

G 5.1.4        Contractor Essential Service Letters will be issued in accordance with Procedure 515 if required for the prime Contractor and any named subcontractors to facilitate travel and work.

**G 5.2        Occupational Health and Safety**

G 5.2.1        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.

- G 5.2.2 Where “Safety Management System” is referenced in this document, it is referring to the Contractor’s Safety Management System, which must be in affect while in the Contractor’s Care and Custody and must be in accordance with the applicable OHS regulations and procedures.
- a) The Contractor must, for all work on Canadian Coast Guard Vessel, meet or exceed the Safety Management System defined in the FSM unless a Contractor proposed comprehensive Safety Management System is presented and accepted by the TA.
- G 5.2.3 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:
- a) Contractor and all its representatives must attend an orientation session on vessel safety before beginning any work to familiarize the Contractor’s employees with the dangers specific to the vessel and with its permit systems for work protocols as well as with the procedures for safety, risk prevention, hazard response and pre-work safety assessments. The Contractor will have access to an uncontrolled copy of the Fleet Safety Manual DFO/5737.
- b) The Contractor must comply with the Fleet Safety Manual, DFO/5737, as well as with the instructions for working on board the vessel, in addition to the relevant requirements of the Canada Labour Code during performance of the following types of work:
- i) Work at heights;
  - ii) Entry into enclosed spaces;
  - iii) Degassing before entering into confined spaces and for hot work;
  - iv) Lockout and Tagout;
  - v) Pre-work safety assessments.
- c) For the purpose of the Lockout and identification procedure, the Contractor must provide the padlocks and locking devices for the Contractor’s employees in addition to those provided by the Chief Engineer for the vessel’s crew.
- d) The Contractor must adhere to local facilities shore based safety instructions and safety procedures.
- G 5.2.4 The Contractor must identify a specified person that 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 5.2.5 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 5.3 Lead Paint and Paint Coatings**

G 5.3.1 The Contractor must not use lead based paints.

G 5.3.2 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. Canadian Coast Guard provides copies of all available lead testing results. The Contractor must take paint samples before starting any work and have them analyzed by a provincially approved laboratory. The results must be sent to the Inspection Authority and Technical Authority (IA and TA) by email before the work begins. The Contractor must take measures to decontaminate, protect personnel, protect the work area and dispose of the contaminate material if the analysis is positive. This must be completed in accordance with all applicable municipal, provincial and federal regulations.

**G 5.4 Primer coats**

G 5.4.1 Unless otherwise stated, all steel surfaces that have been renewed or added must be coated with two coats (2.0 mils dry film thickness per coat) of marine primer compatible with the paint schedule. Unless otherwise stated, the primer must be supplied by the Contractor and the work must be approved by the IA immediately after completion of the work. All welds must be deburred and cleaned prior to applying the first coat of primer.

**G 5.5 Touch-up / Disturbed Paint**

G 5.5.1 The Contractor, at a minimum, must repair coating systems disturbed as a result of the specified work. Coating systems must be in accordance with the coating system of the vessel, and be applied in accordance with the paint manufacturer's recommended procedures.

G 5.5.2 All types of coatings required must be applied in accordance with their manufacturer's instructions and specifications on surface preparation, ambient conditions, drying/curing time, time between each layer, thickness of layers and preparation of coatings.

**G 5.6 Painting**

G 5.6.1 The Contractor must prepare a painting schedule and present it to the TA and to the IA for review and acceptance. The painting schedule must list all areas and compartments on the vessel affected by the project work and indicated the proposed paint type, painting scheme, surface preparation, type of coating, number of coats, thickness and colors. All paint used must be compatible with the existing paint on the vessel. CCG may require chemical expertise to demonstrate the compatibility of a new paint with the existing paint. The expertise must be confirmed by a chemist. The cost of the expertise will be borne by the Contractor.

- G 5.6.2 All pipe markings must comply with the standard CGFM 308-00-03, Color Coding Standard for Piping Systems.
- G 5.6.3 All new and disturbed steel and aluminum work must be painted in accordance with publication DFO 5847 and with the paint manufacturer's specifications.
- G 5.6.4 All paint must be suitable for use in the marine environment and comply with standards CAN/CGSB 1.61-2004 – Enamel Alkyd Exterior and Interior Marine Paint and CAN/CGSB 1.193-99 – Epoxy Resin Coatings, Marine. Paints, varnishes and other coatings used on interior surfaces must be included in the list of TCMS approved products, TP 438.
- G 5.6.5 Each coat of paint must be of a different shade to indicate proper coverage, and must be completely dry before application of subsequent coats. At minimum, the first coat of primer must be applied by brush or airless spray.
- G 5.6.6 The final topcoats must be protected from dirt or damage until the vessel is delivered to Canada. The Contractor must ensure that furnishings and equipment liable to more serious damage due to overspray are adequately protected during the painting process.
- G 5.6.7 Without limitation, the following elements must NOT be painted. When in doubt, the Contractor must consult the IA:
- a) screw threads;
  - b) grease fittings;
  - c) bronze pins;
  - d) door screens;
  - e) nameplates;
  - f) gaskets;
  - g) stainless steel or monel metal fittings;
  - h) machined surfaces;
  - i) instrumentation;
  - j) interior gratings;
  - k) electrical wires, insulation and fittings;
  - l) electrical panels;
  - m) rubber seals on watertight doors and hatches;
  - n) fire door seals;
  - o) Hydraulic hoses;
  - p) in general, all working parts or other exceptions stipulated by the IA.
- G 5.6.8 When the manufacturer and type of paint is mentioned in this specification, the Contractor must supply only the requested paint. In the case where the Contractor wishes to offer other types of paint from different manufacturers, he must demonstrate to the TA and / or that all

the characteristics and technical aspects of these are equivalent to those required. In the case of partial repairs, the Contractor must supply only the same paint as the one already applied to ensure adherence thereof.

- G 5.6.9 The paint covering the hull at the moment is INTERSHIELD 163 INERTA 160 (see technical document : Intershield\_163\_Inerta\_160\_eng\_usa\_A4\_20160202.pdf).

## **G 5.7 Cleanliness**

- G 5.7.1 The Contractor must ensure that all spaces, compartments and areas of the ship, both interior and exterior, are returned to their original state (upon delivery of the ship). The cost of removing dust, debris and other materials must be included in the bid price.

## **G 5.8 Asbestos Containing Materials (ACM)**

- G 5.8.1 The Canadian Coast Guard has detected the presence of various materials containing non-friable asbestos on board the CCGS Amundsen. An inventory report of materials containing asbestos, indicating the locations and quantities of materials is available for consultation from the TA. In addition, a study was conducted on the vessel in May 2020 and is included with these Specifications (see document: 171-09529-67 Annual monitoring of hazardous materials management). The studies on the vessel's materials carried out by WSP list the type of asbestos, quantities and locations where asbestos and other hazardous materials are found.
- G 5.8.2 The Contractor must become familiar with the content of this report and attest to its content by filing its bid.
- G 5.8.3 The Contractor is responsible to ensure that its employees, subcontractors and the employees of subcontractors are informed of the presence of various materials containing non-friable asbestos onboard the CCGS Amundsen.
- G 5.8.4 It is prohibited to use new materials or to reuse materials containing asbestos. If required, any handling of material containing asbestos must be done by trained and certified personnel. The Contractor must provide the certificates of certified personnel to the IA prior to beginning any handling or work.
- G 5.8.5 It is the Contractor's responsibility to eliminate all material containing asbestos in a safe manner and it must provide the IA with copies of certificates pertaining to the disposal of material containing asbestos, in accordance with federal, provincial and municipal regulations.

## **G 5.9 Confined Spaces**

- G 5.9.1 Entry into any confined space onboard the vessel during the contract period must be conducted in accordance with the safety management system. Unless specified otherwise,

the Contractor must prepare a schedule of access to the confined spaces on a weekly basis. The Contractor must supply the schedule one week ahead of the work to the TA and IA. In addition to those requirements, the Contractor must also conduct the following:

- a) Have a qualified person in accordance with TCPS TP 3177E issues a "Gas Free Certificate" for spaces that will be entered and post the certificate outside the entrance to the space. Certificates must specify, "Safe for persons" or "Safe for hot work" as appropriate.
- b) The certificates must clearly indicate the type of work authorized and must be renewed in accordance with the regulations in force in the province in which the work is being conducted.
- c) Provide copies of all certificates generated to the TA in accordance with the Documentation section of the General Notes.

## **G 5.10 Hot Work**

G 5.10.1 All hot work of this specification conducted during the work period must be in accordance with the Safety Management System. In addition to the requirements of the Safety Management System the Contractor must as a minimum also:

- a) Certify confined spaces affected by hot work as "safe for hot work" in accordance with the Confined Spaces section G 5.9 of the General Notes.
- b) Remove all portable combustible materials from the vicinity, to a safe distance not less than two meters away;
- c) Supply and install protective material to prevent the spread of sparks, protect electrical cables and other services;
- d) Supply and post fire sentries in each space and in the adjacent space where welding, grinding, or burning is being carried out on bulkheads, deckheads or decks;
- e) Supply and provide appropriate fire extinguisher(s) to the fire sentries and ensure each sentry is trained in the extinguisher's use. The fire sentry must maintain a watch in his designated area for a minimum of thirty (30) minutes after any hot work has been completed. The Contractor must record the sentry attendance time on all hot work permits indicating when hot work stopped, and time sentry left post;
- f) A safety round of the hot work area must be completed one hour and four hours after the end of hot work. The Contractor must record the time the fire watch was made on all hot work permits;
- g) Provide a copy of the site generated hot work permits to the TA in accordance with the Documentation section G 8 of the General Notes; Named in accordance with the specification item generating the required work.

**G 5.11 Work Aloft**

- G 5.11.1 Any work aloft onboard the vessel during the work period must be conducted in accordance with the Safety Management System. Notices must be placed to prevent operation of Radars while personnel are working aloft on the mast or on the wheelhouse top.

**G 5.12 Electrical Equipment**

- G 5.12.1 When working on electrically operated equipment, the Contractor must lock-out equipment in accordance with the Safety Management System, and as a minimum conduct the following:
- a) Isolate the main power source and any alternative power source to the equipment;
  - b) Install Electrical lock-outs and place electrical caution tags on the main power source and any alternate power sources for the switches/disconnects supplying the equipment under maintenance;
  - c) Verify at the terminals to ensure power is not present.
- G 5.12.2 Ensure the lock-outs and electrical caution tags remain in place until completion of all work.
- G 5.12.3 The TA must be notified of all such ongoing work.
- G 5.12.4 All electrical installations and repairs must be done in accordance with the latest revisions of ABS - Marine Vessel Rules and of standard 45- Recommended Practice for electrical installation on ships – of the IEEE. ABS Standard takes precedence over the IEEE standard.

**G 5.13 Workplace Hazardous Materials Information System (WHIMS)**

- G 5.13.1 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 5.13.2 All MSDS sheets must be maintained in accordance with OHS procedures.
- G 5.13.3 The TA will provide the Contractor with access to MSDS sheets for all controlled products on the ship for all specified work items on request.

**G 5.14 Smoking in the Work Space**

- G 5.14.1 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-Contractor.



- G 5.14.2 Only the crew living onboard the ship must be allowed to smoke outside on aft Upper Deck. In the event that the Contractor doesn't allow any smoking on exterior deck, the Contractor must supply a designated smoking area near the access gangway for the crew.

**G 5.15 Contractor Furnished Materials (CFM) and Tools**

- G 5.15.1 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 5.15.2 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 5.15.3 The Contractor must provide all equipment, appliances/devices, tools and machinery such as crange, staging, scaffolding, hoardings, and rigging necessary for the completion of the work in this specification.
- G 5.15.4 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 5.15.5 All tools are Contractor supplied unless otherwise stated in the technical specifications.

**G 5.16 Government Supplied Materials (GSM) & Tools**

- G 5.16.1 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 5.16.2 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 Procedures for Design Change or Additional Work. (PWGSC 1379).

**G 5.17 Storage**

- G 5.17.1 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 5.17.2 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 5.18 Regulatory Inspections and/or Class Surveys**

- G 5.18.1 Prior to the close out of any item under this specification, the Contractor must afford the TA and IA 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 5.18.2 The Contractor must demonstrate to IA that the completed work and equipment comply with the performance requirements described in this Specification package or those of the equipment suppliers. The Contractor must develop test and trial procedures, and must conduct all tests and trials required by this Specification package, as well as those recommended by manufacturers or by regulatory bodies following written approval by CCG in order to obtain all appropriate certificates required for the ship. The Contractor must obtain all certificates required herein this specification to ensure that the vessel is fully certified and seaworthy, for a vessel of its class, prior to the completion of the contract.
- G 5.18.3 The Contractor must prepare the trials schedule showing dates, sequence, procedures and duration of each trial or set of trials. This schedule, including the proposed trial record sheets for all trials, must be submitted to the TA and the IA for review and approval 10 business days prior to the start of any tests and trials.
- G 5.18.4 The Contractor must coordinate the testing schedule with ABS Classification Society and Health Canada (HC) to ensure their participation, where applicable. The Contractor must ensure the availability of a Field Service Representative (FSR) or obtain written authorization from the manufacturer before initial start-up of the installed or modified equipment.
- G 5.18.5 The IA must be present for all tests, as indicated in each section of this specification as well as the ABS, FSR or subcontractors, where applicable. The Contractor must notify the IA at least **24 hours** before any inspection points required under this specification are held.
- G 5.18.6 Tests must follow the recommended procedures described below. Any defects must be corrected to the satisfaction of the IA, TA, ABS and the attending FSR on site. Once defects are corrected, the tests and trials must be repeated upon request of the IA, and where necessary ABS.
- G 5.18.7 Upon completion of each specification item, the Contractor must notify the IA and ABS (as required) so they can inspect the work prior to final acceptance of each specification item or reassembly of equipment/components. Failure to notify the IA does not absolve the Contractor from its responsibility to provide the opportunity to inspect any completed item in accordance with regulatory and contract requirements.

- G 5.18.8 Inspections completed by the IA do not in any way, replace those inspections required by TCMS, ABS and/or HC.
- G 5.18.9 Shop testing, dock and sea trials must be to the standards required by ABS. Where ABS has no requirements for shop test procedures, the Contractor must adhere to SNAME guidelines as referenced in section G 3 of this Specification package. The minimum standard for all electrical dock and sea trial must comply with ABS and IEEE 45-2002. All electronic equipment static tests must be completed prior to seal trials, with only the operational tests to be carried out at sea.
- G 5.18.10 Hydrostatic testing of piping and components forming part of any system must be completed prior to any operational testing of the system. The Contractor must have on hand signed and witnessed test sheets showing the results of hydrostatic tests prior to the operational tests of a system. As a minimum, the IA must be notified when any components are being hydrostatically tested.
- G 5.18.11 The Contractor must provide the TA with a complete list of disturbed services aboard the ship that require functional and operational tests prior to the completion of each specification requirement. The Contractor must develop specific test procedures to test the operational and functional condition of each of the disturbed services and/or ship's systems. The Contractor must submit the list of disturbed services and ship's systems and the associated specific test procedures for review to the IA and TA twenty (10) working days prior to the testing of these systems.
- G 5.18.12 The Contractor must contact, coordinate, schedule and arrange for all visits and inspections associated with Class, TC or its RO's, HC, Environment Canada, or any other inspection required by the specification unless otherwise indicated. The Contractor must ensure complete preparation for all such inspections and surveys has been done before offering it to the inspectors or surveyors. All costs and fees associated with these visits and inspections will be billed directly to Canada.

**G 5.19 Contractor Inspections – Initial condition and location of work areas**

- G 5.19.1 In collaboration with the TA, the Contractor must conduct an inspection of 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 5.19.2 All parties present during this evaluation process must sign the report. This activity must be done prior to the commencement of work by the Contractor.
- G 5.19.3 The Contractor must make reference to Section G 8.7 with respect to documentation requirements for tests, trials and inspection registers.

G 5.19.4 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 G 8.4 of the General Notes, named according to the specification section G 8.4 that resulted in removing those items.

G 5.19.5 The Contractor is responsible to produce and supply a photographic inspection survey report to TA.

## **G 5.20 Mechanical and Piping Systems Inspection**

G 5.20.1 All piping systems and sub-assemblies fabricated by the Contractor must be hydrostatically tested to 1.5 times the system's working pressure and proven tight to the IA prior to installation onboard the ship. ABS requirements must be met.

G 5.20.2 An engineer approved welding procedure for the type and thickness of pipe used must be subject to AT verification prior to commencement of welding.

G 5.20.3 100% visual inspection of welds must be done on all hoses with operating pressures below 6 bar. In addition to the visual inspection, a radiographic inspection must be carried out on 100% of the welding of pipes whose operating pressure is greater than or equal to 6 bars. The ABS and ASME B31.1 and B31.3 standards must be applied.

G 5.20.4 Machinery and equipment must not be exposed to pressures higher than the maximum allowable operating pressure during system pressure tests. Valves at the components may be closed, or the connection blanked off to protect such components from excessive pressure. Where there any flanged joints in the piping between a tank isolating valve and the open end of the tail pipe, or where a tank isolating valve has not been installed, the flanged joint next to the open end of the tailpipe must be temporarily blanked off so the system may be pressure tested up to that point. Instruments, pressure switches and other components that may be damaged by excessive pressure must be removed or otherwise protected during hydrostatic testing.

G 5.20.5 For tests, calibrated pressure gauges must be installed at the connections provided in the gauge piping for this purpose. During the tests, readings of installed gauges must be checked with the calibrated test gauges. Installed pressure gauges must be adjusted where necessary, to indicate the correct pressure. The Contractor must provide all calibration certificates for all instrumentation used for the testing of systems to the IA and TA.

G 5.20.6 When the duration of a pressure test is not specified, the test pressure must be maintained for a sufficient length of time (minimum 30 minutes) to allow a thorough examination of the system for leaks, to the satisfaction of the IA.

G 5.20.7 Relief and safety valves and all other components installed to limit the operating pressure of a system must be removed, blanked, or bypassed where necessary, in order to build up

the required pressure for the test. After a system has satisfactorily passed these tests, all components previously removed must be reinstalled and tested under pressure to ensure they are operating at their approved set pressures. Set pressures, as indicated on identification plates of these components must conform to the approved set pressures.

- G 5.20.8 All components required for the safe operation of the system must be examined and adjusted during the operating tests to demonstrate that they comply with the requirements specified and approved for the system. Operating testing must demonstrate that the design and installation of the piping adequately meets the service requirements.
- G 5.20.9 Components, such as spring clamps, must be adjusted where necessary to ensure the systems are operating in accordance with their defined performance criteria. Flexible piping connections, slip joints, expansion joints and noise isolation pipe fittings must be checked for satisfactory operation while the system in which they are installed is being operated.
- G 5.20.10 Where pumps or ejectors have suctions from tanks or compartments, the operating test must demonstrate the system's ability to remove the service liquid down to the level of the open end of the suction line.
- G 5.20.11 Open systems such as vent lines, overflows and deck drains must be tested for unobstructed flow. This test must be conducted using a compressed air or water not exceeding 690 kPa (100 psi). Manual pump systems, portable drainage facilities and other various systems must undergo an operating test, as well as the specified pressure test. Pressure tests must precede operating testing.
- G 5.20.12 All systems must undergo visual inspection and must be leak free during the specified tests.
- G 5.20.13 All pressure and operating tests must be completed before system trials.
- G 5.20.14 Where tanks have been opened for the purpose of conducting work, they must be cleared, cleaned and inspected by the IA prior to being closed. Failure to notify the IA does not absolve the Contractor of its responsibility of providing the opportunity to inspect any completed items.
- G 5.20.15 Inspections completed by the IA do not in any way, replace those inspections required by ABS.
- G 5.20.16 Upon completion of the inspection, new gaskets compatible with the tank content must be installed on all tank covers. Prior to closing the Contractor must supply to the IA the technical data sheet of the proposed gasket. The Contractor is responsible for producing a register containing the signatures of those responsible for each inspection of each task to be inspected in the tanks. This register must include signature spaces for the IA (CCG), ABS inspector and the Contractor responsible representative attesting that all work and inspections have been completed.

- G 5.20.17 Where work has been conducted in or on any structural part of a tank, that tank must be subjected to a hydrostatic pressure test at a water column height of 8 ft. (2.5 m). The hydrostatic pressure test must be witnessed by the IA and ABS. Hydrostatic pressure tests must be documented and recorded and provided to the TA.

## **G 5.21 Ship Performance Sea Trials**

- G 5.21.1 In addition to dock trials commissioning tests of individual ship's systems specified with in this Specification package, the Contractor must perform a full set of sea trials in accordance with the "Guide for Sea Trials" as published by SNAME. The Contractor must develop all sea trial procedures and data sheets. The sea trial procedures with attached data sheets, must be submitted to the IA and TA for review and approval 10 days before the start of sea trials.
- G 5.21.2 After the refloating of the ship and once all the work in this Specification package has been completed, sea trials of a minimum of 8 hours must be performed. The Contractor must also provide an hourly rate, in its bid, permitting the price of these trials to be adjusted (up or down) in order to ensure they meet the regulation requirements of this Specification package.
- G 5.21.3 The Contractor must put together and present a complete MS Project schedule for sea trials. The Contractor must provide sufficient shipyard personnel, including one supervisor, for the duration of the trials in order to make all necessary adjustments as it is moving along.
- G 5.21.4 The Contractor must ensure the attendance of any required FSR for the duration of the sea trials.
- G 5.21.5 The Contractor must organize and assume all docking costs associated with the sea trials. The Contractor must provide the necessary resources required for handling the ship's mooring lines and any tugs required for the ship's departure from and return to the dock.
- G 5.21.6 The fuel for the dock and sea trials will be provided by CCG.

## **G 5.22 Recording of Work in Progress**

- G 5.22.1 The TA may record any work in progress using various means including, but not limited to, photography and video, digital or film.

## **G 5.23 Access for Maintenance, Installation, and Removal - [Not Used]**

## **G 5.24 Assembly of Components**

- G 5.24.1 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 5.24.2 Upon written approval of CCG and prior to performing the work, covers, cowlings and components damaged by the Contractor must be replaced with a new CFM cover, cowling, or component.
- G 5.24.3 Where torque specifications are not provided by the manufacturer, the applicable SAE, ANSI, or BS 1083 nut and bolt standard torque must be used.

## **G 5.25 Protection of Equipment**

- G 5.25.1 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 5.25.2 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 5.25.3 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, media (sand) blasting, grinding and painting.
- G 5.25.4 Any damage to surfaces, equipment, furnishings or decor incurred prior to acceptance must be returned to As-Delivered condition by the Contractor.
- G 5.25.5 All openings in machinery and/or systems prior to connections being made must be kept covered by fitted secure solid inserts or covers at all times.
- G 5.25.6 The Contractor must obtain and follow instructions from its Sub-Contractors for any special protection required for the Sub-Contractors equipment during the project work. Such instructions must be made available to the TA.
- G 5.25.7 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 5.25.8 The ship is currently free of vermin. 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 5.26 Halocarbon containing Systems**

- G 5.26.1 All work conducted on Halocarbon containing systems, must be in accordance with the Federal Halocarbon Regulations, 2003 (SOR/2003-289). For information purposes, these regulations are available on the internet at the following address: <http://laws-lois.justice.gc.ca/eng/regulations/SOR-2003-289/page-1.html>.
- G 5.26.2 A control policy for halocarbons used on CCG ships is in vigor. This policy is in Section 7.D.4 of the Fleet Safety Manual. The Contractor must ensure its employees and subcontractors respect this policy.

**G 5.27 Disposal of Waste Oil and Hydrocarbons**

- G 5.27.1 The Contractor must dispose of all waste oil and hydrocarbons or assign the task to subcontractors holding the provincial permits required for disposal of petroleum products. Copies of these permits must be presented on request, and disposal of waste oil and hydrocarbons must be done in accordance with Canadian Coast Guard policy on handling of fuel, oil and waste oil, described in Chapter 7.C.1 of the Fleet Safety Manual.

**G 5.28 Waste Disposal**

- G 5.28.1 Disposal of waste generated by sandblasting and mechanical cleaning must be done by the Contractor in accordance with provincial or municipal regulations, or by a subcontractor holding a permit from provincial authorities for the disposal of such material. Copies of these permits must be presented on request.

**G 5.29 Workmanship**

- G 5.29.1 The Contractor must use qualified, certified and competent tradesmen and supervisors to ensure a high quality and standard of work in accordance with ship construction/building standards and to the satisfaction of the IA.

**G 5.30 Supervision**

- G 5.30.1 During all phases of the work, the Contractor must supervise the work of its staff and subcontractors. Personnel designated by the IA will accompany the Contractor's employees at all times in accommodations and cabin spaces.

**G 5.31 Welding**

- G 5.31.1 All welding and weld inspection must be in accordance with the CCG Welding Specification CT-043-EQ-EG-0001. This document is provided to the Contractor as part of the Technical Reference Documents of the tendering documents.



- G 5.31.2 The Contractor must provide CWB's most recent audit report as requested under paragraph 4.1.4 in Part 4 of the Call for Tender.
- G 5.31.3 The Contractor must provide access to a customer-determined and hired third party at the welding facilities to perform a verification of the equipment, procedures and quality plan.
- G 5.31.4 The governing standards for welding of materials less than 3 mm in thickness must be in accordance with the requirements of the CCG Welding Specification CT-043-EQ-EG-0001. For materials greater than 3 mm in thickness, the Contractor must meet the following:
- a) For structural steels greater than 3 mm in thickness, welding must meet the requirements of CSA Standards W47.1 and W59, except as modified by the CCG Welding Specification CT-043-EQ-EG-0001.
  - b) For structural aluminum greater than 3 mm in thickness, welding must meet the requirements of CSA Standards W47.2 and W59.2, except as modified by the CCG Welding Specification CT-043-EQ-EG-0001.
  - c) For structural stainless steels greater than 3mm in thickness, welding must meet the requirements of CSA Standard W47.1 and AWS D1.6, and of the CCG Welding Specification CT-043-EQ-EG-0001.
  - d) ABS standards
  - e) Provide a welding procedure specific to the work approved by an engineer.
  - f) Inspections must be performed by a Level II Inspector CSA W178.2.
  - g) The Contractor must provide a 100% visual inspection of the welds that confirms acceptance.
  - h) When the Contractor performs welds on the hull, in addition to the visual inspection, the Contractor must perform Ultrasonic NDT (Non-Destructive Testing) on 100% of the welds and provide a quality control report that confirm the acceptance.
- G 5.31.5 Consumables (ref: CT-043-EQ-EG-0001, part 5.4) must meet the following requirements:
- a) Welding electrodes and consumables for welding steel must be certified by the BCS in accordance with the requirements of CSA W48 or the applicable AWS A5 series of standards and the ABS Classification Society .
  - b) The mechanical properties, corrosion resistance and hydrogen retention of the base material must be complied with in accordance with the classification society's rules.
- G 5.31.6 The welding procedure must meet the following requirement:
- a) The welding procedure (piping and structure) must be stamped by the Contractor's welding engineer and available on site for review by the CCG and the ABS Classification Society.

- G 5.31.7 The Welding Procedure Qualification Test (WPQT) and Welding Procedure Qualification Record (WPQR) must meet the following requirements:
- a) The WPQT and WPQR must be available for review by the CCG and the classification society (exception: unless the classification society has approved and stamped the welding procedure, then no revision is required).
  - b) The WPQR must be included in all the classification test requirements.
- G 5.31.8 Welders certification must meet the following requirements:
- a) Structure: All welders must be certified to CSA W59.1, W47.1 for steel and CSA W59.2 and W47.2 for aluminum.
  - b) Pipe: All welders must be certified to ASME Sections IX and B31.1 / B31.3.
- G 5.31.9 Welding inspection and qualification of inspectors must meet the following requirements:
- a) Structure: The Welding Inspector must be Level II certified in accordance with CSA W178.2 or an equivalent standard.
  - b) Pipe: The Welding Inspector must be Level II certified to ASME Section IX.
- G 5.31.10 Non-destructive testing must meet the following requirement:
- a) Inspector must be certified level II according to CGSB.
- G 5.31.11 Contractor Requirements
- a) Certification Requirements for Steel Structures
    - i) All welding Contractors must be certified by the Canadian Welding Bureau (CWB) to Canadian Standards Association (CSA) Standard W47.1 -2019, Division 1 or 2. The Contractor must meet all of the requirements of Annex M – Qualification of Welding Personnel and Procedures for Marine Applications.
  - b) Certification Requirements for Stainless Steel Structures
    - i) All welding Contractors must be certified by the Canadian Welding Bureau (CWB) to CSA Standard W47.1 -2019, Division 1 or 2. The Contractor must meet all of the requirements of Annex K – Qualification of Welding Personnel and Procedures for Stainless Steel Materials.
  - c) Certification Requirements for Aluminum Structures
    - i) All welding Contractors must be certified by the CWB to CSA Standard W47.2-11 (R2015), Division 1 or 2.
  - d) Scope of Certification
    - i) The scope of certification filed with the CWB as required by CSA Standards W47.1-2019 and W47.2-11 (R2015) must include all welding work performed under the requirements of the CCG vessel specifications and statements of work.

- ii) Pipe used as hollow structural section material such as pillars, masts, supports, handrails, etc., must not be excluded from any company's scope of certification.
- e) Validation Certificates
  - i) Company welding certification validation certificates are required for each Contractor and subcontractor facility where welding work will take place. Scope of certification indicated on the validation certificates must include all welding work performed under the requirements of the CCG vessel specifications and statements of work.
- f) Welding Procedures
  - i) All welding procedure specifications and/or welding procedure data sheets must be qualified by procedure qualification testing and reviewed and approved by the CWB prior to use.
  - ii) Welding procedures must be tested to the requirements of Annex M of CSA Standard W47.1-2019 for all steel welding work, Annex K of CSA Standard W47.1-2019 for all stainless steel welding work and to the requirements of CSA Standard W47.2-11 (R2015) for all aluminum welding work.
- g) Welding Personnel
  - i) All welding personnel must be approved by the CWB prior to their commencing any welding work.
  - ii) Welders must be tested to the requirements of Annex M of CSA Standard W47.1-2019 for all steel welding work, Annex K of CSA Standard W47.1-2019 for all stainless steel welding work and to the requirements of CSA Standard W47.2-11 (R2015) for all aluminum welding work.
- h) Performance and Qualification Testing
  - i) All welder performance and welding procedure qualification testing must be fully witnessed and documented by the CWB.
- i) Limitations Prior to Commencing Welding Work
  - i) All Contractors must submit their welding personnel qualification records and approved welding procedures to the CGTA prior to commencing any welding work.
  - ii) All welding procedures, including welding procedure specifications and welding procedure data sheets, must include an indication of acceptance by the Contractor's Welding Engineer (by signature, seal or other appropriate means) and a stamp of acceptance by the CWB.
- j) Governing Standards for Welding
  - i) For structural steels  $\geq 3$  mm in thickness, welding must meet the requirements of CSA W47.1-2019 – Annex M, CSA W59-2018, and the CCG Welding Specification CT-0043-EQ-EG-1-E.

- ii) For structural stainless steels  $\geq 3$  mm in thickness, welding must meet the requirements of CSA W47.1-2019 – Annex K, AWS D1.6-2017 and the CCG Welding Specification CT-0043-EQ-EG-1-E.
- iii) For structural aluminum  $\geq 3$  mm in thickness, welding must meet the requirements of CSA W47.2-11 (R2015), CSA W59.2-2018 and the CCG Welding Specification CT-0043-EQ-EG-1-E.

k) Weld Design

- i) Weld design must be to the Rules of a Classification Society that is an approved Recognized Organization by Transport Canada Marine Safety and Security and/or as given on the supplied design drawings or welding schedules.
- ii) Unless otherwise approved by the CGTA, the following conditions must be met:
  - all groove welds in butt joints of plate and pipe must be complete joint penetration; and,
  - all corner joints must be complete joint penetration groove welds combined with single continuous fillet welds.
- iii) A weld design schedule must be submitted to the CGTA in drawing form for review prior to commencing any welding work.
- iv) Welds must not be made without an approved weld design requirement for each joint to be welded.

l) Symbols for Welding

- i) Design drawings must include weld requirement symbols and construction drawings must include welding symbols following the requirements of CSA Standards W59-2018 and W59.2-2018. For fillet welds, the drawings and welding schedules must indicate if the weld dimension shown in the symbol is throat size or leg length.

m) Surface Weld Inspection

- i) All completed welds must be examined visually by a third party welding inspector certified by the CWB to CSA Standard W178.2-2018, Level 2 or 3. The individual must have code endorsements for the standards of compliance being used for acceptance (CSA W47.1/W59, CSA W47.1/AWS D1.6 and/or W47.2/W59.2). Safe access must be given to the satisfaction of the CGTA. Lighting, viewing angle and viewing distance for close up examination must meet the requirements of ASME Section V.
- ii) Steel butt welds in thick plate ( $\geq 19$  mm) that have been visually examined must undergo examination by magnetic particle testing following the requirements of CSA W59-2018. Third party personnel performing magnetic particle examination must be qualified by the Certifying Agency of NRCan to the requirements of CGSB 48.9712, Level 2 or 3. Procedures and techniques must

meet the requirements of CSA W59-2018. The entire weld length (100%) must be examined.

iii) Aluminum butt welds in thin plate (< 5 mm) that have been visually examined must undergo examination by penetrant testing following the requirements of CSA W59.2-2018. Third party personnel performing penetrant examination must be qualified by the Certifying Agency of NRCAN to the requirements of CGSB 48.9712, Level 2 or 3. Procedures and techniques must meet the requirements of CSA W59.2-2018. The entire weld length (100%) must be examined.

n) Volumetric Weld Inspection

i) All volumetric weld inspection examinations must be performed by a third party inspection organization certified by the CWB for the inspection methods to be used in accordance with CSA Standard W178.1-2018. Volumetric weld inspection examinations must be performed in accordance with all of the requirements of the CCG Welding Specification CT-0043-EQ-EG-1-E.

ii) The non-destructive examination methods used for volumetric weld inspection and the extent of the examinations must be as required in the vessel specifications and/or statements of work.

o) Vacuum Box Leak Testing

i) Vacuum box leak testing of welds does not exclude the Contractor from performing the third party non-destructive examination requirements specified herein and within the CCG Welding Specification CT-0043-EQ-EG-1-E.

**G 6      GOVERNMENT PROPERTY**

**G 6.1      General**

G 6.1.1      All materials and equipment removed from the vessel by the Contractor remain the property of Canada, unless the project requirements explicitly provide for their disposal.

G 6.1.2      The Contractor must keep and maintain these materials and equipment in their original condition while awaiting instructions from the TA.

G 6.1.3      The Contractor must obtain the approval of the CA to dispose of the materials and equipment, whose market value is void after being removed from the vessel.

**G 6.2      Categorization**

G 6.2.1      Any property of Canada that must be removed from the vessel either temporarily or permanently must be placed in one of the following three categories:

a) Category A:

i) These items must be permanently removed from the vessel and remain the property of Canada. The Contractor must store and protect these parts from weather, physical damage, or loss. The Contractor must store these parts on pallets, platforms, or containers adapted for shipping until Canada has inspected them and has accepted to take charge and store them. The Contractor is responsible for storing these parts for Canada for the duration of the contract period. It is the responsibility of Canada to remove these parts from the Contractor's premises.

b) Category B:

i) These items remain the property of Canada and must be temporarily removed from their location on board the vessel during the contract work. They must be returned to their original location on board the vessel before it leaves the Contractor's facility. The Contractor must protect these items from weather, physical damage, or loss. These items must be stored to allow movement of the items to permit access for inspection, refurbishment and/or maintenance of these items as necessary. The Contractor must take care not to damage the equipment and the materials.

c) Category C:

i) Upon removal, these items become the property of the Contractor, who must dispose of them in accordance with all applicable laws, rules, and regulations.

G 6.2.2 Prior to removal of any item from the vessel, the items must be clearly identified with wire tags clearly indicating if it belongs to Category A, B, or C, in accordance with the instructions of the TA.

G 6.2.3 This requirement is in addition to those concerning any spare parts required for regulatory purposes. All such spare parts must be supplied packaged and individually identified with the description of the equipment, the model number, and the catalogue/part number.

### **G 6.3 Spare Parts**

G 6.3.1 All new equipment that is procured by the Contractor for installation on the vessel must be supplied complete with sufficient manufacturer's recommended original spare parts (OEM) for six months or 2,000 hours of operation whichever is greater or unless otherwise specified by the TA.

G 6.3.2 All system spares must be provided in a spare parts list supplied by the Contractor in an electronic MS Excel or equivalent spreadsheet format. The spreadsheet must identify, for each component of a system, the number of spare parts recommended in the previous paragraph. The list must include the following fields:

a) The supplier;

i) The manufacturer;

- ii) The manufacturer's part number;
- iii) The unit price;
- iv) The definition of the quantities (unit, case, etc.);
- v) The recommended number;
- vi) The associated system/equipment

- G 6.3.3 An electronic copy of the spare parts list must be must be submitted to both the IA and the TA.
- G 6.3.4 The Contractor must notify the IA and the TA when such spare parts have been received.
- G 6.3.5 The Contractor must store the spare parts in accordance with the manufacturer's requirements and ensure that they are protected from weather, physical damage, or loss.

## **G 7 PROJECT MANAGEMENT**

### **G 7.1 Introduction**

- G 7.1.1 As part of this project, project management refers to the management needs for ensuring the integration of both upstream and downstream activities and sub-activities, technical control, and management of deadlines required for the refit project of the CCGS Amundsen. The Contractor must provide, during the start-up meeting, a draft of a Gantt bar chart in a MS Project 2013, or equivalent in compliance with sub section G 7.6.

### **G 7.2 Project Action Plan (PAP)**

- G 7.2.1 The Contractor must document the management of the project work in a PAP, and must update this plan every month or more frequently as required by the Contracting Authority (CA).
- G 7.2.2 As a minimum, the PAP must include organization structure charts, a schedule (MS Project), support schedules, subcontractor schedules and work, and delivery dates for Government and Contractor furnished equipment (GFE and CFE).
- G 7.2.3 The monthly updates to the PAP must include schedule updates, a progress report, and review meetings. The components of the PAP and the updates are described in the following sub-sections.

### **G 7.3 Project Integration Management**

- G 7.3.1 Included with its bid, the Contractor must provide an organization chart of the entire project, indicating all key personnel and subcontractors. In addition, the Contractor must identify, in whole or in part, the work attributed of the subcontractors.

### **G 7.4 Change Management Log**

G 7.4.1 The Contractor must provide a Change Management Log that must be used for the duration of the project to manage changes to the project.

G 7.4.2 The Change Management Log must track project issues using the following criteria:

- a) Individual tracking number;
- p) Identification in the Specifications section;
- q) Date issue was raised;
- r) Expected resolution date;
- s) Date issue was resolved;
- t) Date resolution is accepted by the IA;
- u) Brief note of resolution on issue;
- v) Individual who raised the issue;
- w) Individual assigned to resolve issue;
- x) Risk factor.

## **G 7.5 Risk management**

G 7.5.1 Using an MS Excel spreadsheet or equivalent, the Contractor must prepare a risk management plan of emerging risks, and classify them according to their impact on the work and the production schedule. Mitigation strategies must be developed for all high risks. This risk management plan must be updated at least every two weeks and submitted to both the TA and CA. The Risk Management Plan must be included in the weekly progress meetings record of decisions.

## **G 7.6 Scheduling**

G 7.6.1 The project management and planning file as per Sub-Section G 7.1.1 must contain a minimum of the following planning elements:

- a) The Work Breakdown Structure (WBS) on at least three or more levels for each section of the Specification package. More specifically, the WBS must include the strip outs, production, assembly, bench testing, installation, system tests, commissioning, trials, the expected and required resources and the necessary sea trials;
- b) Predecessors and successors;
- c) The start and end dates for each item;
- d) The critical path to the acceptance of the work;
- e) The subcontractors' schedules up to the same level;
- f) Long lead items and GFE;

G 7.6.2 The Contractor must provide MS Project work schedules.



- G 7.6.3 The Contractor must update the schedules for each progress meeting and present the updates to the Contracting Authority, the TA and the IA.
- G 7.6.4 The schedules must identify all work in the project, main milestones, and all interrelationships between the tasks. The schedules must be baseline.
- G 7.6.5 Unless otherwise stated in the contract, the initial schedule must be delivered at the start-up meeting.
- G 7.6.6 At the written request of the contracting authority, before contract award, a schedule of milestones must be provided in the bidder's presentation.
- G 7.6.7 The Guide to the Project Management Body of Knowledge, 5th edition, must be used as a reference for planning.

## **G 7.7 Project reports**

- G 7.7.1 Three (3) working days before the progress review meeting, the Contractor must provide a progress report, in which the project's progress, costs, and performance are described in the introduction. The deadlines, costs, and performance will then be examined in detail to clearly demonstrate the value earned through the IPC and the IPS. The report must indicate significant risks for the program, and the measures taken to resolve them. The risk analysis must identify any impact on the project's completion and determine the measures taken to make up for the delays that may affect the completion date of the work. The report must be submitted on paper during the meeting, and sent electronically beforehand to IA, TA and CA.

## **G 8 DOCUMENTATION**

### **G 8.1 The Contractor must store and share with CCG all electronic format files listed as a deliverable documentation. This must be accomplished by the following manner:**

- G 8.1.1 The Contractor must provide services and accesses to an online protected and secured licensed file sharing platform that can only be edited (organized and controlled) by designated administrators. The other users will only have access in READ mode.
- G 8.1.2 There must be a limited amount of administrators: Two (2) from CCG and Two (2) from the Contractor.
- G 8.1.3 Folder tree structure must be initially presented and approved by CCG TA and CA and it must be based on SOW item numbering (ABS).
- G 8.1.4 Documents stored must be accessible during the entire contract period and at any time by CCG CA, TA and IA using unique credential and password for each user profile.

G 8.1.5 For each transfer of deliverable documentation on the secured file sharing platform, the Contractor must send a report in an official transmittal, by email, to be signed and returned by the TA.

G 8.1.6 The offer of platform must be presented and approved by CCG CA and TA a month after the contract has been awarded. Google drive, WeTransfer and unprotected FTPs will not be accepted.

## **G 8.2 Text Documents**

G 8.2.1 All text deliverables must be accompanied by a PDF file that must contain the complete document. The Contractor must check the quality to verify that the content reflects the same content/formatting as the Master Document file. In the case of changes, a second PDF file that contains only the changed sheets must be supplied.

G 8.2.2 Further guidance is available from the Canadian Coast Guard Specification for Electronic Technical Data Deliverables (CA-014-000-NU-TD-001).

## **G 8.3 Data Book**

G 8.3.1 The Contractor must provide all documentation generated as a result of specified deliverables, in both electronic and paper formats. There must be 2 paper copies of each document, in two separate binders, as part of the Contractors QA program. An electronic copy of all documentation must also be provided to the TA in accordance with the formats described in this specification section.

G 8.3.2 All copies of documents generated as a result of specified deliverables will be referred to as the “Data Book”.

G 8.3.3 The Contractor must provide to the TA all the files generated as part of the Data Book prior to the contract requirement being considered complete. The files must be in hard format (USB Flash Drive). Each specification item is to have its own folder named according to the specification item. For example “G General Notes”.

G 8.3.4 Any documentation, media, and reports that are the result of Additional Work must be included as part of the Data Book.

## **G 8.4 File Naming**

G 8.4.1 File naming must be in the following format: Specification#.# – Date (yyyy-mm-dd) – File Name Describing Information. For Example: “G\_1.0\_2013-12-01\_Details of file naming.pdf”.

## **G 8.5 E-mails**

G 8.5.1 Any files sent to the CA/TA/IA by e-mail must be named as per the “File Naming” section G 8.4 of this specification. All files that are e-mailed must have the Contract # – Specification Item # - Date - Keywords short description of the content in the subject name. **Deliverable documents will NOT be accepted by email. They must be transferred to CCG on the protected online file sharing platform (see item G8.1).**

## **G 8.6 File Formatting**

G 8.6.1 All documentation, reports, test results, certificates, or data obtained by the Contractor in paper form must be scanned into unprotected, searchable, Adobe PDF formatted files and named according to the “File Naming” section of this specification.

G 8.6.2 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 G 8.4 “File Naming” of this specification. Both the original and the converted copy must be provided as part of the Data Book.

## **G 8.7 Photographs**

G 8.7.1 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 G 8.4 of this specification.

## **G 8.8 Measurements, Calibrations, and Readings.**

G 8.8.1 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 8.8.2 Unless otherwise specified the Contractor must record dimensions to a precision of three significant digits in imperial along with the metric equivalent.

G 8.8.3 The Contractor must provide to the TA current and valid calibration certificates, and control values 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 8.9 Test/Inspection Records and Certificates Register**

G 8.9.1 Test and/or Inspection Records and Certificates are identified as a deliverable in the individual specification item requesting them.

G 8.9.2 Test and/or Inspection Records and Certificates, must be included as a separate section in the Databook and indexed/arranged in numeric order by specification number and dated.

- G 8.9.3 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 8.9.4 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 the regulatory body, 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 G 8 of these General Notes.
- G 8.9.5 The Contractor must maintain a complete and accurate register of all certificate records for the work performed. Certificates records must be up-to-date and correspond to the type of equipment installed by the Contractor. When certificates of approval from a Classification Society are required, the Contractor must ensure that they are inserted within the Certificate register binder. When manufacturers provide equipment certificates in operating manuals, copies of these certificates must also be indexed in the Certificate register binder. The Contractor must also obtain and index all certificates issued by its subcontractors.
- G 8.9.6 The originals of tests, trials and inspections registers must be signed by ABS, the Contractor and where applicable, the subcontractor and/or Field Service Representative who witnessed the tests.
- G 8.9.7 Tests and inspections carried out for the specific purpose of satisfying the ABS requirements for the Ship Inspection Reporting System (SIRS) update of the vessel must be recorded and signed on documents meeting the requirements of ABS, to clearly indicate which piece of equipment or system with associated field number was tested and the results of tests performed. All copies of the documents must be dated and signed by the ABS inspector present and by the Contractor.
- G 8.9.8 The Contractor must prepare a separate binder for the documentation of all Certificate records as well as in electronic format. The binder must be indexed for each element or piece of equipment for which Certificate records are available.
- G 8.9.9 The Contractor must maintain a complete and accurate register of all certificate records for the work performed. Certificates records must be up-to-date and correspond to the type of equipment installed by the Contractor. When certificates of approval from a Classification Society are required, the Contractor must ensure that they are inserted within the Certificate register binder. When manufacturers provide equipment certificates in operating manuals, copies of these certificates must also be indexed in the Certificate register binder. The Contractor must also obtain and index all certificates issued by its subcontractors.

- G 8.9.10 The Contractor must provide the number of paper copies and electronic copies of the tests, trials and inspection records.
- G 8.9.11 Where original certificates are provided, especially ABS certificates, one of the three paper copies submitted must be the original document.
- G 8.9.12 The Contractor must, in addition, provide originals of each certificate document to the TA in an envelope marked with the vessel's name and the words "Original Certificates".

## G 9 **DRAWINGS**

### G 9.1 **General**

- G 9.1.1 The Contractor must provide all drawings & diagrams necessary for the design and execution of work on the new or modified systems, including drawings & technical manuals produced by the manufacturers or the subcontractors.
- G 9.1.2 All new drawings must be submitted as individual files compatible to DWG (AutoCAD Version 2013). The files must be provided to the TA on a DVD storage media, clearly identified with the title and number of the project.
- G 9.1.3 The drawings must provide a complete and detailed visualization of all new or modified systems (Electrical & mechanical). The drawings must include all the information so that a qualified technician can conduct a quick, complete and specific search in case of malfunction or for any other reasons.
- G 9.1.4 Generally, the drawings must include or describe all of the following elements:
- a) Detailed cover page and index;
  - b) Abbreviations and symbols used;
  - c) Identification and specification of equipment;
  - d) Location, physical representation and mechanical dimension;
  - e) Block diagrams, overview of the systems;
  - g) Electrical circuits: Controls, power, cables and wiring;
  - h) All other references or details required to understand the system
- G 9.1.5 It is the responsibility of the Contractor to update or redraw all original vessel drawings affected by the modernization project. Changes made to the old drawings must be denoted in a different colour or style. If more than 50% of an original diagram is changed, the diagram must be redrawn in full, compatible to DWG (AutoCAD) format. Although some original diagrams are kept in a series, this must not prevent all drawings from being homogenous in presentation, numbering and method of interpretation.
- G 9.1.6 The Contractor must have an effective method to produce and update drawings throughout the work period. The Contractor must maintain an up-to-date list of drawings & revisions,

and must provide this list to the TA at the monthly progress meeting. This list must include a column of all drawings sent to ABS for approval and the date of their approval by ABS.

G 9.1.7 The Contractor must provide the IA and TA all drawings required by or generated by subcontractors.

G 9.1.8 A final version of the "As Fitted" drawings must be provided at the end of the project. DWG (AutoCAD) files must not be electronically protected, and the CCG must be able to modify all elements as needed in any future changes.

## **G 9.2 Conceptual design drawings**

G 9.2.1 The Canadian Coast Guard provides all technical reference drawings to the Contractor for reference purposes only. The Contractor must produce working drawings and ensure that all of these drawings receive relevant regulatory approval. The Contractor must note that the reference drawings provided are not all "As Fitted" drawings. The Contractor must physically verify each element affected, as well as all dimensions required for the work.

## **G 9.3 Working drawings**

G 9.3.1 The Contractor must prepare the details of the project working drawings in accordance with the requirements of the regulatory agency. All changes must be included in the revisions of working drawings.

G 9.3.2 Working drawings must clearly indicate the materials or equipment being supplied, all construction details, precise dimensions, capacity, operating characteristics and performance. Each working drawing must include a unique identification number, and blocks of numbers must be used to identify the various elements of the specification items. When multiple working drawings are required, each drawing must indicate the total number of sheets within the series.

G 9.3.3 Each working drawing for non-catalogue items must be prepared specifically for this project. Working drawings and brochures for catalogue items must be clearly marked to show the items being supplied.

G 9.3.4 The Contractor must approve all working drawings and indicating:

- a) The drawing's compliance with all specification requirements has been verified;
- b) The equipment has been coordinated with the other equipment to which it is attached or connected;
- c) All dimensions have been verified to ensure the correct installation of equipment within the available space.

## **G 9.4 Working drawings – Submission for Review by PSPC and CCG for review**

- G 9.4.1 The Contractor must submit to the TA and IA by email or other electronic means the working drawings, shop drawings and schedules required for the work. The TA may request up to three paper copies of these drawings. Drawings must be submitted at least 10 business days before the start of the work for the affected drawings. The IA and TA must verify specification compliance and, as needed, share their comments with the Contractor within five business days. The Contractor must make all necessary amendments and return and return the revised version of the drawing, with revision dates and revision numbers, to the TA, in the following two working days.
- G 9.4.2 Reviewed drawings must not be modified in any way without written authorization from the TA. In the event of subsequent revisions to drawings already reviewed the entire drawing (all sheets, revised or not) must be resubmitted for review.
- G 9.4.3 Space must be provided on the working drawings for review dates and signatures of the IA and the TA.
- G 9.4.4 Drawings submitted for review, unless otherwise specified, must be in the form of original drawings. Printed manufacturer's data sheets for standard components are acceptable as long as the pertinent characteristics are identified and relate to specified items.
- G 9.5 Working drawings – Submission for ABS approval**
- G 9.5.1 The Contractor must submit to ABS copies, as necessary, of working drawings, ship drawings and/or layout drawings, schedules and calculations required for approval by ABS.
- G 9.5.2 The Contractor is responsible for ensuring that working drawings are approved by ABS before beginning work on any section of these specifications that must be approved by ABS.
- G 9.5.3 Space must be provided on all working drawings for ABS approval stamps. This space must be clear of all technical information and must not be on the back of any sheets.
- G 9.5.4 The Contractor must communicate with the respective ABS approval office to determine the quantities and types of materials required for approval purposes.
- G 9.5.5 The Contractor must submit one copy of the original stamped drawing and three copies of all ABS approved drawings to the TA.
- G 9.5.6 The Contractor must provide the TA with a USB Flash Drive containing all ABS approved drawings compatible to PDF format.
- G 9.6 “As Fitted” Drawings**

- G 9.6.1 Upon completion of work, the Contractor must transfer all mark-ups from the working drawings to a final revision of all vessel drawings affected by the project work. These drawings must become the "As fitted" drawings for the project work.
- G 9.6.2 Within 10 days after acceptance of the ship, the Contractor must provide the following:
- a) four copies on standard ANSI paper of the latest revision of each of the "As Fitted" drawings;
  - d) the latest revision of each "As Fitted" drawing, compatible to AutoCAD 2013 DWG format, containing a detailed, up-to-date, MS Excel-format list of the files for each DVD;
  - e) All drawings must become the property of the Government of Canada.
- G 9.6.3 If no AutoCAD drawing files are produced, then The Contractor must supply scanned files (raster format) to the TA compatible to PDF format.
- G 9.6.4 The "As Fitted" drawings must be delivered prior to vessel departure.

## **G 9.7 Framed drawings**

- G 9.7.1 The following drawings, modified as "As Fitted" drawings, must be printed, framed and mounted on board the ship at the locations designated by the TA:
- a) General Arrangement Drawings including: plan view of all decks and profile view;
  - b) Tank Capacity Plan;
  - c) Fire Control Plan;
  - d) Lifesaving Equipment Location.

## **G 10 MANUALS**

### **G 10.1 General**

- G 10.1.1 Instruction Manuals and Registers must be bound in a hardcover three-ring, D-ring binder with positive locking mechanisms capable of holding 8 1/2" by 11" sheets. Larger drawings and documents must be concertina folded to suit. All manuals must be in bi-lingual format French/English. The following information must be printed on the cover:
- a) CCGS Amundsen – Dry Dock;
  - b) Specification identification number;
  - c) Identification of equipment or systems;
  - d) Equipment manufacturer;
  - e) Revision number and date.
- G 10.1.2 All sections of the manuals must be equipped with plastic tabbed indices. Major equipment components must be subdivided into separate sections in the manuals.



- G 10.1.3 A main index must be provided at the beginning of each binder indicating all items included in each section.
- G 10.1.4 A list of names, addresses and telephone numbers of contacts associated with equipment manufacturers must accompany the document for consultation after the completion of the project for maintenance and information data purposes.
- G 10.1.5 A copy of the final and approved "As Fitted" drawings must be included in the maintenance manual.
- G 10.1.6 The Contractor must provide the TA with two paper copies of all manuals and data sheets in English and in French (1 copy each) for the equipment components supplied by the Contractor prior to the completion of the contract.
- G 10.1.7 The Contractor must submit four copies of all manuals and data sheets to the TA on individual USB Flash Drives compatible to PDF format, prior to the completion of the contract.

## **G 10.2 Operation Manuals – “As-Fitted”**

- G 10.2.1 The operating manuals must include the following:
- a) A general description of the equipment's operating sequence in English and French;
  - f) A detailed equipment start-up procedure in English and French;
  - g) Schematic wiring diagram for the fitted equipment;
  - h) All pertinent equipment performance criteria;
  - i) When systems are accompanied by software or hardware, a user manual must include the following:
    - i) Full software documentation manual for the system, in USB Flash Drive format, such that Canada may revise the programs without recourse to the Contractor.
    - ii) The minimum software documentation must include:
      - System level diagrams describing the overall scheme of the software/hardware system;
      - The list of project-specific programs, including all comments describing the particularities of the code functions;
      - All listings, files, manuals and associated documentation material must be delivered to and become property of Canada.
- G 10.2.2 The Contractor must supply the number of paper copies and electronic copies of the operating manuals.

## **G 10.3 Maintenance Manuals – “As-Fitted”**

G 10.3.1 These manuals must include the following:

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

G 10.3.2 The Contractor must supply the number of paper copies and electronic copies of the maintenance manuals.

## G 11 **IDENTIFICATION**

### G 11.1 **Nameplates**

G 11.1.1 Nameplates must be affixed to all new equipment, compartments, doors and closures.

G 11.1.2 All nameplates must be written in both official languages.

G 11.1.3 Lettering must be clear and concise while minimizing the use of abbreviations. Primary information must be given in larger size lettering than secondary information.

G 11.1.4 The type of nameplate must correspond to the location on the vessel as specified below:

- a) Plastic must be used in accommodation and navigation spaces where the nameplate is not exposed to mechanical damage and does not risk being covered by ice, paint, oil, grease or dirt.
- b) Plastic nameplates must be laminated phenolic rigid type with machine engraved lettering and secured using stainless steel or brass screws. Unless otherwise indicated, nameplate must have white lettering on a black background for normal signs and white lettering on a red background for warning or emergency signs.
- c) Laminated plastic nameplates, black with white core engraved through to the center core, must be provided for all devices secured to the exterior surfaces the distribution panels/switchboard.
- d) Nameplates must be secured to the distribution panel/switchboard with machine screws. New nameplates to be fitted on the existing distribution panel/switchboard must be consistent in size and lettering with those already fitted. Nameplates for feeder circuits must identify each circuit by name and number and the fuse size and/or trip element rating.

- e) Warning or caution nameplates must be in laminated plastic; red with white core engraved through to the center core. They must indicate the circuit breakers provided with trip coils requiring completion of remote circuits prior to being operated, as well as those having a potential power source connected to both sides, or to any other potentially hazardous condition.
- f) Engraved metal, stainless steel or brass nameplates must be used in machinery spaces and where exposed to weather. Engraved metal nameplates must have lettering accentuated by means of black wax and secured with stainless steel or brass machine screws.
- g) Before ordering or manufacturing nameplates, a complete drawing list of nameplate must be submitted, specifying the size of the plates, the size of the lettering and their inscription, for review and acceptance by the IA and the TA.

## **G 11.2 Key Tags**

- G 11.2.1 Plastic labels must be provided for all new keys. Tags must be marked to identify the space or the item they lock. The description must be identical to that used for the identification nameplate for the space or the equipment. The complete list of new keys and labels must be submitted to the IA and to the TA.
- G 11.2.2 All new keys and tags must be turned over to the TA as part of the acceptance of the vessel.

## **G 11.3 Safety Related Signs**

- G 11.3.1 All new signs must be written in both official languages, French first.
- G 11.3.2 Painted signs for muster station directions, fire stations, emergency equipment, etc., must be provided and installed in accordance with ABS approval.
- G 11.3.3 The Contractor must prepare and present a drawing indicating the location, type and size of lettering for all signs. This drawing must be submitted to ABS for approval prior to fabrication or installation of the signs.

## **G 11.4 Nameplates for electrical equipment**

- G 11.4.1 All new signs must be in both official languages, French first.
- G 11.4.2 All special precautions and maintenance or operating instructions must be written on the nameplate or on a separate plate attached to the equipment.
- G 11.4.3 All electrical equipment operating on hazardous voltages and the compartments in which they are located must be marked with a warning that a hazard exists and must specify the maximum system voltage.
- G 11.4.4 Distribution boards must be provided with nameplates indicating the following:

- a) The name of the switchboard;
- b) The manufacturer;
- c) serial number (if applicable);
- d) The date of manufacture.

G 11.4.5 Each circuit breaker must be provided with a nameplate indicating the name and function of the circuit and the circuit breaker configuration. The Contractor must correctly identify the functions and names of each instrument, switch, etc. on the distribution board and mark with a red line the value of full load or normal operation.

G 11.4.6 Distribution panels must be provided with nameplates indicating:

- a) The space, service, device or circuits controlled and the designation of the power supply conductor.

G 11.4.7 Inside, panels and switchboards and motor controls must have nameplates to identify bus bars and terminals. The phases of the busbars must be identified by means of a color code.

G 11.4.8 Electrical boxes housing multiple electrical and electronic devices must have a unique identification code for each device, and each device must be labeled accordingly. Drawings must be mounted inside the enclosure and must clearly indicate the mounting and identification codes of the devices found in the enclosure.

G 11.4.9 The terminal blocks and terminal wiring must be marked with the circuit designation and must be treated as devices within the enclosures. Terminal blocks must be labeled consecutively and in ascending order from left to right and from top to bottom.

G 11.4.10 The size and other characteristics of nameplates must be in accordance with section G 11.

## **G 11.5 Labeling of cables**

G 11.5.1 All identifying marks of conductors and all cable labels must be shown on the drawings of the "As-Fitted" system and must comply with the following instructions:

- a) Cable tags must be printed with indelible ink and must not be handwritten;
- b) Each cable must have an identifier unique to the installation;
- c) Each cable tag must have the following information: unique cable designation and location of each end;
- d) Conductor identification markings must be secured to the conductors to prevent them from becoming disassociated from the conductor when it is connected to a device.

G 11.5.2 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 11.5.3 All wiring in panels specified to be labelled must be labeled with the Cable Number and their conductor number unless otherwise specified in equipment installation drawings.

## **S**      **SERVICES**

### **S 1**      **GENERAL**

- S 1.1      The Contractor must supply all labour, materials and facilities necessary for the maneuvering during, the dry docking and the refloating the ship identified in section G 2 as required to conduct the work described in this Specification package. Details of berthing and mooring facilities must be included in the bidder's proposal.
- S 1.2      The ship must be located at the Contractor's facilities for the duration of the work.
- S 1.3      The Contractor must supply all material and labour required to dock and undock the vessel including any vessel movements, provisions for tugs, and line handling personnel.
- S 1.4      The Contractor must supply and install two (2) gangways fitted with a safety net in compliance with the Canada Labour Code for as long as the ship is docked at/in its facilities. The Contractor is responsible for the safety of the gangways.
- S 1.5      The following services for which unit prices must be submitted, must be provided to the ship while it is at the Contractor's facilities. These prices must cover the entire work period. Services identified with an asterisk (\*) will be required both in dry dock and at the Contractor's wharf.
- S 1.6      The Contractor must supply all equipment, tools and machinery required to perform the work as described in this Specification package. The Contractor cannot make execution of work conditional on provision of equipment or other machinery that is not already included in its firm price by the Government of Canada or by a subcontractor paid by the Government of Canada. Lifting equipment must be properly adapted and of sufficient capacity for its intended use. It must be accompanied by a valid certificate indicating its safe working load, or bare a permanent marking indicating its safe working load. Certificates must be valid for the entire work period.
- S 1.7      All welded supports or other mountings required in this section must be installed by welders certified by the Canadian Welding Bureau. A testing by magnetic particle will need to be completed to confirm the quality of the weld and lifting capacity, prior to use. Upon completion of the work, all supports and mountings used for the work described in this Specification package must be removed from the ship.
- S 1.8      The overhaul and installation of all machinery and equipment specified herein must be in accordance with the applicable instructions, drawings and specifications of the manufacturer.

**S 2      BERTHING**

- S 2.1      The Contractor must be responsible for docking and mooring of the ship for the duration of the contract period. The Government of Canada must have free access to the ship at all times.
- S 2.2      A berthing plan is available upon request to the TA. The Contractor must make himself a copy and return the document to the TA.
- S 2.3      The depth of water must be sufficient to prevent the ship from touching bottom during any tidal or low water conditions. The Contractor must ensure that there is sufficient water under the keel to allow propulsion system testing during dock trials.

**S 3      MOORING LINES**

- S 3.1      The Contractor must supply all mooring lines and labour required for docking/undocking, mooring, dock trials, refloating of the ship and casting off of the vessel. The Contractor may use the ship's mooring lines to tie up the vessel upon arrival, but must be immediately replace these and remove the vessel's lines to storage.

**S 4      DRY DOCKING**

- S 4.1      The docking plan from the last dry dock (2020) will be provided to the shipyard by the TA during the first contractual meeting or before the ship arrives at the shipyard. The Contractor must make a copy and return the original to the TA.
- S 4.2      For planning purposes, the ship's displacement must not exceed 7620 metric tons with a mean draft of 6.63m in Sea water or 6.78m in Fresh water. As indicated in Part 6 of the Invitation to Tender, section 6.4 Docking Facility, the Contractor may be required to provide proof that the docking facility is certified to dry docking a ship with these particulars.
- S 4.3      The ship will be delivered to the entrance of the shipyard. The Contractor is responsible for docking the ship at the wharf adjacent to the dry dock, including the installation and removal of a gangway (Contractor supplied), regardless of the ship's arrival and departure times. This also applies to any docking/undocking as required for sea trials.
- S 4.4      The Contractor must supply all labor, materials, equipment and resources necessary for handling the ship's mooring lines and tug assistance as required to perform the docking and refloating of the vessel, as well as any other movements required throughout the duration of the contract period. The Contractor must be responsible for any associated fee.
- S 4.5      The Contractor must note that the ship will require a period of 24 hours, both before after dry docking, to allow for ballasting and fuel transfer operations necessary to obtain the desired trim of the vessel for dry docking.

- S 4.6 At the written request of the contracting authority, before contract award, the Contractor must supply a plan of the dry dock with its proposal. The plan must comply with the requirements of this specification of work. The plan must include the date and time of foreseen entry/exit from the dry dock, as well as the availability of the adjacent wharf.
- S 4.7 The stability books are included in the Technical Data Package provided to bidders see section G 3.2.
- S 4.8 The Contractor must supply all labour, materials and facilities necessary for dry docking and refloating the ship as required to conduct the work described in this Specification package.
- S 4.9 The Contractor must prepare a new blocking plan, offsetting the blocks relative to the measurements indicated on the 2020 plan in order to permit sandblasting of the hull and application of paint in those areas where the ship rested on keel blocks in 2020.
- S 4.10 The new blocking plan must indicate the location of all keel blocks in relation to the respective frames to serve as a reference for the next dry docking, permitting work to continue on the hull in the areas covered by blocks during this dry docking.
- S 4.11 The new blocking plan must be submitted to the TA and the IA for consultation before the Contractor prepares the dry dock.
- S 4.12 Before the dry docking of the ship, the Contractor must arrange an inspection with the IA to verify the blocks and their alignment. A report of the alignment readings must be submitted to the IA.
- S 4.13 The Contractor must prepare the blocks and any shoring required to maintain the true alignment of the ship's hull and machinery throughout the dry-docking period. The Contractor must dock and undock the ship and plan sufficient lay days to carry out the work described in this document, with a sufficient margin to perform 5% unscheduled work.
- S 4.14 The Contractor is responsible for recording all tank soundings, draft, trim and list of the ship, and must perform the stability calculations required to properly dock the ship. These calculations must be forwarded to the TA and IA two (2) business days prior to dry docking the vessel.
- S 4.15 The ship must be docked so that all docking plugs, transducers, anodes and sea inlet grids are clear and accessible. Blocks supporting the keel and hull that prevent removal of the drain plugs from tanks will have to be moved, as well as those preventing access to seawater intake and sea chest grates.
- S 4.16 The Contractor must not place blocks under the echo sounder transducer plates located between frames 138 and 140, port and starboard, nor under the Doppler sonar transducer plates located between frames 155 and 156.



- S 4.17 There must be a minimum vertical clearance of 5f (1.52 m) under the keel. There must also be a minimum vertical clearance of 9'-10" (3m) in way of the retractable thrusters. This can be accomplished by positioning the vessel over a pit(s) in the bottom of the dry dock that would create sufficient clearance for the thrusters to be lowered out, removed and replaced from under the vessel.
- S 4.18 There must not be blocs between frames 140 and 156 and on frame 128.
- S 4.19 In the event that hull fittings are covered, the Contractor must be responsible for all labour and equipment required for making alternative arrangements to drain tanks and/or move blocks to gain access to areas of specified work.
- S 4.20 All misplaced blocks, not corresponding to the new blocking plan provided by the Contractor, must be moved at the Contractor's expense.
- S 4.21 If the CCG requires other blocks to be moved for other reasons, the Contractor must provide a unit price for additional block displacement.
- S 4.22 The Contractor must supply and install gangways compliant with the Canada Labour Code as long as the ship is in dry dock. The ship must be equipped with two separate and independent accesses at all times. One gangway must be installed at the front of the ship on the port or starboard side and the other must be installed at the aft of the ship on the opposite side of the forward gangway. The gangways must be safe and structurally adapted for the passage of the ship's crew and workers, in accordance with Section 2 of the Maritime Occupational Health and Safety Regulations. The gangways must be well lit at night. The gangways must be placed at both ends of the ship, in accordance with the TA's directives. The Contractor is responsible for the safety of the gangways.
- S 4.23 Once the ship is properly resting on the blocks, the Contractor must immediately remove the ballast tank drain plugs and drain these tanks. The position of these plugs is indicated on the docking plan.
- S 4.24 The drain plugs must be clearly labelled as they are removed to insure they are reinstalled in their respective positions. Once the drain plugs have been removed, the Contractor must give them to the CCG IA, who will be responsible for their storage.
- S 4.25 The Contractor must install drain fittings to the various deck scuppers overboard drains if they interfere with the work in any way. The Contractor must quote a unit price for the installation of five (5) temporary drains for deck scuppers and overboard drains.
- S 4.26 The Contractor must be responsible for the safe transfer of the ship to the berth or mooring location where it will stay until the dry docking. During dry docking, radio contact must be maintained between the ship's Commanding Officer or IA and the Contractor's docking

master. If necessary, the Contractor must include in its bid towing and/or pilotage and icebreaking services. All costs for rope handling and for the certified docking master are the Contractor's responsibility. The Contractor must provide and install a ground cable between the vessel and the dock while it is docked, as per TCMS Ship Safety Bulletin 6/1989.

S 4.27 The Contractor must notify the CCG of all movement or refloating of the ship not required by this Specification package, seven (7) days prior to the start of the operations. The Contractor must supply the IA, TA and CA with a plan of its intentions. The Contractor will be responsible for all costs associated with these decisions.

S 4.28 Within eight hours of dry docking, the bottom of the ship's hull must be pressure washed (5000 psi minimum) with fresh water to remove any marine life/vegetation allowing for a preliminary hull inspection.

## S 5 **HULL CLEANING AND INSPECTION**

S 5.1 Within 4 hours of dry docking, the Contractor must clean the entire hull, from the keel to the top of the bulwarks, propellers, rudder trunk, bow thruster, bow thruster tube and rudder using fresh water under pressure (5,000 lb/in<sup>2</sup> minimum) to remove fouling and any loose material.

S 5.2 The IA and ABS inspector will inspect the hull, keel, propellers and rudder as soon as possible after they have been cleaned.

S 5.3 The Contractor must supply a motorized platform (cherry picker), including a certified operator for a period of eight (8) hours to facilitate the inspection.

S 5.4 The Contractor must use the unit price for adjustment purposes of the final cost.

S 5.5 The Contractor must clearly identify the repairs required by ABS to the hull plate welding butts and seams in order to facilitate its execution.

S 5.6 The Contractor must perform an inspection of the ice belt with the ABS Inspector to determine the necessity to conduct any repairs.

## S 6 **NUMBERING**

S 6.1 The shipyard must supply the necessary material and labour to temporarily number the hull frames and bulkheads to facilitate the external hull inspection. The shipyard will be responsible for keeping the frames numbered throughout the entire dry docking period until the ship is refloated.

S 6.2 Frames must be numbered on each side of the ship, at five-frame intervals, in conformity with the ship's construction drawings. Each number must be accompanied by a line 60 cm in height, on each side of the hull at bilge-level.

**S 7      UNDOCKING**

- S 7.1      Before refloating the ship, the Contractor must obtain the drain plugs from the IA and install them in their respective locations using white lead and twine. The Contractor must verify the water tight integrity all tank drain plugs, including those that were not removed, by means of a vacuum box test. If the seal of a previously removed drain plug does not pass the vacuum box test, the Contractor must remove it and add more white lead with twine and redo the test until proven watertight. The IA must witness the tests. This requirement applies whenever the Contractor floods the dry dock.
- S 7.2      Before refloating the ship, the Contractor must verify all grate fasteners for all sea chests, seawater intakes and hull openings to ensure that they are locked in place by welding.
- S 7.3      Before undocking the ship, the Contractor must ensure that any protective covers and connections are removed. The Contractor must supply, install and remove, upon completion of work, all fittings and lugs required to perform the work indicated in this Specification package. Where the lugs and/or fittings are installed and removed, the welds must be ground flush with the hull. Any damaged or disturbed paint work must be repaired in accordance with the instructions found in the paint section of these Specifications and of those of the paint manufacturer. Paint must be applied in accordance with the ship's color and external marks diagram.
- S 7.4      Before undocking the ship, the Contractor must ensure that all tanks are filled to obtain the same conditions as at docking. The Contractor is responsible for the safe refloating of the ship, taking into consideration any changes in stability resulting from the work carried out in these Specifications. The Contractor must perform the necessary stability calculations required to refloat the ship. These calculations must be submitted to the IA and TA for review, 48 hours prior to flooding the dry dock.
- S 7.5      Prior to refloating the ship, the Contractor must clean the transducers using a mild soapy fresh water solution to eliminate any contaminants or fouling. The transducers must then be rinsed with fresh water to ensure that there is no residual soap on their exterior surfaces.
- S 7.6      The Contractor must ensure the safe undocking of the vessel and that no damage to the vessel will be incurred during the undocking process. The Contractor must have a sufficient number of personnel on board to respond in case of water ingress or other problems.
- S 7.7      Prior to flooding the dry dock, the Contractor must ensure that all ship's side, including valves, are properly closed using a Contractor developed checklist.
- S 7.8      Prior to the ship's departure, the Contractor must provide the CCG TA with the documentation required to obtain a certificate of seaworthiness from ABS.

**S 8      GANGWAYS**

- S 8.1      The Contractor must supply and install two gangways fitted with a safety net in compliance with the Canada Labour Code for as long as the ship is docked at/in its facilities. The Contractor is responsible for the safety of the gangways.

**S 9      PLATFORMS**

- S 9.1      The Contractor must supply the labour and material for the erection of access platforms required to execute the work specified in this Specification package and any additional agreed upon work. Upon completion of the work, the platforms will be disassembled and removed from the ship. The Contractor must include the cost of these preparations must in its bid.

**S 10     ACCESS AND CUMBERSOME ITEMS**

- S 10.1     The Contractor must remove any piping, inspection hole covers, components and equipment where necessary, in order to perform the work and access work spaces. Upon completion of the work, the Contractor must reinstall the removed items with new gaskets, collars, hardware and anti-seize compound to be supplied by the Contractor. During the bid period the Contractor must identify the interference items and include in its pricing all costs for its removal, storage and replacement on completion of the work.

**S 11     (\*) ELECTRICAL POWER**

- S 11.1     The Contractor must supply two electrical power connections (600 VAC, three-phase, 300 amps/connection) for the duration of the contract (docked or in dry dock).
- S 11.2     The Contractor must supply the material and labour to connect and disconnect as required, two electrical cables for shore power supply, each being 150 feet long with male plugs. These two cables must be connected in parallel onboard ship. Before powering the ship, the Contractor must ensure that power sources supplied have the same phase sequence at the source and on the ship. The nominal load of the ship is between 350 and 400 kilowatts. The ship will provide two, female plugs with two meter long extensions for connection to ship yard's electrical system. These cables must not be shortened. The cables and connections must be Megger-tested before connection. A ground cable is to be solidly attached to the ships hull.
- S 11.3     The Contractor must provide a unit price per kilowatt hour which the Contractor must use in its bid to determine a price for a block of 500 000 kilowatt hours. This unit price will also be used to adjust (up or down) the ship's total consumption at the end of the contract period via a PWGSC 1379 form.
- S 11.4     The Contractor must supply a kilowatt-hour meter and connect it to the ship's power source to track consumption. The Contractor must read the kilowatt-hour meter in the presence of the TA before connection and disconnection of the power supply to verify the electrical

consumption. The meter must be read in the presence of the TA before and after any movement of the ship.

S 11.5 The power supply for which the price is indicated must only be used for the ship.

S 11.6 Upon completion of the work and disconnection of the shore power, the shore power adaptors/extensions must be disconnected from the cables and returned to the ship's Electrical Officer.

S 11.7 NOTE: If the Contractor powers the ship using a diesel generator installed on the deck, it must be responsible for watch keepers and generator fuel.

S 12 **(\*) TEMPORARY PROTECTION OF DECKS AND BULKHEADS**

S 12.1 In order to avoid accumulation of dirt in corridors and to protect floor coverings, the Contractor must supply and install HDF (High Density Fibreboard) hardboard panels (1/8 inch thick) on all deck surfaces and of the Main deck, Upper deck, Boat deck, Officers deck, Navigation deck, Bridge and the Control Room. The Contractor must also supply and install HDF (High Density Fibreboard) hardboard panels in all entries, staircases, the Chief Engineer's, the Engineers offices, the two (2) offices for the Government of Canada representatives, the Crew's Dining Room, the laundry room deck and the rear main deck from the port propulsion room entrance to the steering gear compartment, inclusive. The total area to be covered is approximately 650 m<sup>2</sup>. For adjustment purposes, the Contractor must provide a unit price per square metre (m<sup>2</sup>).

S 12.2 The Contractor must supply and install 48 in. x 1/8 in. thick cardboard on the lower bulkheads of all deck corridors mentioned above. The Contractor must ensure that the cardboard and HDF hardboard panels remain in good condition for the duration of the contract. If the cardboard and HDF hardboard panels become damaged, they must be replaced at the Contractor's expense.

S 12.3 Installation of the deck and bulkhead coverings must be done as soon as the ship arrives at the shipyard facilities. The Contractor is responsible upon taking charge of the ship. Upon completion of the work, the Contractor must remove all cardboard and HDF hardboard panels and must remove any remaining adhesive residue on decks and bulkheads. The use of polyethylene covers is prohibited.

S 13 **TEMPORARY LIGHTING AND VENTILATION**

S 13.1 The Contractor must supply, install and maintain any temporary lighting and ventilation as required to carry out the work in this Specification package. Upon completion of the work, the Contractor must remove these items.

S 14 **HEATING**

- S 14.1 It is the Contractor's responsibility to ensure that heating and dehumidification are maintained for the duration of the contract. The Contractor is responsible for monitoring the environmental conditions onboard the ship to prevent damage from temperature variations. This must include protection from freezing of all piping systems containing liquids and protection against overheating in any spaces in which electronic equipment is susceptible to damage, such as the electronic equipment room, the wheelhouse and the engine control room. As the ship is mostly shut down and unmanned, cooling water will not be necessary.
- S 14.2 The ship's boilers will be kept in operation during the dry dock period. The yard must maintain custody of the vessel at all times. CCG will monitor boilers and related equipment only.
- S 14.3 The fuel to feed the boilers will be supplied by the CCG, from within the tanks of the vessel. A tank inspection plan must be developed by the contractor to keep the boilers in operation and allow the tank inspection as specified in item 11.7.
- S 14.4 The HVAC units will also be kept operational, to the extent possible. The air intake louvers must be protected by an additional filtration box designed and supplied by the contractor and installed on the outside of the vessel in way of each louvers. The objective is to limit the spread of dust from the outside to the inside of the vessel to a minimum. The filters in the boxes must be replaced every week over the entire work period.
- S 14.5 The contractor must perform a complete cleaning of the ventilation ducts of the accommodation HVAC units upon completion of the work. Cleaning must be carried out by a company specialized in cleaning ventilation ducts.
- S 15 **STORAGE SPACE**
- S 15.1 The Contractor must provide a secure storage space for the ship's equipment as required for this Specification package. The storage space must be climate controlled throughout the duration of the contract period.
- S 15.2 The Contractor must provide a sufficient number of shelves and pallets to meet storage and handling needs related to the work.
- S 15.3 All items must be stored so that they can be easily accessible for inspection. No item must be stored directly on the ground.
- S 15.4 The storage space must be located on the Contractor's site.
- S 15.5 The Contractor must provide a three-ton truck with a driver and a forklift with an operator, totaling 64 hours each, to help Canada to empty and resupply the ship. For adjustment purposes (upward or downward) the Contractor must provide an hourly rate for this service. The Contractor must keep a record of the use to be signed weekly by the IA.

- S 15.6 The Contractor must provide the means to transfer before and after, and to store the remaining fuel on board during the contract period. For the purposes of these Specifications, the Contractor must provide a price for the storage of 50,000 liters of diesel fuel and a unit price per 1,000 liters. If the quantity of fuel is not equivalent to 50,000 liters, the price of storage must be adjusted up or down using a PWGSC 1379 form. The Coast Guard reserves the right to inspect storage facilities prior to the commencement of the transfer.

S 16 **FIRE PROTECTION**

- S 16.1 The Contractor must supply the appropriate type and quantity of fire extinguishers including fire watches, required for all hot work until these surfaces and walls have cooled (see section G 5.10). The ship's fire extinguishers must not be used except in emergency situations. If the Contractor must use one of the ship's fire extinguishers, it must be refilled and verified by an authorized company. The Contractor must supply fire-retardant protection to protect cable trays, cables, equipment and structure against slag and any hot work by-products.

- S 16.2 For each day that hot work is planned, the Contractor must submit a hot work permit to the IA ensuring that safety measures have been identified and will be applied. If a permit is not available, the Contractor must alternatively submit a request to the IA along with the safety measures planned. The Contractor must maintain the fire watch (firefighter) where the hot work took place for up to 30 minutes after stopping.

S 17 **FRESH WATER AND FIREMAIN SEAWATER SERVICES**

- S 17.1 The Contractor must supply all material and labour to install necessary connections and supply fresh water necessary to provide the services described hereunder for the last 4 weeks of the dry docking period. The Contractor must disconnect connections upon completion of work.

- S 17.2 The Contractor must supply and install a calibrated flow meter for each domestic water supply line connected to the ship for the duration of the contract. Flow meters must be sized for the service they are intended for. The flow meter calibration records must be presented to the IA. All flow meters must be read by the Contractor at the beginning and at the end of the contract period, as well as before and after any vessel movements to or from the fit out wall or the dry dock, in the presence of the IA. The following connections are required to service the vessel:

- a) The Contractor must supply and install a 1½ inch hose certified for potable water. The water must come from a source that is certified safe for human consumption by a health services authority from the local municipal or provincial government. The Contractor must supply a valid potable water certificate to the IA before making the connection. Potable water must be supplied through a pressure regulator, complete with pressure gauge and isolation valve. Potable water pressure will be held to fifty (50) psi gauge. Water consumption is approximately 8 tons/day when the crew of 32 are on board.

Filling of two potable water tanks (135 m<sup>3</sup>). The real quantities used will be adjusted using a PWGSC 1379 form. A consumption report must be submitted to the IA every 2 weeks.

- b) The Contractor must supply a separate and continuous, uninterrupted non-potable water connection, which must pass through a pressure regulator and connected to the ship's fire main. The water supply must be connected immediately after the ship's entry into the dry dock. This water supply must be maintained at a pressure of 690 kPa (100 psi gauge) at all times and must be supplied by one 2.5 inch diameter hose. This installation must include an on-board pressure regulator equipped with a pressure gauge and isolating valve. The Contractor must communicate with the IA to determine the exact locations for connecting to the ship. There must be no interruption of this supply while the ship is at the Contractor's facilities. It is the Contractor's responsibility to take all necessary precautions to ensure that lines do not freeze in cold weather. The Contractor must repair any damage caused by frozen pipes at their own expense. Water will be consumed as needed for firefighting and cleaning purposes. During the summer, air conditioning, refrigeration and air compressor cooling require 3,400 m<sup>3</sup> of water per day. In other seasons, without air conditioning, 130 m<sup>3</sup> are required per day. The real quantities used will be adjusted using a PWGSC 1379 form. A consumption report must be submitted to the IA every 2 weeks.

- S 17.3 The Contractor must supply separate fresh water for cleaning, testing and rinsing tanks, in accordance with these specifications. The cost of water consumption for these items of this specification package must be assumed by the Contractor.

## S 18 **OVERBOARD DISCHARGE/DRAINAGE CONNECTIONS**

- S 18.1 When the ship become manned again and if determined as necessary at the moment, the Contractor must supply all required materials and labour to attach temporary drainage hoses to the overboard discharges as listed below, such as to prevent water from running down the hull and disturbing uncured paint. The Contractor must also supply and install temporary drainage hoses to each of the overboard scuppers in such a manner as to prevent water from running down the hull. All drainage connections must be drained to suitable disposal facilities and/or drains. It is the Contractor's responsibility to take all necessary precautions to ensure that lines do not freeze in cold weather. The Contractor must disconnect and remove all temporary connections upon completion of work.

OUTLETS	DIMENSIONS	LOCATION
AIR CONDITIONING # 2 and 3	5"	STBD FR-94
AIR CONDITIONING # 4	4"	PORT FR-96
AIR CONDITIONING # 5	3"	PORT FR-36



DOMESTIC REFRIGERATION	3"	PORT FR-36
CARGO REFRIGERATION	3"	STBD FR-36
GREY WATER	4"	PORT FR-59
BLACK WATER	3"	STBD FR-96
BOILER PURGE (2)	3"	PORT FR-96
CONDENSATE DRAIN	5"	STBD FR-96
FORWARD COMPRESSOR	2"	PORT FR-96
AFT COMPRESSOR	3"	PORT FR-96

## S 19 **BLACK WATER AND GRAY WATER**

- S 19.1 For black and grey water, the Contractor must supply portable tanks or tanks that can be pumped out; the Contractor must be responsible for disposing of this water. We evaluate producing approximately 10 m<sup>3</sup> of black water and 4 m<sup>3</sup> of gray water per day for the four (4) last weeks of the dry dock period. All related costs must be included in this item. The Contractor must provide a unit price per cubic meter to adjust upward or downward the total use of the vessel at the end of the work period using PWGSC 1379 Form. A consumption report must be submitted to the IA every 2 weeks.

## S 20 **OILY BILGE WATER**

- S 20.1 The Contractor must indicate a price for the disposal of approximately 20,000 litres of oily bilge water from the ship's bilges. The Contractor must provide a unit price for each additional 1,000 litres regardless of the proportion. The price specified for this item must be adjusted upward/downward upon request of additional work using the PWGSC 1379 form. The quantity stated in this item must only apply to the ship's needs and not to the Contractor's needs as required to complete any work described in this Specification package. The Contractor must provide the IA with the name(s) of the company(ies) registered for pumping and disposal of waste oil, and receipts for the elimination of ship hydrocarbons for inclusion in the hydrocarbon service booklet.

## S 21 **(\*) GARBAGE REMOVAL**

- S 21.1 The Contractor must supply two (2) garbage containers of 8 cubic yard placed on the flight deck beside the gangway for waste and recycling from the ship. These containers must be emptied twice a week. For bid purpose, the Contractor must include 6 weeks total. (2 first weeks and 4 last weeks of the contract). Contractor must provide a unit price per week to adjust upward or downward the total cost at the end of the work period using PWGSC 1379 Form. Any garbage generated by the Contractor themselves is to be to their own account.

**S 22      CRANES AND SCAFFOLDING**

- S 22.1      Provide the services of a crane of at least 5 tonnes from the shipyard for the ship's general needs, including an operator and all personnel needed to ensure that these operations are carried out safely. The Contractor must provide a price for this service for one (1) hour per working day, giving an average of five (5) hours per week, for the duration of the contract. For adjustment (up or down) purposes, the Contractor must provide an hourly rate for this service. The Contractor must maintain a record of crane usage that must be signed weekly by the IA. A usage report must be submitted to the IA every 2 weeks.
- S 22.2      For the duration of the contract period, crane services must be provided by the shipyard for displacement of parts arising from the work described in this Specification package. This work must be in addition to the specific needs of the ship, and the costs must be included with each item of this Specification package.
- S 22.3      The Contractor must provide a price for general services of a powered platform (cherry picker). The Contractor must provide a price for this service for one (1) hour per working day, giving an average of five (5) hours per week, for the duration of the contract. For adjustment (up or down) purposes, the Contractor must provide an hourly rate for this service. The Contractor must maintain a record of use that must be signed weekly by the IA.
- S 22.4      The Contractor must supply all labour and materials needed to set up scaffolding, work platforms or shelters required to carry out the inspection of the ship's hull by the ABS inspector or by the IA, as well as all work performed on the ship's hull. This includes, but not limited to, scaffolding and equipment to access propellers, rudder, rudder trunk, bow thruster and cathodic anodes to be replaced.

**S 23      CLEAN UP**

- S 23.1      At the end of the work, the Contractor must rid the ship of all waste, debris and extraneous materials resulting from work carried out in this Specification package. The ship must be returned to its original state of cleanliness when it was handed over to the Contractor see section G 5.19.4. The Contractor must also ensure that all spaces, compartments and areas of the ship where work was done are left in an “as clean as found condition” daily. The cost of cleaning up must be included in the bid.
- S 23.2      Upon completion of all work and final cleaning, the Contractor's Quality Assurance (QA) representative and the CCG TA must complete an inspection together of all compartments and spaces where work was performed by the Contractor. Any defect or damage noted during this visit must be recorded and compared with the digital images taken during the initial inspection (section 1.10).

- S 23.3 The Contractor must provide a detailed monthly report of repairs of any damages or defects resulting from the work carried out. Any repairs will be at the Contractor expense.
- S 23.4 The Contractor must hire an external housekeeping service to perform a cleaning once one week before the return of the crew onboard the ship in the following spaces: CCG representatives offices and washrooms, Chief Engineer, Electrical Officer and Senior Engineer's cabins (including living room/office, bathroom and bedroom), Engineers' office, the crew's dining room (cafeteria) and a shared washroom.

S 24 **(\*) VESSEL SECURITY**

- S 24.1 The Contractor must ensure security of the ship while under its care, custody and control.
- S 24.2 The Contractor must provide specialized security staff to carry out rounds all spaces, both interior and exterior, of the vessel. In addition to the requirements for hot work, the Contractor must ensure safety of the ship every day, twenty-four hours a day, even on holidays and holiday periods. The surveillance of the ship must include a visual inspection of every compartment. The security patroller must be trained and informed of how to immediately take appropriate action upon discovery of any risky or urgent situations for the ship.
- S 24.3 When the ship is afloat, the Contractor must make arrangements to prevent damage to the ship due to wind, waves, tides, floods, fire and weather conditions. The Contractor must increase the frequency of security rounds in the event of bad weather conditions.
- S 24.4 The Contractor must provide a logbook, to be submitted to the IA, and must be initialed by the security patroller must upon the completion of each round. The register must be available at all times for verification and a copy must be sent to the TA and CA every two weeks.
- S 24.5 The Contractor must implement an alert system to intervene in case of emergency, including personnel qualified to remedy these situations and prevent potential damage to the ship. Damage to the ship due to the Contractor's failure to meet these requirements must be repaired at the Contractor's expense.
- S 24.6 The Contractor must provide shipkeeper staff 14 hours per day (from 17h00 to 7h00) for the duration of the work period. The shipkeeper staff must have the ability to monitor the following systems and related equipment, which the Contractor might need to retain in operation during of the work period :
- a) Detection and fire extinguishing systems (Sprinkler and fire main);
  - b) Electrical distribution system and emergency generator;
  - c) Heating and ventilation systems for the entire vessel;
  - d) Steam and condensate system;
  - e) Cargo and domestic refrigeration;

- f) Black water sewage treatment system;
- g) Potable water;
- h) Non-potable water;
- i) Alarm and monitoring.

**S 25      MEETING ROOM AND PROJECT MEETINGS**

- S 25.1      The Contractor must invite and inform CCG personnel of daily production meetings. The IA will usually participate in these meetings and will discuss production and inspection activities.
- S 25.2      The Contractor must provide a room for progress meetings. These meetings will be held every four weeks, but may be more frequent depending on the progress of work and potential issues to be addressed.

**S 26      PROJECT FACILITIES**

- S 26.1      The Contractor must make office spaces available to CCG and PSPC personnel that meet the following requirements:
- a) Two lockable offices that are at least 19m<sup>2</sup> (200 ft<sup>2</sup>) each;
  - b) A furnished conference room that can accommodate 10 people, including a large table and chairs for 10 people;
  - c) Four normal-sized desks with drawers;
  - d) Eight desk chairs in addition to those in the conference room;
  - e) A filing cabinet with four (4) lockable drawers;
  - f) Two shelves;
  - g) Two sets of keys must be provided for each lockable door, office, and filing cabinet;
  - h) One direct-line telephones, in the conference room; this telephone must be “hands-free” for conference calls;
  - i) The telephone line must be available 24 hours a day, ensuring communication with the outside at all times. Detailed billing of long distance calls will be sent to the attention of the CCG Technical Services representative. The Contractor must disconnect this line once the work is complete.
  - j) A list of the telephone numbers for the shipyard, fire and police services and emergency numbers must be provided upon the ship’s arrival to the shipyard.
  - k) High-speed Internet connection via Wi-Fi or a minimum of three (3) LAN connections;
  - l) Two (2) multi-function color printer with copy, scanner, and fax functions, that can handle sheets measuring 8.5 x 11 in., 8.5 x 14 in., and 11 x 17 in. The multi-function color printers must be equipped with an automatic paper feeding mechanism and be serviceable within two (2) hours in the event of a breakdown. The Contractor must supply the paper and ink for the printers.

- m) The offices must be equipped with heating, air conditioning and lighting system, in accordance with provincial health and occupational regulations.

S 26.2 The following must be provided on the Contractor's site:

- a) Washroom facilities must be located nearby;
- b) Ten (10) parking spaces must be made available to Canada personnel. The spaces must be clearly marked to the ship's name. If necessary, passes must be provided to regular Canada project personnel plus an additional 5 for FSRs;
- c) All of the aforementioned equipment and facilities must be in good operating condition;
- d) Canada must have access to the facilities listed above 7 days a week, including at night, from 7 days following the awarding of the contract and up to 7 days after the work is accepted.

## 10.0 **SAFETY AND SECURITY**

### 10.1 **FIREFIGHTING PIPE THICKNESS STUDY**

#### 10.1.A **Identification**

- 10.1.A.1 The objective of this item is to complete the pipe thickness measurement study on 34 fixed fire extinguishing stations.

#### 10.1.B **References**

##### 10.1.B.1 **Equipment Data – [Not Used]**

##### 10.1.B.2 **Drawings and Documents**

Drawing Number	Title / document	Number of pages
08693-20	Incendie - Fire	3
222-660-1	Fire and wash deck diagram	1
222-660-2	Fire and wash deck piping	2

##### 10.1.B.3 **Regulations and Standards**

- 10.1.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

	Title	Included – Yes/No
<b>FSSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>		
<b>Regulations</b>		
PART 7-3-2	Rules for survey after construction	no

#### 10.1.C **Statement of Work**

##### 10.1.C.1 **General**

- 10.1.C.1.1 The Contractor must use services of a certified technician for the ultra-sound measurements. The technician and his measurement tools must have a valid certificate recognized by ABS or another classification society recognized by the Transport Canada mandatory inspection delegation program.

- 10.1.C.1.2 The Contractor must provide a fixed price for the overall work described in this statement of work.
- 10.1.C.1.3 OPTIONAL – The Contractor must provide cost for 4 additional measurements in a report. The cost will be covered on a PWGSC 1379 form and prorated to the number of additional readings required, if any.
- 10.1.C.1.4 4 thickness measurements must be taken per station. See typical fixed station in **Annex 1** below.
- 10.1.C.1.5 The Contractor must provide all material et and all required labor to support the inspector, the certified technician for NDTs and the IA to access to stations to be inspected including removing and reinstalling objects blocking access. The Contractor must ensure that there is no pressure in the stations and that it is totally safe to work on prior to commencing.
- 10.1.C.1.6 The Contractor must do touch ups where steel has been brought to bare metal for the measurements to take place. The paint used for the touch-ups must be compatible with the existing (Interlac 665 Signal Red) in place and be applied in accordance with the manufacturer specifications for application. Paint must be provided by the Contractor.

#### 10.1.D **Proof of Performance**

##### 10.1.D.1 **Inspection Points**

- 10.1.D.1.1 Before initiating the work, the Contractor must provide to IA a typical drawing demonstrating proposed locations of the measurements on a fixed fire station.

##### 10.1.D.2 **Testing/Trials - [Not Used]**

##### 10.1.D.3 **Certifications**

- 10.1.D.3.1 The Contractor must provide to the IA the certification of calibration of the thickness measurement equipment.

##### 10.1.D.4 **Documentation**

- 10.1.D.4.1 The Contractor must provide to the IA and TA a PDF and a hard copy report of the Fixed Stations measurements. For each thickness measurement, the report must physically show where it's been taken, the actual thickness of the steel, the percentage of steel thickness loss and the original thickness of the steel. The groups of measurements must refer to a localization of each of the fixed fire extinguishing station shown on the drawings in reference in section 10.1.B.2.

##### 10.1.D.5 **Formation - [Not Used]**

**Annex 1 (typical fixed fire station) :**



## **10.2 PORT LIFEBOAT SYSTEM**

### **10.2.A Identification**

- 10.2.A.1 The objective of this item is to carry out the five-year inspection and maintenance of the Port lifeboat system.

### **10.2.B References**

#### **10.2.B.1 Equipment Data**

- Davit : Schat-Davit Company Ltd,
- Type :SPG(L) 9500/4850
- Certificate : 1233, date issued :01/06/92 with electric winch of type BE8600
- Certificate : 3283, date issued 21/05/92
- Grease used: SKF LGWM2/04, White
- Gear box oil: Mobil SHC 629

- 10.2.B.1.1 All manuals are existing onboard and are provided on demand.

#### **10.2.B.2 Drawings and Documents – [Not Used]**

#### **10.2.B.3 Regulations and Standards – [Not Used]**

### **10.2.C Statement of Work**

#### **10.2.C.1 General**

- 10.2.C.1.1 The Contractor must provide the equipment and labour to carry out the five-year inspection and maintenance of the vessel's Port lifeboat davit.

- 10.2.C.1.2 The Port lifeboat will be onboard the vessel upon arrival at the Contractor's facilities. The Contractor must remove the lifeboat from its davit prior to carrying out any work and reinstall it once the work is completed. The Contractor must store lifeboat during the work period. The Contractor must ensure the lifeboat protected from all damage, weather and dirt. The Contractor must lift and handle the lifeboat by the two existing lifting points for the lifeboat's hooks. To avoid stressing the hull and structure of the lifeboat, the Contractor must use a lifting device with a lifting beam with lifting points positioned directly above the lifeboats lifting eyes. The Contractor must advise the IA before lifting or moving the lifeboat.

- 10.2.C.1.3 The Contractor must hire a service provider approved by TCMS to perform the inspection and certification of the lifeboat system. The accredited service provider must comply with the requirements of IMO, msc.1/circ. 1277 and certified on Schat-Davit Company Ltd equipment. An allowance of \$5000 will be allocated for travel expenses. This amount will

be adjusted as required and upon presentation of invoices to the contracting authority. All labour costs for this item must be included in the contractor's financial proposal.

- 10.2.C.1.4 The Contractor must replace all worn or non-conforming parts with original equipment manufacturer.
- 10.2.C.1.5 The Contractor must provide the equipment and labour required to inspect and certify the release system and the lifeboat.
- 10.2.C.1.6 The Contractor must pay particular attention when removing and reassembling the 2 steel cables, the locks must be inspected and properly reinstalled. The forward and aft cables are of different lengths and cannot be interchanged. The Contractor must provide and replace these cables with new cables of the same make and manufacturer. The Contractor must give the old cables to the CCG.
- 10.2.C.1.7 The Contractor must dismantle and inspect all 19 sheaves for wear and deformation.
- 10.2.C.1.8 The Contractor must clean and inspect the shafts and grease passages. All sheave shafts and pivots must be subject to a magnetic particle inspection.
- 10.2.C.1.9 The Contractor must remove all 4 pivot pins, while the front and rear arms must be supported for inspection. The Contractor must remove and inspect all other pivots, e.g. gripping hooks, for wear and deformation.
- 10.2.C.1.10 The Contractor must sandblast (SA1) all pulleys and subject them to magnetic particle testing. The Contractor must degrease and mechanically brush their supports and adjacent surfaces on the davit arms, to remove flaking paint and rust. The Contractor must paint the pulleys and their supports, including the davit arms using paint compatible with existing coating method: 2 coats of Interprime 539 primer (yellow) and 2 coats of Interlac 665 topcoat white RAL 9003. The paint must be supplied by the Contractor.
- 10.2.C.1.11 The Contractor must inspect the hooks for wear and tear.
- 10.2.C.1.12 The Contractor must disassemble, inspect, lubricate and reassemble the two stop springs (one front and one rear).
- 10.2.C.1.13 The Contractor must carry out the disassembly and inspection of the brakes, the disc brake and the centrifugal brake. Blow off dust and rust, clean, inspect. The Contractor must provide and replace the brake pads on both brakes and reassemble. The Contractor must return the old brake pads to the CCG.
- 10.2.C.1.14 The Contractor must drain the oil (about 15 litres) from the gearbox, open the gearbox and inspect the parts. The Contractor must supply and replace the level indicator. The Contractor

must supply and fill the gearbox with oil (Mobil SHC 629). The Contractor must return the old level indicator to the CCG.

- 10.2.C.1.15 The Contractor must grease all dismantled equipment and put it back in place, the work must be to the satisfaction of the IA. The Contractor must supply the grease (SKF LGWM2/04, White, or equivalent).

10.2.D **Proof of Performance**

10.2.D.1 **Inspection Points**

- 10.2.D.1.1 All work must be carried out in accordance with the manufacturer's instructions and recommendations.

10.2.D.2 **Testing/Trials**

- 10.2.D.2.1 The Contractor must carry out the test under dynamic load (SWL + 10%) meeting ABS requirements and in presence of the ABS Inspector. The Contractor must provide the necessary weights (e.g. sandbags) for the dynamic test.

10.2.D.3 **Certification**

- 10.2.D.3.1 The Contractor must also provide a copy of the ABS survey credit to the IA.

10.2.D.4 **Documentation**

- 10.2.D.4.1 The Contractor must give to the IA and the TA with a comprehensive report detailing the work undertaken, defects, repairs made and measurements and readings taken on all axles, pivots and sheaves.
- 10.2.D.4.2 The Contractor must provide the IA and the TA with all magnetic particle testing certificates.
- 10.2.D.4.3 The condition of additional rigging on wire ropes; such as rigging screws and shackles.
- 10.2.D.4.4 The Contractor must provide the T-8 inspection and test certificate approved by the ABS inspector.

10.2.D.5 **Training – [Not Used]**

### **10.3 FIREFIGHTING SYSTEMS**

#### **10.3.A Identification**

- 10.3.A.1 The objective of this item is to perform annual inspection and maintenance of firefighting systems in accordance with Transport Canada requirements.
- 10.3.A.2 The Contractor must include in its bid all known work according to the lists provided in reference.
- 10.3.A.3 Labels bearing the name of the Contractor, the date and the initials of the person carrying out the inspection must accompany each system.

#### **10.3.B References**

##### **10.3.B.1 Equipment Data**

- 10.3.B.1.1 Technical information:
- a) MinuteMan Fixed System: Foam (no dilution, holding tank under the nozzle)
  - b) Firecombat Fixed System: Powder (Aft holding tank) and Foam (Forward holding tank)
  - c) Inventory of foam reserves: See annexed reference documents
  - d) Kitchen hood fixed extinguishing system: Kitchen Knight II
- 10.3.B.1.2 Fire extinguisher maintenance list spring 2020
- 10.3.B.1.3 List of fixed extinguishing systems
- 10.3.B.1.4 Lots of foam AFFF 3%
- 10.3.B.1.5 Complete list extinguishers

##### **10.3.B.2 Drawings and Documents**

- 10.3.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>Drawing / Document Title</b>	<b>Number of Sheets</b>
08693-20	Fire Control Plan	3
	CCGS Amundsen - 2021 Fire Detection Annual Inspection Report FRT	12

	CCGS Amundsen - 2021 Fixed and Portable Fire Equipment Report MRT	16
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### 10.3.B.3 **Regulations and Standards**

- 10.3.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

	Title	Included Yes/No
<b>FSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>		
NFPA 12 (2018)	Standard on Carbon Dioxide Extinguishing Systems	No
<b>Regulations</b>		
IMO Circ. 1432	Revised guidelines for the maintenance and inspection of fire protection systems and appliances	No

### 10.3.C **Statement of Work**

#### 10.3.C.1 **Anti-defragmentation heat detectors**

- 10.3.C.1.1 Verification of 5 local defragmentation heat detectors 416 Hangar helicopter, 417 hangar workshop, 605 hazardous materials warehouse, aviation fuel pump room and 314 local immersion clothes. (Simplex Grinnel)

#### 10.3.C.2 **Fixed CO2 extinguishing systems of ship and barge compartment**

- 10.3.C.2.1 Maintenance of the fixed fire extinguishing systems must comply with the manufacturer's requirements and in accordance with Transport Canada's regulations (Canadian Shipping Act 2001).
- 10.3.C.2.2 Cylinders must be uncoupled to avoid accidental discharges during maintenance. Pipes must be blown with dry air, nitrogen or other inert gas.

- 10.3.C.2.3 The Contractor must have at the beginning of each day enough full bottles to blow the ducts throughout the inspection to avoid delays.
- 10.3.C.2.4 The Contractor must verify that all timer systems, visual indications, audible alarms and shutdowns of the vessel's ventilation systems are working properly.
- 10.3.C.2.5 The Contractor must demonstrate that all nozzles and distribution ducts are clear of obstructions. These tests may require the dismantling and sealing of certain parts of the ducts. Each system must be returned (as far as possible) to its original state of good functioning once the tests are completed at the end of each day.
- 10.3.C.2.6 The Contractor must check all on-site and remote operation devices, time delays as well as the temperature raise triggers.
- 10.3.C.2.7 The Contractor must ensure the tightness and good condition of the flexible hoses connecting the cylinders to the distribution ducts. Any worn or defective hoses will be reported to the TA and replaced using 1379 action.
- 10.3.C.2.8 The level of all cylinders in each system must be checked. A label must be affixed to each cylinder indicating its level.
- 10.3.C.2.9 Fire equipment must be accessible and available in case of emergency and appropriate precautions must be taken when hot work is performed in the area normally protected by the fixed extinguishing system.
- 10.3.C.2.10 In cases where a fixed cylinder of extinguishing agent is found to be defective, under normal load, or where a hydrostatic test is required, the Contractor must remove the cylinder, fill it, return it to its original location on board, connect it and put it back into service.
- 10.3.C.2.11 The Contractor must perform all hydrostatic tests on fixed fire cylinders that are due within the next 12 months according to the list provided.
- 10.3.C.3 **Portable fire extinguishers**
- 10.3.C.3.1 The annual maintenance and inspection of portable fire extinguishers must be in accordance with the manufacturer's requirements and with Transport Canada's regulations.
- 10.3.C.3.2 The Contractor must perform the annual inspection of all portable extinguishers aboard the vessel as per the list provided as reference. The inspection must be done on board the ship. If for any reason extinguishers are to be brought outside the vessel, the Chief Officer or Chief Engineer must be notified.
- 10.3.C.3.3 Each fire extinguisher must be removed from its wall bracket and inspected for any abnormality. The pressure gauges and the date of the last hydrostatic test will be checked.

- 10.3.C.3.4 All powder extinguishers with a cartridge must have these checked and weighed.
- 10.3.C.3.5 Labels bearing the name of the Contractor, the date and the initials of the person carrying out the inspection must accompany each fire extinguisher.
- 10.3.C.3.6 The Contractor must repair, refill any defective fire extinguisher, down load normal and hydrostatic test as needed. The Contractor is responsible for removing fire extinguishers, filling them and replacing them in their respective locations.
- 10.3.C.3.7 Perform all hydrostatic tests and 6 year maintenance on portable fire extinguishing cylinders that are due within the next 12 months according to the list provided.
- 10.3.C.3.8 All fire equipment must be accessible and available in case of emergency. Adequate protection must be taken when hot work is required to complete the inspection.
- 10.3.C.4 **Kitchen Knight II Fixed extinguishing system**
- 10.3.C.4.1 That section must only be completed after section 16.3 of the actual SOW is completed.
- 10.3.C.4.2 The Contractor must perform the complete annual maintenance and inspection of the kitchen fixed system in accordance with the requirements of the manufacturer and Transport Canada regulations.
- 10.3.C.4.3 The Contractor must verify the proper operation of the ventilation stops, visual indications and fuses.
- 10.3.C.4.4 Devices for local, remote and automatic operation must be verified.
- 10.3.C.4.5 The condition of the cylinder must be checked, its level and the date of the last hydrostatic test verified. If the cylinder test is due within one year this must reported to the TA.
- 10.3.C.4.6 The Contractor must install a cylinder compatible with the system if the current cylinder needs to be removed to bring it back to its original state. The cylinder will only be removed if it needs to be recharged or hydrostatically tested.
- 10.3.C.4.7 The Contractor will have to renew the labeling once the inspection has been completed.
- 10.3.C.5 **Flight deck fire extinguishing system**
- 10.3.C.5.1 The Contractor must conduct annual inspection and maintenance of the fixed flight deck fire suppression systems: *Fire Combat and Minuteman* in accordance with manufacturer's recommendations and Transport Canada regulations.

- 10.3.C.5.2 The Contractor must provide the sampling containers to take a sample of AFFF foam in each system: one in the Minuteman system, one in the Fire Combat system and another in each reserves as indicated by the Chief Officer (see attached reference document.)
- 10.3.C.5.3 The analytical results of each sample must be provided to CCG.



### 10.3.C.6 **Smoke and heat detectors**

- 10.3.C.6.1 The Contractor must verify the function of all smoke and heat detectors. Any found defective detector must be reported to the TA.
- 10.3.C.6.2 The smoke detector in the elevator shaft must be tested while the elevator inspection Item 17.3 of the actual SOW is being carried out. The elevator technician specialist must assist a fire safety specialist to reach the detector located on the ceiling of the elevator shaft as it involves riding on top of the elevator to the top of the tunnel.

### 10.3.D **Proof of Performance**

#### 10.3.D.1 **Inspection Points**

- 10.3.D.1.1 All work must be inspected by the IA or delegate. The IA or his delegate must follow the Contractor throughout the duration of the inspections and works.
- 10.3.D.1.2 The IA will verify the labels bearing the Contractor's name, the date and the initials of the person who performed the inspection on each system.

#### 10.3.D.2 **Testing/Trials**

- 10.3.D.2.1 The proper functioning of the equipment must be demonstrated to the IA.

#### 10.3.D.3 **Certification**

- 10.3.D.3.1 The Contractor must provide the IA with two hard copies of the inspection certificates along with the original copy. The Contractor will also send an electronic copy of the certificates to the IA and TA.
- 10.3.D.3.2 Annual Inspection Certificate:
  - a) Fixed system MinuteMan: Foam (container under the nozzle)
  - b) FireCombat Fixed System: Powder (Aft Container) and Foam (Forward Container)
  - c) Inventory of foam reserves
  - d) Kitchen Hood Fixed Extinguishing System: Kitchen Knight II (subject to change with hood replacement see item 16.3)
  - e) Fixed CO2 extinguishing system: ship and barge

#### 10.3.D.4 **Documentation**

- 10.3.D.4.1 The Contractor must provide the IA, before the end of the work period, with a complete report which explains in detail the work carried out, the cause of the failures (if any), the modifications required and parts replaced.

- 10.3.D.4.2 The Contractor must provide the IA and the TA with an electronic copy of the report in PDF format.
- 10.3.D.4.3 The analytical results for each foam batch sample (3) and system (2) must be provided to CCG
- 10.3.D.5 **Training - [Not Used]**

## 11.0 HULL AND RELATED STRUCTURES

### 11.1 HULL WELDING INSPECTION AND REPAIRS

#### 11.1.A Identification

- 11.1.A.1 The objective of this item is to determine the amount of work/repairs required to the welded joints of the hull plating (butts and seams), and conduct the repair as required by ABS. The extent of the work will be determined during the inspection of the vessel's hull, immediately after dry docking.

#### 11.1.B References

##### 11.1.B.1 Equipment Data – [Not Used]

##### 11.1.B.2 Drawings and Documents

Drawing Number	Drawing / Document Title	Number of Sheets
222-H-1	Shell Expansion	1
221-H-13	Shell Stringer Plan	1
221-H-12	Framing Expansion	1
	CCGS Amundsen Spring 2020 Drydocking - Hull Welds Survey - PORT SIDE MPI & UT MAPPING	1
	CCGS Amundsen Spring 2020 Drydocking - Hull Welds Survey - STBD SIDE MPI & UT MAPPING	1
	2020.024 CCGS Amundsen - PORT SIDE Weld Repairs	1
	2020.024 CCGS Amundsen - STBD SIDE Weld Repairs	1

##### 11.1.B.3 Regulations and Standards

- 11.1.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
<b>FSM Procedures</b>		
<b>Publications</b>		
CT-043-EQ-EG-0001-E	CCG Welding Specification	Yes
<b>Standards</b>		
SSPC SP 1	Solvent Cleaning	No

SA-2½ / SSPC SP10	Near White metal blast cleaning (sablage très soigné)	No
<b>Regulations</b>		

### 11.1.C **Statement of Work**

#### 11.1.C.1 **General**

- 11.1.C.1.1 The Contractor must supply all equipment, ventilation, scaffolding, shelters, chain hoists, cherry picker, slings and shackles required to perform the work.
- 11.1.C.1.2 After cleaning the hull, the Contractor must list the weld butts and seams to be repaired, as identified by the ABS inspector.
- 11.1.C.1.3 The welds to be repaired must be chamfered using compressed air arc gouging or grinding, and brought to their original levels using approved welding techniques and materials.
- 11.1.C.1.4 The Contractor must take include in the price the following preparations that must be implemented before welding the hull:
- Degassing of adjacent tanks (Completed as part of spec items 11.6 and 11.7 of the actual SOW);
  - Grit blasting of the hull side in accordance with Sa 2½ for a strip of about five (5) cm wide near all welds on the selected plating, until the metal is shiny and clean;
  - Cleaning to a SSPC-CP1 standard. Removal of all salt deposits, dirt, grease, etc., on the welds;
  - Removal of all grit from the welds using vacuuming or compressed air jet. The Contractor must install a shelter made of polyethylene or equivalent in the work areas to prevent rain, snow, ice, or their melted counterparts from rapid cooling the welds;
  - Plating welds must be preheated to 93°C (200°F) before welding.
- 11.1.C.1.5 The Contractor must provide a firm price to re-weld 500 linear feet of plating welds (beads) on the port or starboard plating (butts and seams) with 18 welding passes on average to form a bead, for a total of 9,000 feet (2743 m) of linear welding. The Contractor must provide a unit price per foot of bead for adjustment purposes of the actual final cost using the PWGSC 1379 Form. The Contractor must provide in its bid price the cost of gouging all the fill material that must be removed. A report of how many feet of completed welding done on the ship must be sent to the TA every week.

- 11.1.C.1.6 The unit passes of a linear foot are defined as: butt or seam welding of the shell joints are made using the FCAW or GMAW technique in semi-automatic mode. Passes must be a minimum of ½" wide and 3/8" thick.
- 11.1.C.1.7 Welding must produce an excess of about 1 in. (2.54 cm) wide by ¼ in. (6.35 mm) high.
- 11.1.C.1.8 The Contractor must ensure before the work that all undercuts and the separation plates are ground smooth.
- 11.1.C.1.9 Using the development drawing for the ship's hull plating (222-H-1 Shell expansion), the Contractor must indicate, using thick red marks on both port and starboard sides of the ship, the full extent of the new seam welds carried out during these repairs.
- 11.1.C.1.10 Any lugs or supports used for carry out these repairs must be removed and ground flat. All notches left by removal of the lugs must be ground in a V, re-welded and ground flat until the surface is smooth.
- 11.1.C.1.11 Upon completion of all welding, the Contractor must apply, on newly welded seams, bare and disturbed areas, the same preparation and paint schedule(s) as required for the area of the hull where the welding was done. (i.e. underwater hull, ice belt or topside).

#### 11.1.D **Proof of Performance**

##### 11.1.D.1 **Inspection Points**

- 11.1.D.1.1 For the visual inspection, the IA and ABS inspector must do the following:
  - a) Inspect all welds of the hull (port and starboard).
  - b) Inspect the condition of welds on sea water overboard discharges, seawater intakes and any other hull appendages.

##### 11.1.D.2 **Ultrasound Inspection**

- 11.1.D.2.1 The Contractor must indicate a firm price for 8 Ultrasound. The ABS inspector must identify the areas to be tested. In its bid, the Contractor must indicate a unit price per test. The firm and unit price must include required scaffolding and cranes.

##### 11.1.D.3 **Certification**

- 11.1.D.3.1 The Contractor must provide to the IA the certification of calibration of the ultrasound testing equipment.
- 11.1.D.3.2 One copy of the NDT Surveyor's certification.

##### 11.1.D.4 **Documentation**

- 11.1.D.4.1 The Contractor must provide the TA with a hard copy and an emailed digital version of the report detailing the work done, defects, repairs performed, measurements and readings taken.
- 11.1.D.4.2 The Contractor must provide a report of the repaired weld joints using a copy of drawing 222-H-1 Shell expansion.
- 11.1.D.4.3 The Contractor must provide two (2) copies of all test reports made.
- 11.1.D.4.4 The Contractor must provide a Quality Assurance (QA) report indicating that all areas as defined in this specification have been inspected by the Contractor's QA Department and all areas of defects established by this survey have been identified for remedial action. This report must be given to the TA no later than 3 weeks before floating the ship.
- 11.1.D.5 **Training – [Not Used]**

## **11.2 HULL PREPARATION AND PAINTING**

### **11.2.A Identification**

11.2.A.1 The objective of this item is to identify the work required to prepare the ship's hull for painting. The hull must be coated with two component, abrasion resistant epoxy coating, designed for an ice-going vessel and compatible with the existing coating Inerta 160. This work also applies to the seawater intake grids.

11.2.A.2 The purpose of this item is also to repaint freeboard markings once the vessel's hull has been painted.

### **11.2.B References**

11.2.B.1 **Equipment Data – [Not Used]**

11.2.B.2 **Drawings and Documents**

<b>Drawing Number</b>	<b>Drawing / Document Title</b>	<b>Number of Sheets</b>
08693S01	Hull Surface Calculation	1
08693_SF	SF Symbolisation fédérale	2
DRY DOCK COATING REPORT International 01.28.18	DRY DOCK COATING REPORT International 01.28.18	20
	1200 Icebreaker Coating scheme V5	1

### **11.2.B.3 Regulations and Standards**

11.2.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	<b>Title</b>	<b>Included Yes/No</b>
<b>FSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>		
ASTM D4060	Standard Test Method for Abrasion Resistance	No
ASTM D4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers	No
SP0287-2016-SG	Field measurement of surface profile of abrasive blast cleaned steel surfaces using replica tape	No

SA-2½ / SSPC SP10	Near White Metal Blast Cleaning	No
SA 2 / SSPC SP6	Commercial Blast Cleaning	No
SSPC SP 1	Solvent Cleaning	No
<b>Regulations</b>		

11.2.B.4 **The coating to be applied to the hull of a polar icebreaker must meet the following criteria:**

- a) If the Contractor selects a different coating from the existing one, an evaluation report of the selected paint must be provided to the TA before the paint is ordered.
- b) The product must have proven its worth for at least 3 years on a polar icebreaker hull;
- c) Must be recognized by a classification society RO as a coating with a high resistance to abrasion;
- d) Must be effective at temperatures as low as -50°C;
- e) Anticorrosive epoxy coating with minimum 90% solids;
- f) It must be possible to paint the hull in a single application, with a thickness of at least 30 mils dry;
- g) Taber abrasion resistance (ASTM D4060, 1 kg, CS-17 wheel): maximum weight loss 50 mg;
- h) Elcometer adhesion value (ASTM D4541): 1,000 psi min;
- i) Kinetic coefficient of friction against ice of less than 0.03 at a velocity between 10 and 25 cm/s.
- j) The coating must be compatible with the actual coating specified in the vessel coating scheme.

11.2.C **Statement of Work**

11.2.C.1 **General**

11.2.C.1.1 The Contractor must supply all materials and equipment to conduct the work.

11.2.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.



- 11.2.C.1.3 The total surface area of the hull is 2,820 m<sup>2</sup>. This includes all submerged parts from the keel to 0.9 m above the load line, including the rudder, rudder stock, the ship's bow covering the anchor pockets, the rudder trunk, seawater intake grids, bow thruster tunnel and its two (2) grates.
- 11.2.C.1.4 Part of the hull must be painted red (ERA174-CGuard Red), from 2 m below the load line to 0.9 m above the load line, while the remaining hull, including the hawseholes, the rudder and the rudder trunk, must be painted in black (ERA163-Black).
- 11.2.C.1.5 The Contractor accompanied by the IA must have an agreement on the degree of detachment (peeling) of the paint and the areas to be prepared and the areas to be coated prior to commencing coating work. The Contractor must provide a report of the agreement reached before painting work begins no later than 5 days following the dry docking.
- 11.2.C.1.6 The Contractor must supply and apply all the paint according to the manufacturer's specifications. For all black and white markings, all paint must be compatible with the various hull coatings.
- 11.2.C.1.7 Colours and type of paint to be used for markings:
- White: RAL9003
  - Black: RAL9004
  - Red: RAL3000
- 11.2.C.1.8 The Contractor must paint the load line, draught marks, forward and aft, port and starboard, letters, with two (2) coats of white paint compatible with the hull coating.
- 11.2.C.1.9 The Contractor must ensure that all paint used for the markings is applied in two (2) coats and is compatible with existing INERTA and INTERTHANE coatings.
- 11.2.C.2 **Preparation and coating procedures**
- 11.2.C.2.1 During blasting and coating operations, the Contractor must provide protection for the following items and/or locations: Accommodations, Engine room intakes, bearings, screw threads, oil grooves, grease fittings, gearing, pins, universal joints, door screens, machined surfaces, nameplates, gaskets, electrical insulation, cable tray, electrical panels and fixtures, hinges, fair leads, hawseholes, windows and all working parts in general.
- 11.2.C.2.2 The Contractor must pay special attention to the propeller blades and associated shafts, seals, liners, pintles, bow thruster, echo sounding transducers, speed log, and anodes. The Contractor must cover these elements before grit blasting and coating operations begin and keep them covered until completion of the work.

- 11.2.C.2.3 The Contractor must shield the glass from the portholes, in way of areas that are to be grit blasted and coated, with rubber gasket in such a way as to both protect the glass and allow for grit blasting of the porthole ring.
- 11.2.C.2.4 The Contractor must fit all overboard discharges and deck scuppers with a drainage plug and/or spouts to ensure that any active over boards and water runoff is drained clear of the shipside before grit blasting and coating work starts.
- 11.2.C.2.5 In the case of vessels that have the spar deck flush with the ship sides, the Contractor must fit a temporary barrier to the deck so as to contain or redirect snow or water runoff and prevent it from coming in contact with grit blasted or freshly coated surfaces. This work must be included in the Contractor's pricing.
- 11.2.C.2.6 Water run-off, rain or snow that comes into contact with fresh epoxy coatings may produce an "amine blush". These areas must be cleaned with a suitable solvent and is the responsibility of the Contractor.
- 11.2.C.2.7 The Contractor must ensure that all surface preparation and coating application conforms to the manufactures recommended guidelines unless otherwise stated, including recommended surface profiles, temperature, relative humidity, drying times between coats and over coating intervals, drying time upon completion of coating, wet film thickness', dry film thickness', and curing time prior to immersion of coating during dock flooding operations. This applies to all coatings used during the Work.
- 11.2.C.2.8 The Contractor is responsible for timely ordering of all coating products and the proper disposal of used containers and solvents.
- 11.2.C.2.9 All coating products must be stored by the Contractor in a dry heated space according to manufacturer's specifications.
- 11.2.C.2.10 The Contractor must prepare all new steel to SA2½ and give one (1) coat of paint compatible with existing Interplate 937 pre-weld construction primer on both sides as per coating manufacturer directions.
- 11.2.C.2.11 All areas of contamination subject to surface preparation will be solvent cleaned to SSPC SP1 by the Contractor.
- 11.2.C.2.12 The Contractor must perform grit blasting in order to achieve a surface profile, coarse angular, from 50 to 75 microns, unless stated otherwise in the Coating specification.
- 11.2.C.2.13 For areas in the specification where washing is required, the Contractor must test for chlorides and areas found unacceptable for coating must be re washed and is to the Contractors account.

- 11.2.C.2.14 The Contractor must monitor surface and ambient temperature and humidity, and painting can only take place when conditions are within the paint manufacturer's guidelines, or must provide suitable containment and environmental control to compensate.
- 11.2.C.2.15 On completion of blasting and before application of any paint or primer, the Contractor must blow the steel surfaces free of dust, using dry, oil free air. No paint is to be applied without the surface preparation being verified by the Owner's Representative or agreed Designate.
- 11.2.C.2.16 Prepared areas must be coated, by the Contractor, before flash rusting occurs or the blast will be considered unacceptable and will require re-blasting at the Contractor's expense.
- 11.2.C.2.17 The Contractor must apply a stripe coat by brush to edges, welds, crevices, bolt heads, transitions, backs of stiffeners, cut outs, ladders, handrails and other surface irregularities when applying the primer and intermediate coat for surfaces cleaned to bare metal. The stripe coat may be applied to the surface by spray provided it is immediately and thoroughly worked into these areas by brush.
- 11.2.C.2.18 The Contractor must feather all coating repairs back into sound existing coating and touch-up and recoat soiled, damaged or missed areas.
- 11.2.C.2.19 For items in the specification requiring spot application of coating, the Contractor must ensure that the topcoats cover undercoats completely.
- 11.2.C.2.20 The Contractor must apply all coatings with airless spray equipment using adequate ventilation and lighting. Areas not accessible by spray painting such as cut outs and brackets must be brushed or rolled to achieve the specified dry film thickness.
- 11.2.C.2.21 For coatings applied to any confined space, the Contractor must install an exterior supply / exhaust fan with adequate trunking to facilitate air circulation and the removal of solvents from the lowest areas possible to aid in the curing of the coating.
- 11.2.C.2.22 The dry film thicknesses specified are the minimum required and must be verified by the Contractor. The Contractor must monitor humidity, surface and ambient temperatures and record, at all times, during coating operations. All this data must be made available for the TA for review upon request.
- 11.2.C.2.23 The Contractor must take care in the application of final coats to ensure that all vessel equipment is protected from excess paint spray and, in particular, electronic or other equipment liable to more serious damage due to excess spray.
- 11.2.C.2.24 Excessive runs, curtains and sags in the coating must be brushed out by the Contractor while the coating is wet. If the coating dries, the Contractor must remove these defects, sand and re-coat the area at its own account.

- 11.2.C.2.25 Regardless of the number of coats required, lines of graphics, points of color change, names, logos and all cosmetic top coatings that are to be cut in by brush or masked, are to be cut sharp by the Contractor, square and be esthetically pleasing.
- 11.2.C.2.26 Where names and lines of graphics are to be painted over and are not clearly etched or outline welded into the substrate, the Contractor must drill or punch into the steel the outlines before over coating.
- 11.2.C.2.27 Note that when the Coating Specification calls for epoxy coating over existing Intershield 163/Inerta 160, the over coating windows are very short and finite and the Contractor must apply the epoxy coat while the coat beneath is **“thumbprint”** soft.
- 11.2.C.2.28 Any new and/or existing paint coatings that are disturbed during the performance of the Work must be touched-up to the same specification as the existing coating system and is to the Contractor account.
- 11.2.C.2.29 On completion of the repairs and prior to flooding the dock, any and/or all of the above mentioned protective coverings or containments must be removed from the equipment, by the Contractor. Sand ingress, coated and/or damaged items as listed above will be cleaned, repaired or replaced by the Contractor at no cost to the Owners. The installation and removal of any protective devices must form part of the Contractor’s quoted price.
- 11.2.C.2.30 Contractor’s quoted prices must include all material, ice removal from dock, specialized equipment, water, chemicals, staging, containment, environmental controls, services, high pressure hosing machines (i.e.: pumps, hoses, nozzles, etc.), fresh water supply, stain/grease removers, special scrapers, staging, lighting, cherry pickers, sandblasting and paint spraying machine, etc. as necessary to effect the blasting and coating task in its entirety and must include removal and disposal of sandblast grit and debris from the vessel and dock as per the applicable environmental regulations.
- 11.2.C.2.31 Estimated area measurements supplied by the Owner are for reference only at it is the Contractors responsibility to verify actual areas referred to in this specification prior to commencement of the Work.
- 11.2.C.2.32 The Contractor must supply and install a temporary shelter covering the ship’s hull from the keel until above the main deck bulwark. This shelter is to be ventilated and heated. No combustion gasses exhausted from the heaters are allowed in the shelter. The shelter must be dismantled only after the paint work is completed, and only after the recommended drying time is reached. The shelter must withstand all possible bad weather and be waterproof with the vessel’s hull.

### 11.2.C.3 **Coating Inspection Procedures**

- 11.2.C.3.1 All blasting and coating operations will be inspected by the Contractor as per an agreed Quality Assurance plan, a copy of which is to be submitted to the TA, and will be subject to periodic inspection by the TA.
- 11.2.C.3.2 The Contractor must measure the surface profile in accordance to NACE RP0287-95.
- 11.2.C.3.3 The following references must be used for coating application inspection procedures:
- Sa2½ or SSPC SP10 - Near White metal blast cleaning
  - Sa2 or SSPC SP6 - Commercial blast cleaning
  - SSPC-SP1 Solvent cleaning
  - NACE RP0287-95 Field measurement of surface profile of abrasive blast cleaned steel surfaces using replica tape
- 11.2.C.3.4 The Contractor must hire a technical service representative of the coating manufacturer who must be present during the preparation, inspection and coating application for both the Underwater Hull and Ice Belt. Costs for this are to be included in the quotes for these areas. CCG reserves the option to hire a Nace Inspector to monitor the work.

### 11.2.C.4 **Surface Areas**

- 11.2.C.4.1 For the purpose of this tender, the surface areas of the vessel hull will be denoted in three distinct parts; Underwater Hull, Ice Belt and Topsides. Additional areas such as sea chests/bay, lettering, draft marks and trim etc. will be addressed as separate individual items
- 11.2.C.4.2 The maximum load line (waterline) is denoted by weld marks placed at regular intervals around the periphery of the vessel. This will be abbreviated for the purpose of this document as W/L. This will be considered the base line for all hull surface area determination.
- 11.2.C.4.3 The Underwater Hull will be the total shell plate area denoted from the keel upwards to a point 2.0m below the W/L, and will include the stern tubes and supports, the rudder and stock up to the W/L, the exterior of any sea chest grates, interior are grates of the bowthruster tunnel and grates, and the exterior of the cover plate of any extending device.
- 11.2.C.4.4 For the purpose of this document, the calculated surface area of the Underwater Hull is 1885 m<sup>2</sup>.
- 11.2.C.4.5 The Ice Belt will be considered the total shell plate area denoted from 2.0m below the W/L and 0.9m above, for a total Ice Belt height of 2.9m. In addition, this area will include the anchor pockets and surrounding protection, the area of the stem between the anchor pockets and the area immediately aft of either anchor pocket beginning at the upper aft edge of the

pocket and angling downward at 45° until meeting the upper delineation of the Ice Belt at 0.9m above W/L.

11.2.C.4.6 For the purpose of this document, the calculated surface area of the Ice Belt is 657 m<sup>2</sup>.

11.2.C.4.7 The Topsides of the vessel will be considered the total shell plate area denoted from upper demarcation of the Ice belt upwards to the rail of the vessel, including fore and aft bulwarks, and any removable bulwark plates in profile line with the shell plating.

11.2.C.4.8 For the purpose of this document, the calculated surface area of the Topsides is 825 m<sup>2</sup>.

#### 11.2.C.5 **Hull Cleaning**

11.2.C.5.1 As mentioned in item S5.1, the Contractor must clean the ship's hull with high pressure (5000 psi minimum) fresh water before any sandblast / paintwork preparation. Work is to proceed from the vessel rail downwards to the keel to remove any and all salt residue from hull shell plating. Upon inspection of vessel, after dry-docking, it is determined that there exists sufficient reason to include a higher pressure fresh water wash to remove excessive residue from the hull, variance will be determined as per the provisions of NACE RP0287-95.

11.2.C.5.2 Additional cleaning variances by way of contaminant removal such as oils, greases, soils etc., if determined to be necessary will be considered according to NACE RP0287-95.

#### 11.2.C.6 **Underwater Hull**

11.2.C.6.1 The Contractor must spot grit blast all rust spots, lifting or peeling coating, and mechanical coating damage on the Underwater Hull to Sa2½ with a coarse angular profile of 75 – 100 micron. The Contractor must feather onto sound coating by 7 – 8cm. The Contractor must clean surface by dry air blast to remove residues and grit dust.

11.2.C.6.2 During sandblasting, the Contractor must completely clean remaining aluminous cement from rudder plug welds. The Contractor must supply and re-fill holes using Speed Crete Blue Line 3700-132 (W.R. Meadows of Canada). The Contractor must plan to fill 96 plugs (20 mm x 5mm x 5mm x 2.5 mm deep)

11.2.C.6.3 The Contractor must hold further work once completed for inspection and release of surface preparation by the IA, TA or CA. Coating manufacturer technical service representative must be consulted by Contractor to obtain directives on the surface preparation.

11.2.C.6.4 Upon authorized release and following coating manufacturer directions, the Contractor must apply one or two coats of Black (ERA163) to obtain a minimum dry film thickness of 500 micron to prepared spots of bare metal and overlapping onto feathering.

- 11.2.C.6.5 It is a requirement that the coating manufacturer technical service representative be present during the set-up, mixing and application of the material to advise the Contractor and confirm conformity to specification.
- 11.2.C.6.6 The Contractor must paint by brush the draft marks below waterline using a compatible white product (EGA010) during the time interval recommended by the manufacturer of the finishing coat. If the overcoating window for the finishing coat is missed for any reason, the Contractor must abrade the areas before the coating can be applied.
- 11.2.C.6.7 Total estimated grit blasting and coating surface area of the Underwater Hull for the purpose of this tender is 60% or 1131 m<sup>2</sup>. Contractor is required to independently verify given surface areas.
- 11.2.C.7 **Ice Belt**
- 11.2.C.7.1 The Contractor must spot grit blast all rust spots, lifting or peeling coating, and mechanical coating damage on the Ice Belt to Sa2½ with a coarse angular profile of 75 – 100 micron. The Contractor must feather onto sound coatings by 7 – 8cm. The Contractor must sweep blast remaining areas to create 50 – 75 micron profile for full overcoat. The Contractor must clean surface by dry air blast to remove residues and grit dust.
- 11.2.C.7.2 The Contractor must hold further work once completed for inspection and release of surface preparation by the IA, TA or CA. Coating manufacturer technical service representative must be consulted by Contractor to obtain directives on the surface preparation.
- 11.2.C.7.3 Upon authorized release and following coating manufacturer directions, the Contractor must apply one or two coats of Coast Guard Red (ERA174) to achieve a minimum of 500 micron dry film thickness to prepared spots of bare metal and feathered overlap.
- 11.2.C.7.4 It is a requirement that the coating manufacturer technical service representative be present during the set-up, mixing and application of the material to advise the Contractor and confirm conformity to specification.
- 11.2.C.7.5 The Contractor must paint by brush the draft marks below waterline using a compatible White (EGA010) while during the time interval recommended by the paint coats' manufacturer. If the overcoating window for the product is missed for any reason, the Contractor must abrade the areas before the coating can be applied.
- 11.2.C.7.6 The Contractor must pay an important consideration to the sub-area above the W/L where Topsides coatings overlap onto the Ice Belt to provide a cosmetic finish.
- 11.2.C.7.7 Total estimated grit blasting and coating surface area of the Ice Belt for the purpose of this tender is 50% or 330 m<sup>2</sup>.

**11.2.C.8 Topsides**

- 11.2.C.8.1 The Contractor must spot grit blast all rust spots, lifting or peeling coating, and mechanical coating damage on the Topsides to Sa 2 with a coarse angular profile of 50 – 75 micron. The Contractor must feather onto sound coating by 7 – 8cm. The Contractor must clean the surface by dry air blast to remove residues and grit dust.
- 11.2.C.8.2 Following coating manufacturer directions, the Contractor must apply touch-up coat of Intergard 264 (or equivalent) Red Oxide (FPL274) at 125 micron dry film thickness to prepared spots of bare metal and overlapping onto feathering.
- 11.2.C.8.3 In addition, the Contractor must apply the topsides finishing coatings onto the Ice Belt down to the W/L, cutting in with a defined demarcation line detailed in 11.3.C.2. The Contractor must follow the recommendations of the representative (s) in order to obtain adequate adhesion between the finish coats of the topside and the ice belt. This may include a rolled undercoat application to the ice belt within very short time frame.
- 11.2.C.8.4 The Contractor must apply two coats of paint compatible with existing Interthane 990 RAL3000 Red at 50 micron dry film thickness over the entire Topsides area and down to the W/L demarcation. The Contractor must allow to dry to minimum overcoating window.
- 11.2.C.8.5 The Contractor must allow drying until the recommended ‘hard’ dry time before applying lettering and signage.
- 11.2.C.8.6 Total estimated grit blasting and coating surface area of the Topsides for the purpose of this tender is 20% or 165 m<sup>2</sup>.

**11.2.C.9 List of hull markings to be painted:**

- 11.2.C.9.1 The name of the vessel on port and starboard sides, fore and aft, as well as the port of registry;
- 11.2.C.9.2 On both sides of the vessel, the inscriptions “COAST GUARD” AND “GARDE CÔTIÈRE”, as well as diagonal white stripes, delineated by black stripes;
- 11.2.C.9.3 The inscription “DANGER” with the symbols for “PROPELLERS” and “BOW THRUSTER” on both sides;
- 11.2.C.9.4 The inscriptions/lettering of the Canadian flags, CANADA, PÊCHES ET OCÉANS, FISHERIES AND OCEANS, on both sides of the vessel.
- 11.2.C.9.5 Referring to the plans, mark off the limits of the white diagonal and black stripes on the hull, just above the ice belt.

**11.2.D Proof of Performance**



**11.2.D.1 Inspection Points**

11.2.D.1.1 The following inspections must be carried out in the presence of the IA:

- a) Visual inspection of the hull after cleaning;
- b) Transducer surfaces washed;
- c) Adequate protection of the parts described in this specification;
- d) Degree of cleanliness after painting;
- e) Removal of protective materials after painting.

11.2.D.1.2 The TA or IA can hire and be accompanied by a certified inspector in NACE International standards to ensure that these equivalencies are met. The Contractor must allow site access to this inspector.

11.2.D.1.3 All stripping and coating work must be inspected by the Contractor in accordance with the agreed-upon quality assurance plan, of which a copy must be submitted to the TA, and will be subject to periodic inspection by the IA.

11.2.D.1.4 The surface profile must be measured in accordance with NACE International SP0287-2016-SG.

11.2.D.1.5 The references below must be used for the coating application inspection procedures:

- a) SA 2½ or SSPC SP10 – Near White Blast Cleaning of metal;
- b) SA 2 or SSPC SP6 – Commercial Blast Cleaning;
- c) SSPC-SP1 – Solvent Cleaning;
- d) NACE International SP0287-2016-SG – Field Measurement of Surface Profile of Abrasive Blast-Cleaned Steel Surfaces Using a Replica Tape.

11.2.D.1.6 The Contractor must supply assistance and equipment (cherry picker with operator) required to the CCG representatives and the FSR for inspection of work.

11.2.D.1.7 Freeboard marking must be inspected by the IA, referring to the drawings.

11.2.D.1.8 The Contractor must examine the coating for blisters, runs, sags, dry spray and foreign material after the last coat has dried and before it has cured. No coating containing blisters, runs, sags, dry spray or foreign material will be accepted.

**11.2.D.2 Testing/Trials – [Not Used]****11.2.D.3 Certification – [Not Used]**

**11.2.D.4     Documentation**

- 11.2.D.4.1     Before the end of the contract, the Contractor must give to the IA and TA a comprehensive report detailing the work undertaken, defects, repairs made and measurements and readings taken.
- 11.2.D.4.2     The Contractor must submit an inspection report from the coating manufacturer's technical service representative.
- 11.2.D.4.3     The Contractor must provide the IA a detailed quality assurance report once the work is completed. This report must include, but not limited to, the inspection reports, dry film thickness (DFT) measurements and condition monitoring data during the coating application.
- 11.2.D.4.4     The Contractor must provide a new docking plan in a CAD format indicating the position of each block for the next dry docking. This plan must be given before the undocking of the ship.
- 11.2.D.4.5     The Contractor must provide the technical and data sheet of the paint products used.

**11.2.D.5     Training – [Not Used]**

### **11.3 HULL PAINTING ABOVE THE WATERLINE**

#### **11.3.A Identification**

- 11.3.A.1 The objective of this item is to prepare and paint the ship's hull, from the load line up to the bulwark, including above the bulwark and where the accommodation ladders are located. These ladders must be removed and reinstalled after the paint system has been applied. The Contractor must demonstrate that they function properly when reinstalled. The Contractor must check the operation before disassembly to demonstrate that the operating condition of a reinstalled unit is the same.
- 11.3.A.2 The Contractor must supply and apply two base coats of red oxide, self-priming, epoxy coating, 0.005" to 0.006" (0.13 mm to 0.15 mm) thick, red in colour, on all bare metal surfaces, and then two 0.0015" (0.04 mm) thick coats of a acrylic polyurethane coating red Coast Guard (RAL 3000) over the entire surface. The paint must be compatible with the existing.

#### **11.3.B References**

##### **11.3.B.1 Equipment Data**

- 11.3.B.1.1 [Equipment Details in statements or a table]

##### **11.3.B.2 Drawings and Documents**

- 11.3.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>Document / Drawing Title</b>	<b>Number of Sheets</b>
08693S01	Surface de Coque_Amundsen_Hull Surface	1
	1200 Icebreaker Coating scheme V5	1
	DRY DOCK COATING REPORT International 01.28.18.pdf	20

##### **11.3.B.3 Regulations and Standards**

- 11.3.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

<b>FSM Procedures</b>	<b>Title</b>	<b>Included Yes/No</b>
<b>Publications</b>		

<b>Standards</b>		
ASTM D4060	Standard Test Method for Abrasion Resistance	No
ASTM D4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers	No
RP0287-95	Field measurement of surface profile of abrasive blast cleaned steel surfaces using replica tape	No
normes SA-2½ SSPC SP10	Near White metal blast cleaning	No
normes Sa 2 SSPC SP6	Commercial blast cleaning cleaning	No
SSPC SP 1	Solvent Cleaning	No
<b>Regulations</b>		

### 11.3.C **Statement of Work**

#### 11.3.C.1 **General**

- 11.3.C.1.1 The Contractor must supply all materials and equipment to conduct the work.
- 11.3.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.
- 11.3.C.1.3 The total surface area of the plating above the waterline is 1000 m<sup>2</sup>, including a 0.9 m encroachment on the red ice-going vessel epoxy band.
- 11.3.C.1.4 The maximum load line (waterline) is represented by welding marks that are located at regular intervals all around the hull of the vessel. On the CCGS Amundsen, these marks are at every 7.1 m, which is the reference for determining the surface areas for the entire hull.
- 11.3.C.1.5 Of this surface, 25% (250m<sup>2</sup>) must be repaired. The surface must be sandblasted with abrasive sand to obtain a coarse angular surface profile of 75-100 microns, commercial standard SA 2½, Swedish Standard SIS 055900, or SSPC-SP-10 (near white).
- 11.3.C.1.6 The Contractor must indicate a unit price per square metre for preparation of external steel surfaces of the hull. This price must include all costs required to complete the task.
- 11.3.C.1.7 The Contractor must ensure that all sand used to sandblast the ship's plating is collected and disposed of. Disposal of the sand must be done in accordance with the applicable environmental standards.
- 11.3.C.1.8 The rest of the surface (750 m<sup>2</sup>) will be roughened using mechanical equipment after cleaning it with a high-pressure water jet (5000 PSI).

- 11.3.C.1.9 Before applying paint all surfaces must be blown off with compressed air.
- 11.3.C.1.10 The Contractor must supply and apply two base coats of red oxide, self-priming, epoxy coating, 0.005" to 0.006" (0.13 mm to 0.15 mm) thick, red in colour, on all bare metal surfaces, and then two 0.0015" (0.04 mm) thick coats of a acrylic polyurethane coating red Coast Guard (RAL 3000) over the entire surface.
- 11.3.C.1.11 Mark off the paint in a straight line at the load line and notify the IA for approval.
- 11.3.C.2 **Additional recommendations and requirements:**
- 11.3.C.2.1 During painting, the Contractor must keep all deck scuppers plugged using perforated wooden plugs.
- 11.3.C.2.2 All portholes and windows on the upper deck must be protected during sandblasting and painting work, and uncovered upon completion of the work.
- 11.3.C.2.3 The edges of the portholes must be cleaned by sandblasting or mechanically, and painted. The portholes must be protected from any damage that could occur during sandblasting.
- 11.3.C.2.4 For the duration of the sandblasting work, all the vessel's vents and ventilation openings must be covered with a watertight polyethylene film to prevent sand from entering the vessel's accommodation and the engine room spaces. All equipment located on the upper deck and boat deck (anchor windlass, mooring winch, crane, davits, etc.) must be covered in the same way. Upon completion of the work the Contractor must remove and dispose of all protective coverings.
- 11.3.D **Proof of Performance**
- 11.3.D.1 **Inspection Points**
- 11.3.D.1.1 Inspection of the surface preparation must be performed by referring to the following standards:
- 11.3.D.1.2 Sa 2½ or SSPC SP10 – Near White Blast Cleaning of metal;
- 11.3.D.1.3 Sa 2 or SSPC SP6 – Commercial Blast Cleaning;
- 11.3.D.1.4 SSPC-SP1 – Solvent Cleaning;
- 11.3.D.1.5 NACE International RP0287-95 – Field Measurement of Surface Profile of Abrasive Blast-Cleaned Steel Surfaces Using a Replica Tape.
- 11.3.D.2 **Testing/Trials - [Not Used]**
- 11.3.D.3 **Certification – [Not Used]**

**11.3.D.4     Documentation**

- 11.3.D.4.1     The Contractor must provide the technical and descriptive data sheet for the paint products used.

**11.3.D.5     Training – [Not Used]**

## **11.4 WHEELHOUSE WINDOWS, INSULATION AND WALL PANELS REPLACEMENT (OPTIONAL)**

### **11.4.A Identification**

- 11.4.A.1 The Contractor must supply and replace four (4) existing sliding windows and their accessories/hardware in the Wheelhouse. The new windows will be to (2) sliding type and two (2) fixed type.
- 11.4.A.2 The Contractor must supply and replace all the interior wall panels at the wheelhouse.
- 11.4.A.3 The Contractor must supply and replace all the insulation and vapor barrier material between the exterior partition and the wall panels. This excludes the ceiling.

### **11.4.B References**

#### **11.4.B.1 Equipment Data**

- 11.4.B.1.1 The windows are located in the drawing 221-H-77\_1 Windows & Sidelights.
- 11.4.B.1.2 The AFT PORT (#1) and AFT STBD (#2) sliding windows will be replaced for fixed windows.
- 11.4.B.1.3 The PORT (#3) and STBD (#4) sliding windows will be same type and same size.
- 11.4.B.1.4 The four bridge windows technical information are identified in **Table 1** below:

Item #	Location	Glass thickness	Fixed / Sliding	Approx. Clear Glass Height	Approx. Clear Glass Width	General Remarks	Installation Type
1	PORT SIDE	3/4"	Horizontal SLIDING shaped	33"	59" MAX 54" MIN	Clear Tempered glass	Bolted
2	AFT PORT	1/2"	Horizontal SLIDING	33"	45"	Clear Tempered glass	Bolted
3	AFT STBD	1/2"	Horizontal SLIDING	33"	45"	Clear Tempered glass	Bolted
4	STBD SIDE	3/4"	Horizontal SLIDING shaped	33"	59" MAX 54" MIN	Clear Tempered glass	Bolted

### 11.4.B.2 Drawings and Documents

11.4.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Numéro de dessin	Titre du dessin / document	Nombre de feuilles
221-H-40_1	Navigation bridge deck & deckhouse	1
221-H-40_2	Wheelhouse structure	1
221-H-81	Linings	2
221-H-77	Windows & Sidelights	2
221-H-80	Insulation Plan	2

### 11.4.B.3 Regulations and Standards

11.4.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

	Title	Included Yes/No
<b>FSSM Procedures</b>		
<b>Publications</b>		
BS 1088-1:2003	Marine plywood. Requirements	no
ISO 614:2012	Ships and marine technology — Toughened safety glass panes for rectangular windows and side scuttles — Punch method of non-destructive strength testing	no
ISO 21005:2012	Ships and marine technology — Thermally toughened safety glass panes for windows and side scuttles	no
NEMA	National Electrical Manufacturer Association Standards	no
TP11469E	Guide to Structural Fire Protection	no
	ABS	no
<b>Standards</b>		
<b>Regulations</b>		
MOHS	Maritime Occupational Health and Safety	no



#### 11.4.C **Statement of Work**

##### 11.4.C.1 **General**

- 11.4.C.1.1 The Contractor must supply all materials and equipment to conduct the work.
- 11.4.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.
- 11.4.C.1.3 The Contractor must coordinate an inspection with the TA and IA prior to the commencement of any work to evaluate the condition and location of items to be removed to gain access to a location to carry out the work.
- 11.4.C.1.4 Any damage incurred as a result of the Contractor's work and that is attributable to the Contractor's work performance must be repaired by the Contractor at his expense.
- 11.4.C.1.5 The Contractor must protect all equipment and surrounding areas from damage. Work areas are to be protected from the ingress of water, welding and blasting grit etc.
- 11.4.C.1.6 The Contractor must install protective coverings over all bridge consoles, chart tables, desks, chairs, new flooring and ceiling and keep them protected at all time during dry dock period.
- 11.4.C.1.7 The Contractor must make sure that the CO2 Pull Stations, Wing and Center Bridge Consoles are not disturbed using wood coverings above (not in contact with the equipment underneath).
- 11.4.C.1.8 All removed equipment as a result of this specification must remain the property of the Canadian Coast Guard unless otherwise instructed in the specification sections.
- 11.4.C.1.9 The Contractor must supply all materials, tools, lifting equipment, carnage, scaffolding and labour required to complete the work in this Technical Specification.
- 11.4.C.1.10 The Contractor must ensure that the temperature within the wheelhouse and surrounding spaces is controlled and maintained at a minimum 10°C **AT ALL TIME**. This must be monitored daily by the Contractor and reported to the IA. Any damaged equipment at the wheelhouse due to lack of control of the temperature will have to be replaced by the Contractor at his own expenses.

##### 11.4.C.2 **Equipment**

- 11.4.C.2.1 The Contractor must ensure all materials are new and unused. The Contractor must provide the TA with evidence that all materials used in the fabrication of the new windows and seals

are new and manufactured recently (less than 3 years). Canada will not accept equipment refurbished, reworked or rebuilt.

- 11.4.C.2.2 All components must comply with the Canada Shipping Act and Regulations and be type approved by a Classification Society recognized by Transport Canada Marine Safety (TCMS).
- 11.4.C.2.3 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.
- 11.4.C.2.4 New windows must be of similar quality as the existing.
- 11.4.C.2.5 All the new interior wall panels must be Type B marine approved system. Contractor must have the color approved by the TA before procurement.
- 11.4.C.2.6 Where no particular item is specified or where substitution must be made, the TA must approve the substituted item in writing before proceeding. The Contractor must provide information about various materials proposed to be used including certificate of grade and quality to the TA and IA prior to use.
- 11.4.C.3 **Bridge Disassembly**
- 11.4.C.3.1 The Contractor must take detailed photo records in the presence of the TA detailing all fixtures and fittings on the Bridge that will be disturbed during the work period. A copy of the photo records must be submitted to the TA prior to removal of any items.
- 11.4.C.3.2 The Contractor must remove and store for reinstallation of the following:
1. window blinds complete with fixed and adjustable cleats;
  2. aluminum air flow deflectors (above windows);
  3. All miscellaneous brackets, hooks, etc. in way of the work;
  4. gyro repeaters complete with transits;
  5. binocular boxes;
  6. Telescope box;
  7. ELAC Depth Sounder readouts;
  8. Young Wind Tracker.
- 11.4.C.3.3 The Contractor must ensure that all equipment to be stored are identified at the wheelhouse with the IA during the initial visit for photos.
- 11.4.C.3.4 The Contractor must remove and dispose of the existing wood trimmings, wall panels, insulation and vapor barriers that must be replaced.
- 11.4.C.4 **Windows Templating**

- 11.4.C.4.1 The Contractor must template all windows identified in **Table 1** in section 11.4.B.1.4.
- 11.4.C.4.2 The Contractor must take detailed photo records in the presence of the TA detailing all fixtures and fittings on the Bridge that will be disturbed during the templating work. A copy of the photo records must be submitted to the TA prior to removal of any items.
- 11.4.C.4.3 The Contractor must develop a plan and submit for review to the TA detailing how the Contractor will protect the interior of the Bridge and the equipment within it from the ingress of weather such as wind and rain/snow prior to commencing the work.
- 11.4.C.4.4 The Contractor must protect the interior of the Bridge and its equipment at all times from the ingress of moisture, dirt, wind, rain, etc. Measures must be put in place such that the Bridge must not be rendered open to weather at any time.
- 11.4.C.4.5 Before initiating the works, the Contractor must install resistant wooden protective coverings over all Bridge consoles.
- 11.4.C.4.6 The Contractor must remove all 4 identified windows without any damage to the glasses, window securing ring, mullions, seals and fasteners and then build the templates.
- 11.4.C.4.7 During the time the 4 windows are removed, the Contractor is responsible to coordinate with the IA for an inspection of the window frames in order to identify potential corrective steel work. If required, cost will be negotiated through PWGSC 1379 form.
- 11.4.C.4.8 The AFT PORT (#1) and AFT STBD (#2) sliding windows must be replaced for fixed windows of the same glass type and same dimensions. The PORT (#3) and STBD (#4) sliding windows must be replaced by sliding windows of the same glass type and same dimensions.
- 11.4.C.4.9 The Contractor is responsible for the accuracy of templating and the final fit of all replacement window components. Any measurement errors must be corrected at the Contractor's expense.
- 11.4.C.4.10 Templating of the replacement sliding windows must include the dimensional measurements for the sliding window handles.
- 11.4.C.4.11 During Manufacturing and until new windows are ready to be installed, the Contractor must install sealed wooden blanks where windows have been removed.
- 11.4.C.5 **Windows Manufacturing**
- 11.4.C.5.1 The Contractor must manufacture the new windows to comply with Classification Society Type Approval using only new materials specified under the Type Approval submitted with the Contractor's Bid proposal. The Contractor must manufacture the windows such that they

correspond to the templates produced as per section 11.4.C.4 Templating of this specification.

- 11.4.C.5.2 The Contractor must provide the TA with document proving that the materials used in the fabrication of the new windows and window components have been manufactured within the last 3 years.
- 11.4.C.5.3 Prior to installation, the Contractor must present and get acceptance by the TA for the specification for the new class approved windows.
- 11.4.C.5.4 All glasses must be glazed, clear tempered glass. New glasses must be of equivalent overall thickness as the existing glasses. The window tempered glass must be manufactured in accordance with ISO 21005:2012 and ISO 614:2012 standards and be of the same material as the material used for the manufacturer's R.O (recognized organisation) Type Approved windows for this type of vessel and application. Material certificates of compliance with the ISO standards and compliance with R.O. Type Approval Certification for the glass panes must be provided to the TA prior to manufacturing.
- 11.4.C.5.5 The Contractor must provide the TA with complete "as-manufactured" drawings, including material specifications, and all measurements (length, height, width, thickness and shapes, including all angles and corner fillets) for all new window components.
- 11.4.C.5.6 The Contractor must provide new fixed and sliding windows, seals for fixed and sliding windows, including seals for the sliding window handles that are all manufactured of material suitable for extended use in all weather conditions identified as such:
- a) Outside air temperatures -35°C to 35°C and 100% humidity
  - b) High wind, Heavy rain and /or spray, exposure to high ultra-violet rays
- 11.4.C.6 **Windows Replacement**
- 11.4.C.6.1 Before the start of the windows replacement work, the Contractor must make sure that everything is still covered and properly protected at the bridge.
- 11.4.C.6.2 The Contractor must remove and discard all fasteners for the window retaining rings, mullions and sliding window handles. The Contractor must remove and retain for re-use the window retaining rings, mullions and sliding window handles; and remove the glass panes.
- 11.4.C.6.3 The Contractor must keep all existing window panes on-site until the end of the Contract.
- 11.4.C.6.4 The Contractor must remove and discard all existing gaskets and clean the inside of the window frame, retaining rings and mullions to bare metal. Any damage caused by the

Contractor to the window frames, retaining rings or mullions must be repaired at the Contractor's expense.

- 11.4.C.6.5 There are two life ring release pull wires at each aft corner of the Bridge that control the release of the life rings outside of the bridge. The Contractor must secure the life rings during the work period to prevent accidental release of the life rings.
- 11.4.C.6.6 The Contractor must install all new windows and window components in accordance with the standards of the Classification Society recognized by TCMS identified on the Type Approval certificate for the windows provided. Final inspection after installation will be performed in the presence of the ABS inspector and the IA/TA and to their satisfaction.
- 11.4.C.6.7 The Contractor must replace all the windows panes as specified in **Table 1** in section 11.4.B.1.4 using new caulking that is a high-performance, elastic, gap-filling, 1-component polyurethane direct glazing adhesive that cures on exposure to atmospheric moisture and forms a durable elastomer which must also meet the regulations set out by the International Maritime Organisation (IMO).
- 11.4.C.6.8 The Contractor must re-install all windows retaining rings using new stainless steel fasteners.
- 11.4.C.6.9 Where fitted, the Contractor must re-install all mullions and sliding window handles using new gaskets and new stainless steel fasteners.
- 11.4.C.6.10 The Contractor must position and install the mullions to allow unhindered sliding of the window pane within the window frame to the full extent as the original window.
- 11.4.C.6.11 Upon completion of the installation, the Contractor must afford the TA the opportunity to test all sliding windows for unhindered operation. Any window which does not travel its full course or requires excessive force to operate must be repaired to the satisfaction of the TA at the Contractor's expense.
- 11.4.C.6.12 Upon resealing of all windows, the Contractor must perform a hose test on all windows and the Clearview Screen as detailed in the inspection section of this technical specification. The Contractor must coordinate with IA and TA for their presence to the tests.
- 11.4.C.6.13 Upon successful testing, the Contractor can then start insulation and wall panelling works.
- 11.4.C.7 **Insulation and Wall Panelling replacement**
  - 11.4.C.7.1 Prior to procurement, the Contractor must provide to TA and ABS surveyor the installation procedures and marine type approved certificates of all material for approval.
  - 11.4.C.7.2 The Contractor must install all vapor barriers, insulation material and wall panels in accordance with the standards of the Classification Society recognized by TCMS identified

on the Type Approval certificates provided. Final inspection after installation will be performed in the presence of the ABS inspector and the IA and to their satisfaction.

11.4.C.7.3 The Contractor must install new Marine Panel 3/4" thick. The color of the panels must be presented and approved by the TA before procurement.

11.4.C.7.4 The overall area to be covered out of new marine panel is approx. 800 ft<sup>2</sup>.

11.4.C.7.5 The Contractor must install all wall panels in accordance with the standards of the Classification Society recognized by TCMS identified on the Type Approval certificates provided. Final inspection after installation will be performed in the presence of the ABS inspector and the IA and to their satisfaction.

#### 11.4.C.8 **Wood Trims and Melamine Work**

11.4.C.8.1 Where the melamine/wood trims on the Bridge which surrounds the windows requires removal for access to the mounting arrangements for each window, new melamine/wood trims must be installed once the new windows, insulation and wall panels have been installed, tested and accepted.

11.4.C.8.2 All replacement plywood must be Marine Grade DFP meeting British Standard 1088 or equivalent.

11.4.C.8.3 If there must be replacement, all new melamine must match existing colors in the wheelhouse. Choices of colors must be presented and approved by the TA before procurement. The melamine must be flame retardant. If required, cost will be negotiated through a PWGSC 1379 form.

11.4.C.8.4 For ease of installation, all new melamine face panels must be made removable with stainless steel wood screws and matching stainless steel finishing cup washers. By Contractor request, alternative decorative fastening systems may be considered. All horizontal melamine work surfaces must remain flush and free of fasteners

11.4.C.8.5 Upon successful inspection by IA and TA, the Contractor must re-install all disturbed equipment, clean and return the Bridge to "as-found" condition.

#### **11.4.D Proof of Performance**

##### **11.4.D.1 Inspection Points**

11.4.D.1.1 IA, TA and ABS Surveyor must attend the following:

- a) Initial visit for photos and assessment of the bridge condition prior the beginning of the work

- b) Visual inspection of the bulkheads once wall panels, insulation, vapor barrier and all 4 windows are removed.
- c) Functional tests of new sliding windows and visual inspection on new fixed windows once installed.
- d) Hose tests once windows are sealed and dry
- e) Visual inspection of the insulation once completed and BEFORE wall panels are installed.
- f) Final inspection of wall panels and trims

#### **11.4.D.2 Testing/Trials**

- 11.4.D.2.1 Upon resealing of all windows after both the templating work and after the installation work, the Contractor must perform a hose test on all windows using a 12 mm diameter nozzle from 3 meters away with water pressure of 60 psi for 2 minutes on each window. Testing of the Clearview Screen must be done with the Clearview Screen in operation for 10 minutes prior to the test, during the test and 10 minutes after the application of water on the Clearview Screen has stopped. Any leak must be repaired at the Contractor's expense.
- 11.4.D.2.2 The testing of the windows following templating work must be performed in the presence of the TA. The testing following installation work must be performed in the presence of the IA, TA and the ABS Inspector.

#### **11.4.D.3 Certification**

- 11.4.D.3.1 It is the Contractor's responsibility to obtain a Type Approval from a Transport Canada recognized Classification Society for the materials, design and manufacturing of the new insulation, wall panels, windows and window components. It is also the Contractor's responsibility to ensure that the Type Approval certification is approved by the ABS Surveyor.
- 11.4.D.3.2 It is the Contractor's responsibility to obtain ABS certification for the installation upon completion of the installation of new insulation, wall panels, windows and components.

#### **11.4.D.4 Documentation**

- 11.4.D.4.1 The Contractor must submit to the TA a complete report including:
  - a) "As-manufactured" drawings, including material specifications, and all measurements (length, height, width, thickness and shapes, including all angles and corner fillets) for all new windows and window components;

- b) Bill of materials including all Certificates of compliance with Classification Society Type Approval and ISO compliance;
- c) Technical specifications with supporting illustrations or drawings for installation, maintenance, and repair;
- d) The Contractor must update all related drawings and provide IA and TA a DWG and PDF version.
- e) ABS approval document for the Type Approval from a Transport Canada recognized Classification Society for the materials, design and manufacturing of the new windows and window components.

**11.4.D.5 Training – [Not Used]**



## **11.5 WEATHERTIGHT DOORS REPLACEMENT**

### **11.5.A Identification**

11.5.A.1 The objective of this item is to replace seven (7) weathertight doors, one (1) watertight door and three (3) exterior doors and their frames in various locations onboard the vessel.

### **11.5.B References**

#### **11.5.B.1 Equipment Data**

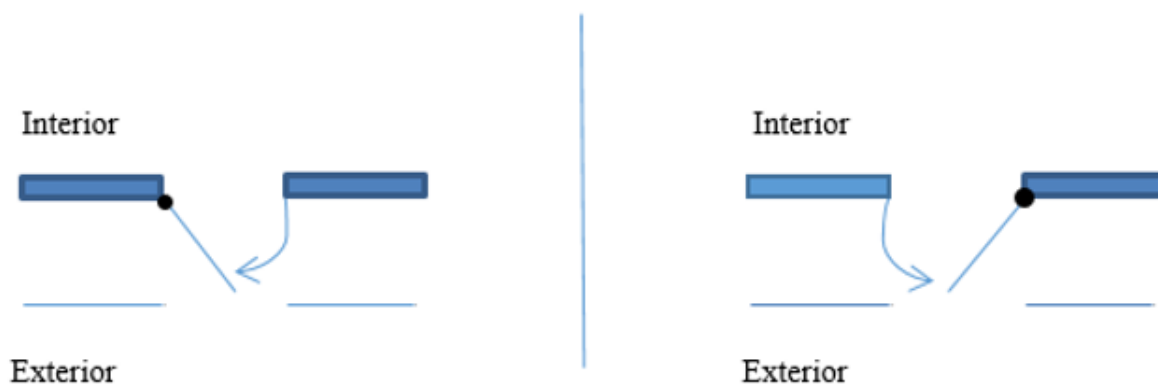
11.5.B.1.1 The Contractor must provide and replace the following doors and their frames:

<b>Item</b>	<b>Description</b>	<b>Quantity</b>	<b>Location(s)</b>
1	Steel weathertight door, 24" wide x 54" high clear opening, opening direction RHR, quick-acting dogging mechanism with 8 dogs (clips) operated by a single lever, 10" diameter window with deadlight.	1	557
2	Steel weathertight door, 36" wide x 77" high clear opening, opening direction RHR, quick-acting dogging mechanism with 8 dogs (clips) operated by a single lever, 10" diameter window with deadlight.	1	559
3	Steel weathertight door, 30" wide x 63" high clear opening, opening direction RHR, quick-acting dogging mechanism with 8 dogs (clips) operated by a single lever, 10" diameter window with deadlight.	2	410, 413
4	Steel weathertight door, 30" wide x 54" high clear opening, opening direction LHR, quick-acting dogging mechanism with 8 dogs (clips) operated by a single lever, 10" diameter window with deadlight.	2	562, 558
5	Steel weathertight door, 30" wide x 63" high clear opening, opening direction LHR, quick-acting dogging mechanism with 8 dogs (clips) operated by a single lever, 10" diameter window with deadlight.	1	549
6	Steel <b>watertight</b> door, 30" wide x 68" high clear opening, opening direction RHR, quick-acting	1	604

	dogging mechanism with 8 dogs (clips) operated by a single lever, no window.		
7	Steel exterior door, 30''wide x 74'' high clear opening, opening direction LHR, hung in a steel frame 8'' deep. Locking mechanism to lock from inside without key (fixed toggle) and with a key on the outside. Automatic closing mechanism at top of door. Window 17'' wide by 27'' high.	1	100
8	Steel exterior door, 30''wide x 74'' high clear opening, opening direction RHR, hung in a steel frame 8'' deep. Locking mechanism to lock from inside without key (fixed toggle) and with a key on the outside. Automatic closing mechanism at top of door. Window 17'' wide by 27'' high.	1	100
9	Steel exterior door, 31''wide x 81'' high clear opening, opening direction LHR, hung in a steel frame 5'' deep. Dogging mechanism with 2 dogs (clips) operated by individual levers. Locking mechanism to lock from inside without key (fixed toggle) and with a key on the outside. Automatic closing mechanism at top of door. Window 18'' wide by 25'' high.	1	415

\*\* LHR = Left Hand Reverse

\*\*RHR = Right Hand Reverse



### 11.5.B.1.2 List of doors to be replaced (As identified in annotated GA):

<b>ID#</b>	<b>Compartment</b>
7	410 - Ventilation unit (HVAC) #2 et 3
10	413 - Static inverter compartment
13	549 - MCC 13 compartment
14	557 - Helicopter fuel pump room
15	558 - Ventilation unit (HVAC) #5
16	559 - Azote Production Compartment
17	562 - Diesel fueling station
18	604 - Bow thruster compartment entrance
20	100 - Wheelhouse
21	100 - Wheelhouse
22	415 – Rosette Control Room

### 11.5.B.2 Drawings and Documents

11.5.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>Drawing / Document Title</b>	<b>Number of Sheets</b>
222-H-101	General arrangement	3
221-H-78	Door Schedule	3
221-H-80	Insulation plan	2
221-H-81	Lining	2
	Door Pictures folder	

### 11.5.B.3 Regulations and Standards

11.5.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and

Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
<b>FSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>		
IACS No. 47	Shipbuilding and Repair Quality Standard	yes
DFO 5737	Fleet Safety and Security Manual - Hot work	yes
<b>Regulations</b>		
	Canada Shipping Act 2001	no
	Hull Construction Regulations 1431	no
	Hull Inspection Regulations 1432	no
	Canadian Load Line Regulations SOR/2007-99	no

### **11.5.C Statement of Work**

#### **11.5.C.1 General**

- 11.5.C.1.1 The Contractor must supply all materials and equipment to conduct the work.
- 11.5.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.
- 11.5.C.1.3 The steel used to make the steel replacements described in this specification must be Lloyd's Grade A. The Contractor must provide the steel certificates to the IA and the ABS representative.
- 11.5.C.1.4 The Contractor must protect all flooring and bulkheads in the areas affected by the work with Masonite and protective covers that protect against sparks and slag metal resulting from hot work. The Contractor must remove and dispose of this protection upon completion of the work.
- 11.5.C.1.5 The Contractor must remove (as needed) wall panels, ceiling tiles, steps, risers and insulation to expose the steel around the doors in preparation for hot work. Care must be taken to prevent any damage. Any items remaining in the compartments must be protected from dust, dirt, sparks and damage resulting from the work. The Contractor is responsible, at its expense, for repairing or replacing any items damaged by the work. This step is very

important and must receive prior approval from the IA. Upon completion of the work, the Contractor must reinstall all items in their original locations.

- 11.5.C.1.6 The Contractor is responsible for identifying any interference items, temporarily removing them, storing them, and then reinstalling them on the vessel.
- 11.5.C.1.7 Light switches that would interfere just inside the door of the compartments must be moved before hot work. Unscrewing the boxes from their supports and unfastening the electrical wires will be sufficient. These boxes must be attached so they don't get in the way of work, while remaining accessible. These boxes must not be left hanging by their electrical wires. Once the work is completed, light switches must be reinstalled and the wires fastened using metal fasteners supplied by the Contractor.
- 11.5.C.1.8 The Contractor must present the selected replacement doors and frames detailed data sheets to the TA for approval before procurement.
- 11.5.C.1.9 While the doors are removed, the Contractor must ensure that the openings are temporarily sealed to prevent any damage to the interior of the vessel.
- 11.5.C.1.10 The Contractor must arrange all required ABS inspections and testing for the installation and acceptance of all steelwork and door installations.
- 11.5.C.1.11 Doors must meet the following criterias:
  - a) Must be class 1 and approved by TCMS or a Classification Society recognized by ABS. Doors must be delivered with their approval certificates.
  - b) Must be manufactured of ASTM A36 grade steel or G40.21 44W. The steel plate assemble of the door must be a minimum of 1/4" thick. Doors and frames must have radius corners.
  - c) Must meet the requirements of the Canadian Load Line Regulations SOR/2007-99 and the Hull Construction Regulations (1431).
  - d) Doors must have a quick acting lever mechanism that can be easily operated from either side of the door.
  - e) Must come with their frames and installation accessories.
  - f) The new doors must not be painted.
  - g) Door frames must be welded type, coated with two coats compatible with existing Interprime 234 red primer, as per the paint manufacturer's standards and thickness.
  - h) Insulated on the inside using a product approved by a recognized Marine Classification Society and covered with a removable 316 stainless steel sheet. (Items 1 to 5).
  - i) Fitted with a hold-back hook.

- j) Equipped with a hasp and eye permitting the doors to be locked from the outside with a padlock.
- k) Come with a hydraulic door closer.
- l) Coated with white baked enamel paint.
- m) Doors hardware to be stainless steel.
- n) "dogs" mechanism must have brass bushings on pivots points.

11.5.C.1.12 Prior to purchasing the doors, the Contractor must submit drawings and technical details of the doors to the TA for acceptance.

11.5.C.1.13 Upon completion of work, all bare steel and steel affected by the work must have new coating applied in accordance with the vessel's paint code and compatible with existing paint as follow:

- a) Two coats of Interprime 234 primer (2.0 mils per dry coat) followed by the following finishing coats:
  - i) **Interior/exterior bulkheads:** two coats of Interlac 665 paint, white (RAL 9003), 2.0 mils per dry coat.
  - ii) **Exterior decks:** 2 coats of Interbond 201 paint, red, KDL274 (6.0 mils per dry coat), with anti-skid particles in the second coat. This paint requires no primer.
  - iii) **Machinery space decks:** 2 coats of Interlac 665 paint, "French Grey" CLJ724.

11.5.C.1.14 After completion of the work, the Contractor must return all rooms to their original functional state and cleanliness.

#### 11.5.C.2 **Doors Replacement**

11.5.C.2.1 Unless otherwise specified, no doors must be removed until the replacement door has been received by the Contractor.

11.5.C.2.2 Before installing the new doors, the Contractor and the IA must check their dimensions, their handling and frame straightness.

11.5.C.2.3 Compartment identification plates (number and name) must be removed and discarded. The Contractor must supply and replace these plates with identical new plates in bronze with black lettering. The new plates must be installed in the same manner as the old ones.

11.5.C.2.4 The Contractor must remove and dispose of old doors, frames and fittings/accessories in accordance with provincial rules and regulations.

- 11.5.C.2.5 The bulkhead openings must be prepared and realigned so that the new doors can be fitted and welded correctly.
- 11.5.C.2.6 Doors must be installed in accordance with the manufacturer's instructions. Before welding, the Contractor must ensure that the doors and frames are straight. Door frames must be welded on both sides of the frame. Attention must be paid to the door manufacturer's welding sequence to avoid warping and deformation of the frames.
- 11.5.C.2.7 Before welding the frame completely, the door must be removed to prevent burning the gaskets. After the welding work is completed, the door must be installed and closing mechanism adjusted according to the manufacturer's installation instructions.
- 11.5.C.2.8 The Contractor must install each, including its accessories, and adjust the hydraulic door closing mechanisms.
- 11.5.C.2.9 The Contractor must replace the insulation around the doors with ABS-approved insulation. Replace the removed mineral wool insulation with a ROXUL (or equivalent) product. The Contractor must also supply the fastening system for the new insulation. The insulation must be equal in thickness and comply with the same standards as indicated in plans 221-H-80 and 221-H-81.
- 11.5.C.2.10 The Contractor must close the walls and ceilings back up and reinstall all removed items to their original places.

#### **11.5.D Proof of Performance**

##### **11.5.D.1 Inspection Points**

- 11.5.D.1.1 The Contractor must check that doors and frames are straight and demonstrate this to the IA before installing each door.
- 11.5.D.1.2 All welds must meet the requirements of the ABS surveyor and the IA.

##### **11.5.D.2 Testing/Trials**

- 11.5.D.2.1 The Contractor must demonstrate to the IA and the ABS representative that all doors and mechanisms function properly.
- 11.5.D.2.2 All doors and steelwork must undergo a hose test. The Contractor must conduct these tests in the presence of the IA and the ABS representative. These tests must be conducted using a fire hose on the exterior of the vessel. The Contractor is responsible for adjusting the doors until they are sealed. The Contractor must repair any defective welds at its own expense.
- 11.5.D.2.3 The Contractor must demonstrate to the ABS representative and the IA that doors close properly by conducting a chalk test or another testing method accepted by ABS.

11.5.D.2.4 Correctives works following failed leak tests must be completed at Contractor's own expenses.

11.5.D.3 **Certification - [Not Used]**

11.5.D.4 **Documentation**

11.5.D.4.1 The Contractor must submit a copy of the steel and insulation certificates to the IA.

11.5.D.4.2 The Contractor must provide proof of acceptance for the door installations from ABS to the IA.

11.5.D.4.3 The Contractor must provide door approval certificates and any other technical documentation provided with the doors to the IA and TA.

11.5.D.5 **Training – [Not Used]**



## **11.6 BALLAST TANKS, VOID SPACES AND COFFERDAMS**

### **11.6.A Identification**

- 11.6.A.1 The objective of this item is to carry out the 5 year inspection, maintenance, and certification of the ship's ballast tanks, voids and cofferdams. This also includes hydrostatic testing of the tanks and cofferdams.

### **11.6.B References**

#### **11.6.B.1 Equipment Data**

- 11.6.B.1.1 The following table identifies the tanks and cofferdams where work is to be carried out:

<b>ID #</b>	<b>Ballast/Voids/Cofferdam</b>	<b>Frame</b>	<b>Capacity (M<sup>3</sup>)</b>	<b>Surface Area (M<sup>2</sup>)</b>
329	Fore peak	Fore frame 183	112.28	727.6
301	Aft peak	Aft frame R to 0	101.29	568.2
326	Fore trim tank	176-183	181.80	879.3
201	Aft trim tank	0-18	113.47	813.3
319	Fwd Upper Wing tank, Port	138 to 165	192.75	541.8
320	Fwd Upper Wing tank, Stbd	138 to 165	202.06	541.8
Void#1	VOID #1 (Aft Azimuth Thruster)	30-39		164
Void#2	VOID #2 (Aft Moonpool)	156-162		11.5
Void#3	VOID #3 (Fwd Moonpool)	162-165		22.1
Void#4	VOID #4 (Fwd Azimuth Thruster)	138-146		49.2
129	VOID (Tunnel Bow Thruster)	165-176		183.0
-	Rudder Trunk	D-0		26.8
303	Helicopter Cofferdam	0-13		779.3
-	F.W. Tank Cofferdam	13-30		153.2
126	Pipe tunnel (Duct Keel)	120-168		375.4

#### **11.6.B.2 Drawings and Documents**

- 11.6.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>Drawing / Document Title</b>	<b>Number of Sheets</b>
NT-2532-14-CA001A-EX01	Tank and compartment surface calculation	112
222-H-131	Docking Plan	1

222-H-146	Capacity Plan	1
221-H-45	Tank Testing Plan	1
221-H-24	Fore end framing	2
D-WK-857-3	Moonpool shell door	
AMUNDSEN_Condition_ Assessment REPORT 12 2017I	Condition Assessment Report	559
	1200 Icebreaker Coating scheme V5	1

### 11.6.B.3 **Regulations and Standards**

- 11.6.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
<b>FSM Procedures</b>		
7.B.3	Entry into Confined Spaces	yes
<b>Publications</b>		
<b>Standards</b>		
<b>Regulations</b>		

### **11.6.C Statement of work**

#### 11.6.C.1 **General**

- 11.6.C.1.1 The Contractor must supply all materials and equipment to conduct the work.
- 11.6.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.

#### 11.6.C.2 **Preparation, cleaning and inspection**

- 11.6.C.2.1 The Contractor must note that the tanks are used as water ballast tanks. The ship's crew, prior to docking the vessel, must empty these tanks to the minimal required level in order to achieve the desired trim.
- 11.6.C.2.2 The Contractor must bid on draining and disposing of approximately 20 metric tons of water and debris from each of the six (6) ballast tank noted for a total of 120 metric tonnes.
- 11.6.C.2.3 Once the vessel has been safely docked, the Contractor must remove the docking plugs for the designated tanks in order to drain them, except the FWD Upper wing tanks which are not

fitted with docking plugs. The Contractor must pump them dry using a portable pump to complete the work. The Contractor must also drain the suction piping between the tanks and the pumps, as well as the 2 tank bottoms.

- 11.6.C.2.4 The Contractor must give the docking plugs to the IA for safekeeping.
- 11.6.C.2.5 The Contractor must open all manhole covers and ventilate the tanks and void spaces. The Contractor must post a certificate, prepared by a certified chemist, near the entrance of each tank specifying a safe entry and permission to perform all required work during the whole duration of the work period. The certificate must be confirmed daily.
- 11.6.C.2.6 The Contractor must descale, mechanically clean, to remove all rust and loose paint that is not in firm contact with the plate, then clean each of the tanks and void spaces noted in this specification, of all rust, dirt and debris. The Contractor must hydro-blast the ballast and cofferdams, using high-pressure water (5000 psi minimum), hand clean them, remove all traces of rust and dirt, and dry them prior to inspection.
- 11.6.C.2.7 The evaluation of the expected surfaces to be treated is indicated in the table above (11.6.B.1.1) for a total of 5836.5 m<sup>2</sup>.
- 11.6.C.2.8 Once cleaned, each of the tanks and void spaces must be surveyed by the ABS Surveyor and the IA. The Contractor must coordinate the presence of the ABS Surveyor and the IA when the work is ready for inspection.
- 11.6.C.2.9 The cost associated with all remedial work, required by the ABS Surveyor and the AI, after their inspections, will be negotiated using PWGSC 1379 form.
- 11.6.C.2.10 On completion of the survey and any remedial action required, any coating damage found must be prepared and painted using a paint that is compatible with the existing paint schedule. For bidding purpose, the estimated surface areas to be touched up is evaluated up to 10% of the 5836 m<sup>2</sup> total surface as indicated in 11.6.B.1 above. All surface preparation and paint application must be done in accordance with the paint manufacturer's recommendations and specifications. The Contractor must apply two coats of paint, each being a different color, to the recommended thickness. The AI and NACE inspector must inspect each coat.
- 11.6.C.3 **Preparation specific to Pipe Tunnel (Duct Keel) ONLY**
- 11.6.C.3.1 All coating products must be stored by the Contractor in a space provided for this purpose based on the Material Safety Data Sheets.
- 11.6.C.3.2 The Contractor must order all coating products in a timely manner and to properly dispose of the containers and solvents used in accordance with the local environmental regulations.

- 11.6.C.3.3 The Contractor must adequately protect all mechanical equipment contained in the adjoining compartments prior to commencement of work.
- 11.6.C.3.4 All surface preparation and application of coatings must follow manufacturers' recommended guidelines, unless otherwise stated, including recommendations for surface profiles, inter-layer drying times, and intervals before topcoats, drying time after coating applied, wet film thickness, dry film thickness, and drying time prior to coating immersion during flood of dry dock . This applies to all coatings used during the work.
- 11.6.C.3.5 The Contractor must provide a firm price to prepare the approximately 100m<sup>2</sup> surface area to SA-2½ SSPC SP10.
- 11.6.C.3.6 After the blast is finished and before the application of a paint or a primer, the steel surfaces must be dusted with a dry air jet and free of air. oil. No paint must be applied if the surface preparation has not been verified by the IA.
- 11.6.C.3.7 All contaminated areas affected by surface preparation must be solvent cleaned in accordance with SSPC SP 1.
- 11.6.C.3.8 The profile of the shot-blasted surfaces obtained must be angular, coarse grain, 50 to 75 microns, unless otherwise specified in the coating manufacturer's specifications.
- 11.6.C.3.9 The profile of any paint or steel surface where the coating is to be applied must have a minimum roughness of 3 mils.
- 11.6.C.3.10 A coating must be applied to prepared areas prior to the occurrence of flash rust. Otherwise, the operation will be deemed unacceptable and a new stripping must be done at the expense of the Contractor.
- 11.6.C.3.11 With respect to areas that, in accordance with the Statement of Work, are to be cleaned, the Contractor must check for chlorides, and areas deemed to not require coating must be washed with new; the Contractor is responsible for the costs associated with this work.
- 11.6.C.4 **Coating specific to Pipe Tunnel (Duct Keel) ONLY**
- 11.6.C.4.1 Following the inspection, the Contractor must paint all internal surfaces of the keel tunnel in the targeted area for a total area of approximately 100 m<sup>2</sup>.
- 11.6.C.4.2 The Contractor must supply and apply one (1) strip coat and two (2) coats of paint compatible with existing "Intergard 7500" paint according to the standards required by the manufacturer.
- 11.6.C.4.3 The Contractor must provide labor, equipment and materials including sheltering, heating and dehumidification to meet the specifications of the manufacturer of the coating.
- 11.6.C.4.4 The coating must be applied by an applicator authorized by the coating manufacturer.

- 11.6.C.4.5 The Contractor must allow the IA and TA the opportunity to witness the application of each layer.
- 11.6.C.4.6 Following the coating process, the Contractor must reinstall all manhole covers with new CFM 1/8 "thick fiber reinforced neoprene gaskets. Contractor must apply anti-seize compound on all fasteners.
- 11.6.C.4.7 The Contractor must reinstall the drain plugs. Perform a "vacuum box" leak test on the cap in the presence of the IA.
- 11.6.C.5 **Closing, testing and certification**
- 11.6.C.5.1 The IA must inspect the tanks, voids and cofferdams between each coat of paint and prior to the final closing of the manhole covers in order to validate the quality of the application.
- 11.6.C.5.2 On completion of all work, the Contractor must:
- a) Recuperate the docking plugs from the IA and install them.
  - b) Install the manhole covers using new gaskets, washers and nuts that he must supply. The new gaskets must be of the same material and thickness as those replaced.
  - c) Apply an Anti-seize compound to all threaded components.
- 11.6.C.5.3 The Contractor must perform a pressure test (hydrostatic or air pressure), on each tank and cofferdam, in presence of a ABS surveyor and the IA.
- 11.6.C.5.4 Once the hydrostatic or air pressure test are completed, if necessary, the Contractor must remove the docking plugs in order to drain the tanks. The FWD Upper wing tanks Port & Stbd (#319 and #320) must be emptied using portable pumps, as indicated above.
- 11.6.C.5.5 The Contractor must re-install the docking plugs, again supplying and installing new joints, and perform a vacuum test in the presence of the IA.

## **11.6.D Proof of Performance**

### **11.6.D.1 Inspection Points**

- 11.6.D.1.1 Inspections by ABS Surveyor and the IA must show that all surfaces from each tank, voids and cofferdam are in good condition and completely and uniformly coated as demanded in the current specification.
- 11.6.D.1.2 The Contractor is responsible for organizing periodic inspections with ABS and the IA at least 24 hours prior to the inspection.
- 11.6.D.1.3 All stripping and coating must be inspected by the Contractor in accordance with the agreed Quality Assurance Plan, a copy of which must be provided to the TA every two weeks.

- 11.6.D.1.4 Where applicable, the surface profile must be measured in accordance with NACE International Standard RP0287 95.
- 11.6.D.1.5 Surface preparation inspection must be followed with reference to the following standards:
- a) SA-2½ or SSPC SP10 standards - Near White metal blast cleaning;
  - b) SA 2 or SSPC SP6 - Commercial Blast Cleaning;
  - c) SSPC Standard SP1 - Solvent cleaning;
  - d) RP0287 95 from NACE International - Field measurement of surface profile of abrasive blast cleaned steel surfaces using replica tape
- 11.6.D.1.6 Inspection of the internal structure of these tanks in the presence of a representative of the IA and ABS.
- 11.6.D.1.7 All work must be completed for acceptance by the IA and ABS.
- 11.6.D.2 **Tests and Trials**
- 11.6.D.2.1 The Contractor must conduct hydrostatic or air pressure tests to prove that all tanks and cofferdams are watertight and be certified according to the requirements of ABS to obtain certification.
- 11.6.D.3 **Certification**
- 11.6.D.3.1 The Contractor must provide a copy of the ABS survey credit to the IA.
- 11.6.D.4 **Documentation**
- 11.6.D.4.1 The Contractor must supply the IA and the TA with an electronic copy, on a USB stick not protected by a password, in Microsoft Office Word 2013 or more recent format, a report detailing all undertaken works, defects, repairs performed and detailed results of all performed tests.
- 11.6.D.4.2 The Contractor must supply the IA and the TA with a detailed QA report at the completion of the Work. This must include, but not limited to, inspection records, DFT readings, and condition monitoring data during coating application, the thicknesses applied, the surface temperatures at each cure day etc.
- 11.6.D.5 **Training – [Not Used]**

## **11.7 FUEL OIL AND OILY WATER TANKS**

### **11.7.A Identification**

11.7.A.1.1 The objective of this item is to carry out the 5 year inspection, maintenance, and certification of the ship's fuel oil and oily water tanks. This also includes hydrostatic testing of the tanks.

### **11.7.B References**

#### **11.7.B.1 Equipment Data**

11.7.B.1.1 The following table identifies the tanks where work is to be carried out:

<b>ID #</b>	<b>Tanks</b>	<b>Frames</b>	<b>Capacity (M<sup>3</sup>)</b>	<b>Area (M<sup>2</sup>)</b>
127	Double Bottom No.1, port	123 to 165	76.99	618.6
128	Double Bottom No.1, stbd	123 to 165	84.40	689.6
121	Double Bottom No.2, port	97 to 123	101.55	715.3
122	Double Bottom No.2, stbd	97 to 123	112	776.3
113	Double Bottom No.3, port	61 to 93	140.13	976.3
114	Double Bottom No.3, stbd	61 to 93	140.13	976.3
106	Double Bottom No.4, port	39 to 61 (oily water)	47.67	425.1
107	Double Bottom No.4, stbd	39 to 61 (oily water)	47.67	425.1
221	Fwd deep tank, port	146 to 165 (no drain plugs)	99.64	368.1
222	Fwd deep tank, stbd	146 to 165 (no drain plugs)	139.92	351.4
202	Aft deep tank, port	18 to 30	106.2	433.1
203	Aft deep tank, stbd	18 to 30	106.2	455.9
219	Fwd Lower Wing tank, port	138 to 158 (no drain plugs)	57.83	340.8
220	Fwd Lower Wing tank, stbd	138 to 158 (no drain plugs)	57.83	340.8
215	Settling tank, port	123 to 127 (no drain plugs)	70.11	257.2
216	Settling tank, stbd	123 to 127 (no drain plugs)	70.11	251
318	Flume tank, upper	127 to 138 (no drain plugs)	261.72	585.8
217	Flume tank, lower	127 to 138 (no drain plugs)	254.31	634.7
316	Day tank, center	123 to 127 (no drain plugs)	42.53	161.1
213	Fwd engine room Wing tank, port	95 to 123 (no drain plugs)	107.39	642.3
214	Fwd engine room Wing tank, stbd	95 to 123 (no drain plugs)	107.39	642.3
208	Aft engine room Wing tank, port	61 to 95 (no drain plugs)	134.19	769.2
209	Aft engine room Wing tank, stbd	61 to 95 (no drain plugs)	134.19	769.2
304	Helicopter fuel tank, centre	4 to 11 (kerosene type aviation fuel) (no drain plugs)	28	62.9
659	Boiler Fuel Oil tank	84-87	3.04	17.6
124	Diesel Engine J.W. Retention tank	116 to 120	4.55	37.6
104	Fwd Engine Room Inner	114 to 123	10.65	N/A

105	Fwd Engine Room Outter	114 to 123	10.65	N/A
-	Prop Motor Room	30 to 33	3.72	
123	Dirty Lub Oil	112 to 116	4.77	37.8
826	Emergency Gen F.O.	72 to 76	3.80	30.3
-	Helicopter Fuel Sump	13 to 16	0.14	N/A
-	Prop Motor L.O. Circ	40 to 43	0.45	N/A
-	Lub Oil	83 to 84	1.60	N/A
-	Lub Oil	103 to 104	0.23	N/A
-	Lub Oil	104 to 105	0.23	N/A
-	Boiler Feed	95 to 100	1.64	N/A
-	Sludge	107 to 115	1.82	N/A
-	Purifier L.O. Storage Port	109 to 112	3.04	N/A
-	Grey Water Retention	142 to 144	0.54	N/A

11.7.B.1.2 The fuel oil tanks contained:

- a) Arctic type diesel; and/or
- b) Marine type 3GP 11D; and/or
- c) Arctic type 3GP 11C; and/or
- d) Marine diesel;

11.7.B.1.3 The helicopter fuel tank contained Jet A1 fuel.

#### 11.7.B.2 **Drawings and Documents**

11.7.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Drawing Number	Drawing / Document Title	Number of Sheets
NT-2532-14-CA001A-EX01	Tank and compartment surface calculation	112
AMUNDSEN_Condition_Assessment REPORT 12 2017I	Condition Assessment Report	559
222-H-131	Docking Plan	1
222-H-146	Capacity Plan	1
221-H-45	Tank Testing Plan	1
	1200 Icebreaker Coating scheme V5	1



### 11.7.B.3 **Regulations and Standards**

- 11.7.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
<b>FSM Procedures</b>		
7.B.3	Entry into Confined Spaces	yes
<b>Publications</b>		
<b>Standards</b>		
<b>Regulations</b>		

### 11.7.C **Statement of work**

#### 11.7.C.1 **General**

- 11.7.C.1.1 The Contractor must supply all materials and equipment to conduct the work.
- 11.7.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.

#### 11.7.C.2 **Emptying and draining the tanks :**

- 11.7.C.2.1 For bidding purpose, the Contractor must evaluate pumping and storing ashore and then pumping back approximately 250 metric tons of diesel fuel. Storage facilities (Contractor supplied) must be clean, uncontaminated, and prior to transferring of any fuel oil to these facilities, inspected by the IA. This fuel transfer operation must be the responsibility of the Contractor.
- 11.7.C.2.2 During the course of this transfer, the Contractor must empty all tanks to the bottom of their suctions. Contractor must consult with the IA as to the sequence of transferring of fuel off the vessel whilst the vessel is sitting on the blocks.
- 11.7.C.2.3 The Contractor must remove the docking plugs and drain remaining fuel and residues from the tanks. The Contractor must bid on the removal and disposal, in accordance with local regulation, of approximately 40 metric tonnes of fuel residue and dirt which can be expected to be found in the tanks indicated in 11.7.B.1.1. For tanks not fitted with docking plugs, the Contractor must use a portable pump to complete the draining procedure. The Contractor must dispose of this remaining residue ashore in accordance with the provincial environmental regulations.

11.7.C.2.4 There will still be some fuel in the day tank and possibly in the settling tanks. The Contractor must include in its bid, the cost to empty these tanks. The Contractor is to bid on the removal and disposal of 20 metric tons of fuel. Cost will be prorated upward or downward after completion of the drainage on a PWGSC 1379 form.

11.7.C.3 **Opening and cleaning of tanks**

11.7.C.3.1 The Contractor must dismantle any equipment restraining access to the manholes and reassemble them once work is completed.

11.7.C.3.2 The Contractor must open the manhole covers of the tanks in consultation with the IA.

11.7.C.3.3 The Contractor must empty, clean of all deposits, and ventilate the helicopter fuel tank, fuel tanks and oily water tanks for a sufficient period of time to ensure that tanks are free of noxious and explosive gases.

11.7.C.3.4 Before any work or inspection can be performed in the tanks, the Contractor must obtain a certificate from a chemist to certify that tanks are gas free, safe to work inside and that hot work can be performed inside. Copies of the certificates must be posted in a visible location, near the manholes, and another copy for each tank must be given to the IA. The Contractor must keep those certificates valid for the entire period where a tank is open.

11.7.C.3.5 Diesel Engine J.W. Retention tank, (frames 116 to 120)

a) The Contractor must clean and degrease the tank using high pressure water jet.

b) For bidding purposes, the Contractor must estimate a loose paint area of 25% after cleaning the tanks. After thoroughly cleaning and degreasing, the Contractor must supply and apply, on all bare steel surfaces, a primer, compatible with the existing paint schedule, and the existing 2 coats of International Interline 624 paint on all surrounding surfaces. The first coat must be 0.004" thick when dry and the second coat must be 0.010" thick when dry. Refer to section 3.27 from document *AMUNDSEN\_ Condition\_Assessment REPORT 12 2017l*.

11.7.C.3.6 Port and starboard, #4 double bottom tanks, (frames 39 to 61)

a) The Contractor must provide a price to mechanical clean a surface of 850 m<sup>2</sup> (9150 ft<sup>2</sup>) using sand blast at SA 2½ ou SSPC-SP10 standard, followed by application of one coat of coating compatible with the vessel paint scheme, with a dry coat thickness of 0.15 mm (0.006 in.). For adjustment purposes of the final cost, the Contractor must also provide a unit price per square meter (m<sup>2</sup>). Refer to sections 3.30 and 3.31 from document *AMUNDSEN\_ Condition\_Assessment REPORT 12 2017l*.

11.7.C.3.7 The Contractor must clean with high pressure water jet (5000 psi) all the other tanks listed above in table 11.7.B.1.1 and dispose of all dirt and debris following related environmental regulations.

11.7.C.3.8 Upon completion of high pressure water jet (5000 psi) cleaning, the Contractor must ensure that each tank is gas freed, suitable for entry and for further inspection and required works.

11.7.C.3.9 The Contractor must ensure that all limber holes in each tank are free and clear and the Contractor must also inspect the bottom of all sounding pipes and tanks suctions to ensure they are not obstructed.

11.7.C.4 **Tanks inspection**

11.7.C.4.1 All the tanks must be inspected by an ABS surveyor and the IA for certification. The Contractor must inform the ABS surveyor and the IA when the above mentioned tanks are ready for inspection. Twenty four (24) hours notification must be provided.

11.7.C.4.2 Following the inspections, all defects noted by the surveyors or the Contractor must be repaired by the Contractor. If any repairs are required for the Contractor, the cost will be addressed using PWGSC 1379 form.

11.7.C.5 **Tank Testing**

11.7.C.5.1 Once the inspections completed, the Contractor must install the docking plugs.

11.7.C.5.2 The Contractor must close the manhole covers, supplying and using new gaskets, nuts and washers. The required gasket material for the manhole cover's gaskets is BUNA-N (NITRILE) or an equivalent suitable for petroleum products. The Contractor must check all manhole cover studs and renew any defective studs.

11.7.C.5.3 The Contractor must perform hydrostatic or compressed air tests on all tanks, in presence and to the satisfaction of an ABS surveyor.

11.7.C.5.4 If hydrostatic tests are performed, once they are completed, the Contractor must:

- a) remove the docking plugs,
- b) drain the tanks,
- c) open the manhole covers,
- d) obtain a chemist certification allowing for safe entrance,
- e) wipe dry the tanks,
- f) close the manhole covers,
- g) install the docking plugs,

h) perform vacuum box tests in the presence of the IA.

11.7.C.5.5 The Contractor must plug all air vents and overflow piping before performing the hydrostatic or compressed air tests on the tanks and free the air vents and overflow piping after testing. There is overflow piping in the following tanks:

- a) Forward Engine Room wing tank, port and starboard;
- b) Settling tanks, port and starboard;
- c) Emergency Generator Fuel Oil tank;
- d) Boiler Fuel Oil tank;
- e) Fuel oil Day tank;

11.7.C.5.6 If compressed air tests are performed on the tanks, the Contractor must plug all piping, supply, vents, overflow, etc.

11.7.C.5.7 All the tanks must be inspected by the IA before the Contractor closes them.

#### **11.7.D Proof of Performance**

##### **11.7.D.1 Inspection Points**

11.7.D.1.1 Storage facilities (Contractor supplied) must be clean, uncontaminated, and prior to transferring of any fuel oil to these facilities, inspected by the IA. Fuel transfer can only start once IA has provided a signed acceptance of the facilities.

11.7.D.1.2 The following inspections are required to be verified by the IA and the ABS surveyor:

- a) Inspection of each fuel oil tank after cleaning,
- b) Final inspection of all tanks prior to their being "closed-up".

##### **11.7.D.2 Testing/Trials**

11.7.D.2.1 The Contractor must perform the following test on each fuel oil tank:

- a) Hydrostatic or air pressure test.
- b) Vacuum box tests on each docking plug.

##### **11.7.D.3 Certification**

11.7.D.3.1 The Contractor must also provide a copy of the ABS survey credit to the IA.

##### **11.7.D.4 Documentation**

- 11.7.D.4.1 The Contractor must supply the IA and the TA with a report, detailing the work undertaken, defects, repairs made and measurements and readings taken, in Microsoft Office Word 2013 or more recent format on an USB stick, not protected by a password.
- 11.7.D.4.2 The Contractor must provide a Quality Assurance report indicating that all areas, as defined in this specification, have been inspected by the Contractor's QA Department and all areas of defects established by this survey have been identified for remedial action.
- 11.7.D.5 **Training – [Not Used]**

## **11.8 GRIDS, SEA CHEST AND SEA BAYS**

### **11.8.A Identification**

- 11.8.A.1 The objective of this item is to do the maintenance of the sea chests and sea bays. The work includes the cleaning-up, touch-up and anode replacement.
- 11.8.A.2 Install 54 "Cathelco" anodes during the dry dock. "Cathelco" anodes will be provided by the CCG.

### **11.8.B References**

#### **11.8.B.1 Equipment Data**

- 11.8.B.1.1 The following table indicates the location of the ship's seawater intakes and seawater boxes that must be opened for cleaning and inspection by the IA.

<b>TANK ID #</b>	<b>COMPARTMENT</b>	<b>FRAMES</b>	<b>AREA (m<sup>2</sup>)</b>
211	Starboard high suction, Forward engine room	95-97	20.3
118	Starboard low suction, Forward engine room	95-97	18.2
117	Port low suction, Forward engine room	95-97	18.2
210	Port high suction, Aft engine room	92-95	20.3
115	Port low suction, Aft engine room	92-95	25.1
116	Starboard low suction, Aft engine room	92-95	25.1
110	Port low suction, Propulsion motor room	60-61	16.1
111	Starboard low suction, Propulsion motor room	60-61	16.1
206	Starboard high suction, Propulsion motor room	59-61	18.1
205	Starboard high suction, submersible pump	58-59	8.9
101	Starboard low suction, sprinkler pump	30-31	7.5
125	Port Evaporator Sea suction	120-123	7.7
-	Starboard sea suction for bow thruster	165-166	9.3
120	Port & Stbd sea bays, forward engine room (14 T)	95-97	102.9
119	Port & Stbd sea bays, aft engine room (14 T)	93-95	102.9
112	Port & Stbd sea bays, propulsion motor room (7 T)	55-61	69.5

#### **11.8.B.2 Drawings and Documents**

- 11.8.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Drawing Number	Drawing / Document Title	Number of Sheets
222-H-101	General Arrangement	3
NT-2532-14-CA001A-EX01	Tank and compartment surface calculation	112
222-H-146	Capacity Plan	1
221-H-45	Tank Testing Plan	1
222-910-15_11	Cathodic protection system	1
3163-1	Caisse eau de mer & prise eau-salle moteurs prop. c. 2212	1
3163-2	Caisse eau mer et prise eau mer-salle mach. avant c. 2212	1
3163-3	Caisse d'eau de mer - salle de propulseur d'etrave	1
222-670-5	sea bay piping	2
222-670-6	Sea inlet box arrangement	1
222-670-8	Details of sea inlet strainer	1
AMUNDSEN_Condition – Assessment REPORT 12 2017I	Condition Assessment Report	559
DRY DOCK COATING REPORT International 01.28.18	2017 Dry Dock Coating International Report	20
	1200 Icebreaker Coating scheme V5	1

### 11.8.B.3 Regulations and Standards

- 11.8.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
<b>FSM Procedures</b>		
<b>Publications</b>		
	[Not Used]	
<b>Standards</b>		
<b>Regulations</b>		

**11.8.C Statement of Work****11.8.C.1 General**

- 11.8.C.1.1 The Contractor must supply all materials and equipment to conduct the work.
- 11.8.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.

**11.8.C.2 Maintenance**

- 11.8.C.2.1 The Contractor must open all access grids and manholes for sea chests and sea bays. To gain access to the sea bays, the Contractor must remove any piping blocking the manholes, store in a secure place and place back on completion of the work. The Contractor must remove the drain plugs to drain the boxes and reinstall them at the end of the work. The drain plugs must be tested with a vacuum box following reinstallation.
- 11.8.C.2.2 The following table indicates the sea chests where the Contractor must install two (2) zinc anodes type Z-22 of 25 lbs each per compartment.

<b>TANK ID #</b>	<b>Compartment</b>	<b>Frame</b>	<b>Area (m<sup>2</sup>)</b>
211	Starboard high suction, Forward engine room	95-97	20.3
118	Starboard low suction, Forward engine room	95-97	18.2
117	Port low suction, Forward engine room	95-97	18.2
210	Port high suction, Aft engine room	92-95	20.3
115	Port low suction, Aft engine room	92-95	25.1
116	Starboard low suction, Aft engine room	92-95	25.1
110	Port low suction, Propulsion motor room	60-61	16.1
111	Starboard low suction, Propulsion motor room	60-61	16.1
206	Starboard high suction, Propulsion motor room	59-61	18.1

- 11.8.C.2.3 Remove 28 extensions from the seawater boxes to allow cleaning. The 28 extensions must be cleaned with a high-pressure water jet. Then inspect the condition of each extension and provide a report to the IA. The Contractor must plan to remove all components, equipment and machinery required to execute the work.
- 11.8.C.2.4 The Contractor must clean all sea chests and sea bays. The internal surfaces must be cleaned using a high-pressure water jet at 5,000 psi (240 kPa). Mud must be removed.
- 11.8.C.2.5 The Contractor must provide a price to mechanical clean a surface of 50 m<sup>2</sup> (538 ft<sup>2</sup>) using a mechanical brush, followed by application of one coat of coating compatible with the vessel paint scheme, with a dry coat thickness of 0.15 mm (0.006 in.). Touch ups completed



in 2017 were made with Intershield 300. For adjustment purposes of the final cost, the Contractor must also provide a unit price per square metre (m<sup>2</sup>).

- 11.8.C.2.6 The Contractor must close all sea bay and sea chest manholes. Manhole covers must be closed using new gaskets, bolts, nuts, and washers to be supplied by the Contractor. The holes of the perforated grids must be mechanically reamed to their original diameter. The perforated grid covers must be closed with new stainless steel bolts and tack welded. All fasteners must receive an application of anti-seize compound. There are 120 countersunk bolts, ¾ in. (1.9 cm) by 5 in. (12.7 cm) long. Nuts welded on the interior must be removed and replaced with new nuts welded in the same locations. Six (6) bolts must be shortened. Nuts and bolts must be supplied by the Contractor.
- 11.8.C.2.7 The Contractor must open and clean the six sea water suction strainers (2 strainers per engine room and motor propulsion room). The internal surfaces and the cover of the strainers must be mechanically cleaned. The Contractor must apply two coats of paint compatible with the vessel paint scheme, black paint. All strainers must be closed using new gaskets, bolts, washers and nuts, which must be supplied by the Contractor.
- 11.8.C.2.8 **Important:** No anode must be installed in the evaporator water intake. The paint used for touch-ups in the seawater intake of evaporators must be certified according to ANSI-NSF 61 for drinking water tanks. No solvents must be added to the paint.
- 11.8.C.3 **Steel Replacement**
- 11.8.C.3.1 A steel plate with excessive corrosion reported during the 2017 dry dock must be replaced in the Port High Suction in the aft engine room. The plate is approximately 4 m<sup>2</sup> and is located at the top of the suction box. The Contractor must remove this plate and fit and re-weld a new Contractor provided plate of the same grade of steel and thickness as shown on the guidance drawing for new plate. On completion of inserting the new plate the plate must be presented to ABS and the IA for inspection. Any defects found must be corrected and the plate re-inspected. The completed plate is to be painted using the same painting scheme as the surrounding plate.
- 11.8.C.4 **"Cathelco" anodes installation (54)**
- 11.8.C.4.1 The Contractor must remove the blanks on the anode wells in the Fwd and Aft Engine Room sea bays and Propulsion Motor Room's sea bay.
- 11.8.C.4.2 Install the new 54 anodes supplied by CCG.
- 11.8.C.4.3 The Contractor must perform a "Megger" electrical insulation test on the anodes and their circuits. The readings obtained must be reported to the TA. High readings on the original

circuits will be corrected using PWGSC 1379 action. High readings found on areas worked on by the Contractor must be corrected by the Contractor at its expense.

11.8.D **Proof of Performance**

11.8.D.1 **Inspection Points**

11.8.D.1.1 All work must be accepted by ABS Surveyor and the IA.

11.8.D.2 **Testing/Trials**

11.8.D.2.1 Perform a "Megger" electrical insulation test on "Cathelco" anodes installed.

11.8.D.3 **Certification - [Not Used]**

11.8.D.4 **Documentation**

11.8.D.4.1 The Contractor must provide a Quality Assurance Report indicating the replaced anodes and work performed in the area.

11.8.D.5 **Training – [Not Used]**

## **11.9 FLOORING REPLACEMENT**

### **11.9.A Identification**

11.9.A.1 The objective of this item is to complete repairs and replacements of some sections of flooring in specific locations of the vessel.

### **11.9.B References**

#### **11.9.B.1 Equipment Data – [Not used]**

#### **11.9.B.2 Drawings and Documents**

11.9.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>DRAWING TITLE</b>	<b>Number of Sheets</b>
221-H-67	Interior Stairways	1
221-H-79	Deck Coverings	2
221-H-80	Insulation Plan	2
221-H-81	Lining	2
222-H-101	General Arrangement	3
	Cafeteria floor design	1
	LOGO-KARAVEL-CLASSIC - ROC-2021-0254	1

#### **11.9.B.3 Regulations and Standards**

11.9.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

<b>FSSM Procedures</b>	<b>Title</b>	<b>Included Yes/No</b>
<b>Publications</b>		
<b>Standards</b>		
<b>Regulations</b>		
	Hull Construction Regulation, C. 1431	No
TP 11469	Guide to structural Fire Protection	No

### **11.9.C Statement of Work**

#### **11.9.C.1 General**

- 11.9.C.1.2 The Contractor must take all necessary measures to protect furnishings, walls, ceilings equipment and floors against any damage. The Contractor is responsible for replacing or repairing any damaged items, at its own expense.
- 11.9.C.1.3 All precautions must be taken to prevent waste, cuttings and dust from leaving the work areas.
- 11.9.C.1.4 The Contractor must also provide all materials, hardware, paint, marine cement/flooring products, black vinyl baseboards (4 inches/10.16 cm), nosing, glue, all equipment, all tools, and all parts necessary to complete the work.
- 11.9.C.1.5 The work must be done deck-by-deck. When the work on one deck has been completed and accepted by the IA, the Contractor can move to the next deck. Sections of the vessel can be partially isolated to facilitate the Contractor's work.
- 11.9.C.1.6 The Contractor must preserve access to floor drains, tank sounding plugs, fire station piping, pipes, grommets and any other penetrations in the floor, if any. The Contractor must supply, manufacture and install special adapters if they are required for these items and their cost will be covered by a PWGSC 1379 form.
- 11.9.C.1.7 All products used for floor repairs must be applied/installed according to the recommendations and instructions from the product's manufacturer.
- 11.9.C.1.8 **Temperature of areas where work is taking place must be controlled and maintained within tolerance of glue/concrete manufacturers recommendation to ensure a quality and durable result when dried.**
- 11.9.C.1.9 After each day and when the work is completed, the workplace and the passageways must be in a state of cleanliness. Waste must be collected and removed from the vessel and disposed by the Contractor.
- 11.9.C.1.10 The Contractor must remove and dispose of the flooring material and baseboards without damaging the subfloors or walls.
- 11.9.C.1.11 The Contractor must mechanically clean the surfaces to remove glue or other adhesive and prepare surfaces for new flooring installation.
- 11.9.C.1.12 The Contractor must correct defects in the subfloor while repairing locations where the marine concrete is damaged.

- 11.9.C.1.13 In any locations, if floor steel repair is required, it will be handled through PWGSC 1379 form.
- 11.9.C.1.14 Before installing the concrete, the Contractor must prepare the steel and apply a coat of concrete primer.
- 11.9.C.1.15 The Contractor must then apply the marine concrete in such a way as to create a surface even with the existing marine concrete which is a Subkote # 1.
- 11.9.C.1.16 The Contractor must include that 15% of the total 3847 ft<sup>2</sup> of areas (see sections below 11.9.C.14.1) will have marine concrete surface rebuilt. The cost will be adjusted upward or downward via PWGSC 1379 form.

**11.9.C.1.17 The Contractor must complete the reconstruction of the marine concrete from steel to top layer following these steps:**

- a) Apply a layer of Neotex type concrete of an average thickness of 2 inches;
- b) Apply a layer of malleable concrete type Dex-O Tex Subkote1 ¼ inch thick;
- c) Apply a layer of concrete such as Dex-O-Tex Megabond Fine.

- 11.9.C.1.18 The Contractor must install a new 4" (10.16 cm) black vinyl baseboard at the base of the walls where it has been removed for flooring replacement.

#### **11.9.C.2 Passageways**

- 11.9.C.2.1 Specific areas of passageways at Upper deck, Boat deck and Officer deck levels have been identified for the Contractor to perform the necessary works.
- 11.9.C.2.2 The Contractor must replace tiles with ones matching existing Armstrong Excelon tiles, No. 51805, camel beige, or equivalent, in order to complete the work described above. Each tiles must be 12" x 12" and 1/8". If the Contractor can't provide same flooring material, the selection of proposed replacement product must be approved for marine application and also presented to TA for acceptance before placing orders.
- 11.9.C.2.3 After installation, the tiles must be cleaned with neutral soap. Then, the Contractor must apply a coat of sealant and three coats of high-grade wax for vinyl tiles. When the work is completed, the Contractor must protect the floors until the end of the contract.

#### **11.9.C.3 Commanding Officer lobby and office #300**

- 11.9.C.3.1 The Contractor must replace carpet with EGE Braiding grey 5575 Accent 22, 5575 Accent 20, 5575 BC1-K28328, or equivalent, in order to complete the work described above. If the Contractor can't provide same flooring material, the selection of proposed replacement

product must be approved for marine application and also presented to TA for acceptance before placing orders.

11.9.C.4 **Commanding officer's sleeping quarters #300**

- 11.9.C.4.1 The Contractor must replace carpet with (EGE mélange Grey K5295 accent 13, GB2-K28602, GB3-K28603; tissage Highline 80/20 -1900), or equivalent, in order to complete the work described above. If the Contractor can't provide same flooring material, the selection of proposed replacement product must be approved for marine application and also presented to TA for acceptance before placing orders.

11.9.C.5 **Helicopter Technician cabin #306**

- 11.9.C.5.1 The Contractor must replace carpet with STREAMO KAVAVEL 0751 Durango taupe, or equivalent, in order to complete the work described above. If the Contractor can't provide same flooring material, the selection of proposed replacement product must be approved for marine application and also presented to TA for acceptance before placing orders.

11.9.C.6 **Chief Officer's lobby #303**

- 11.9.C.6.1 The Contractor must replace vinyl flooring with STREAMO KARAVEL 0705 Teak with black strips 0331, or equivalent, in order to complete the work described above. If the Contractor can't provide same flooring material, the selection of proposed replacement product must be approved for marine application and also presented to TA for acceptance before placing orders.

11.9.C.7 **Chief Officer's sleeping quarters #303**

- 11.9.C.7.1 The Contractor must replace carpet with STREAMO KARAVEL Teak 0705 with black stripes 0331, or equivalent, in order to complete the work described above. If the Contractor can't provide same flooring material, the selection of proposed replacement product must be approved for marine application and also presented to TA for acceptance before placing orders.

11.9.C.8 **Chief Officer's office #303**

- 11.9.C.8.1 The Contractor must replace carpet with STREAMO KARAVEL Teak 0705 with black stripes 0331, or equivalent, in order to complete the work described above. If the Contractor can't provide same flooring material, the selection of proposed replacement product must be approved for marine application and also presented to TA for acceptance before placing orders.

**11.9.C.9 Cabin # 514 Logistic's officer**

- 11.9.C.9.1 The Contractor must replace flooring with STREAMO KARAVEL 0448 Malua Bay tiles, or equivalent, in order to complete the work described above. If the Contractor can't provide same flooring material, the selection of proposed replacement product must be approved for marine application and also presented to TA for acceptance before placing orders.

**11.9.C.10 Cabin #665**

- 11.9.C.10.1 The Contractor must replace ceramic tiles with POLYFLOR voyager marine safe 3210 Ocean Blue, or equivalent, in order to complete the work described above. If the Contractor can't provide same flooring material, the selection of proposed replacement product must be approved for marine application and also presented to TA for acceptance before placing orders.

**11.9.C.11 Cafeteria # 631**

- 11.9.C.11.1 The Contractor must replace tiles with STREAMO Karavel 0475 bolero and 0518 Mugello (see drawing “*cafeteria floor design*”) and a classic wind rose (see drawing “*LOGO-KARAVEL-CLASSIC - ROC-2021-0254*”) with the design of the tiles furnished in order to complete the work described above. If the Contractor can't provide same flooring material, the selection of proposed replacement product must be approved for marine application and also presented to TA for acceptance before placing orders.

**11.9.C.12 Crew's cabin 656**

11.9.C.12.1 The Contractor must replace carpet with STREAMO KARAVEL 0751 Durango taupe in order to complete the work described above. If the Contractor can't provide same flooring material, the selection of proposed replacement product must be approved for marine application and also presented to TA for acceptance before placing orders.

11.9.C.13 **#100 Wheelhouse**

11.9.C.13.1 The Contractor must replace carpet with EGE Harris grey RF5500279 OR Harris tweed 5575; 5575-BC4-K28374, accent 5575-15, accent 557-28, tissage Highline 630 or equivalent in order to complete the work described above. If the Contractor can't provide same flooring material, the selection of proposed replacement product must be approved for marine application and also presented to TA for acceptance before placing orders.

11.9.C.14 **Locations**

11.9.C.14.1 Estimated flooring surfaces:

<b>Estimation des planchers</b>	
<b>Localisations</b>	<b>Surface Approx (m<sup>2</sup>)/(ft<sup>2</sup>)</b>
Upper deck Passageway	18 / 194
Officer Deck Passageway	22 / 237
Boat Deck Passageway	22 / 237
#303 Chief Officer lobby	4 / 43
#303 Chief Officer office	17/183
#303 Chief Officer Cabin	8/65
#300 Captain office and lobby	34/366
#300 Captain cabin	16/173
#306 Helicopter mec.	12/130
#514 Logistic Officer	16/173
#665 Cabin	10 / 108
#631 Cafeteria	71/765
#656 Crew cabin	14/150
#100 Wheelhouse	95/ 1023

**11.9.D Proof of Performance**

11.9.D.1 **Inspection Points**

11.9.D.1.1 The Contractor must coordinate inspections from IA after flooring removal, after sub-flooring preparation and after new flooring installation.



11.9.D.2     **Testing/Trials - [Not Used]**

11.9.D.3     **Certification**

11.9.D.3.1   The Contractor must provide a certificate of approval from TCMS or a recognized classification society for all the concrete, vinyl or carpet products.

11.9.D.4     **Documentation**

11.9.D.4.1   All technical documentation of all products used must be provided to the AI and TA.

11.9.D.5     **Training - [Not Used]**

## **11.10 OVERBOARD DISCHARGE PIPES THICKNESS SURVEY**

### **11.10.A Identification**

11.10.A.1 The objective of this item is to complete the pipe thickness measurement study on overboard discharge.

### **11.10.B References**

#### **11.10.B.1 Equipment Data**

11.10.B.1.1 The names and locations of the overboard discharges are the included in the documents in section 11.10.B.2 below.

#### **11.10.B.2 Drawings and Documents**

<b>Drawing Number</b>	<b>Title / document</b>	<b>Number of pages</b>
222-670-7	Arrangement of Shiplside Valves	4
	11.10 Pipe UTM - Valve List - May 2020	1

#### **11.10.B.3 Regulations and Standards**

11.10.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

	<b>Title</b>	<b>Included – Yes/No</b>
<b>FSSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>		
<b>Regulations</b>		
PART 7-3-2	Rules for survey after construction	no

### **11.10.C Statement of Work**

#### **11.10.C.1 General**

11.10.C.1.1 The Contractor must use services of a certified technician for the ultra-sound measurements. The technician and his measurement tools must have a valid certificate recognized by ABS or another classification society recognized by TCMS.

11.10.C.1.2 The Contractor must provide a fixed price for the overall work described in this statement of work.

- 11.10.C.1.3 The Contractor must take 4 thickness measurements per discharge pipe. Specific locations on the pipe sections must be approved by the TA.
- 11.10.C.1.4 The Contractor must provide all material et and all required labor to support the certified technician for NDTs and the IA to access to stations to be inspected including removing and reinstalling objects blocking access. The Contractor must ensure that there is no pressure in the stations and that it is totally safe to work on prior to commencing.
- 11.10.C.1.5 The Contractor must do touch ups where steel has been brought to bare metal for the measurements to take place. The paint used for the touch-ups must be compatible with the existing in place and be applied in accordance with the manufacturer specifications for application. Paint must be provided by the Contractor.

11.10.D **Proof of Performance**

11.10.D.1 **Inspection Points**

- 11.10.D.1.1 Before initiating the work, the Contractor must provide to TA a typical drawing demonstrating proposed locations of the measurements on a discharge pipe for approval.

11.10.D.2 **Testing/Trials - [Not Used]**

11.10.D.3 **Certifications**

- 11.10.D.3.1 The Contractor must provide to the TA the certification of calibration of the thickness measurement equipment.

11.10.D.4 **Documentation**

- 11.10.D.4.1 The Contractor must provide to the IA and TA a PDF and a hard copy report of the Fixed Stations measurements. For each thickness measurement, the report must physically show where it's been taken, the actual thickness of the steel, the percentage of steel thickness loss and the original thickness of the steel. The groups of measurements must refer to a localization of each of the discharge pipe shown on the drawings and table in reference in section 11.10.B.2.

11.10.D.5 **Formation - [Not Used]**

## **11.11 CHAIN LOCKER (PORT AND STARBOARD)**

### **11.11.A Identification**

- 11.11.A.1 The objective of this item is to prepare the port and starboard chain lockers to carry out the 5 years inspection, repairs and recoating.

### **11.11.B References**

#### **11.11.B.1 Equipment Data**

COMPARTMENT	FRAMES	CAPACITY (m <sup>3</sup> )	SURFACE (m <sup>2</sup> )
CHAIN LOCKER	183 -191		110

##### 11.11.B.1.1 Chain lengths :

- a) Port - 9 links, 2" SL
- b) Starboard - 9 links, 2" SL

#### **11.11.B.2 Drawings and Documents**

- 11.11.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes

Drawing Number	Drawing / Document Title	Number of Sheets
222-H-146	Capacité des réservoirs/Capacity Plan	1
	1200 Icebreaker Coating scheme V5	1

#### **11.11.B.3 Regulations and Standards**

- 11.11.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
FSM Procedures		
Publications		
	[Not Used]	
Standards		

Regulations		

### **11.11.C Statement of Work**

#### **11.11.C.1 General**

- 11.11.C.1.1 The Contractor must supply all materials and equipment to conduct the work.
- 11.11.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.
- 11.11.C.1.3 Chain lockers must be cleaned with high pressure water jet.
- 11.11.C.1.4 The total surface of the lockers must be sandblasted SA-2½ (100%).
- 11.11.C.1.5 An epoxy coating must be applied in 1 strip coat and 2 full coats following the paint manufacturer's instructions on 100% of the surface of the lockers.

#### **11.11.C.2 Preparation**

- 11.11.C.2.1 The Contractor must lower the anchor chains in the bottom of the dry dock to empty the chain lockers.
- 11.11.C.2.2 Prior to the start of all work in this specification, the Contractor must send a sample of the chain locker mud to be analyzed for contaminants at a provincially recognized environmental laboratory. Lab results exceeding acceptable handling and disposal limits must be reported to the TA immediately for remedial action. Copies of the lab report are to be submitted to the TA by email in PDF format.
- 11.11.C.2.3 The Contractor must dispose of two (2) cubic meters of mud and associated debris in accordance with Federal, Provincial and Municipal environmental regulations. The Contractor must provide a unit price per cubic meter to adjust upward or downward according to the total usage of the vessel at the end of the work period using PWGSC 1379 form.

#### **11.11.C.3 Cleaning**

- 11.11.C.3.1 The Contractor must water blast at a minimum 5000 psi all chain locker internal surfaces. All resulting waste material must be disposed of in accordance with Federal, Provincial and Municipal environmental regulations.
- 11.11.C.3.2 The Contractor must perform the SA-2½ SSPC SP10 surface preparation on 100% of the surface of the two chain wells.

- 11.11.C.3.3 The two chain wells must be thoroughly cleaned and dried prior to inspection. The Contractor must demonstrate the full operation of the drains, piping and bilge system.
- 11.11.C.3.4 All dust resulting from surface preparation and coating procedures must be completely contained and disposed of in accordance with applicable environmental regulations. All spaces in preparation of coating must be sealed and the dust removed and contained by forced evacuation conduit.
- 11.11.C.4 **Non-destructive tests**
- 11.11.C.4.1 The Contractor must perform twenty (20) ultrasonic plate thickness measurements adequately spaced and distributed to produce a representative impression on all chain locker bulkheads and deck internal surfaces. Thickness readings must be recorded on a CSM chain locker sketch indicating the location of each measurement. One PDF copy of this sketch must be emailed to the TA.
- 11.11.C.4.2 The Contractor must perform a comprehensive visual inspection for defects of all internal chain locker surfaces, piping, fittings and appliances. All defects and recommended repairs must be immediately reported to the CE and TA. Unless otherwise stated, all repairs must be completed prior to the start of the recoating process.
- 11.11.C.4.3 Following the cleaning of the chain lockers, the Contractor must have all the spaces inspected by the IA.
- 11.11.C.5 **Coating**
- 11.11.C.5.1 Following the inspection, the Contractor must paint all the internal surfaces of the port and starboard chain lockers for a total surface of 110 m<sup>2</sup>.
- 11.11.C.5.2 The Contractor must supply and apply one (1) strip coat of paint compatible with the existing Intergard 7500 paint from International on all edges, acute angles, plate edges, structural corners and the weld joint.
- 11.11.C.5.3 The Contractor must supply and apply two (2) coats of paint compatible with the existing Intergard 7500 paint from International, on the walls, ceiling, bottom, skid plates and well grilles. The final thickness must be 0.006 ".
- 11.11.C.5.4 All surfaces to be coated must be prepared to the coating manufacturer's specifications.
- 11.11.C.5.5 The Contractor must supply all labor equipment and materials, including sheltering, heating and dehumidifying in order to comply with the coating manufacturer's specifications.
- 11.11.C.5.6 The coating application must be performed by a coating manufacturer's authorized applicator.

- 11.11.C.5.7 The Contractor must afford the IA, NACE Inspector and the TA the opportunity to witness each coating application.
- 11.11.C.5.8 Following the coating process, the Contractor must reinstall all manhole covers using new CFM: 1/8 inch fiber reinforced neoprene gaskets. An anti-seize compound must be applied to all fasteners.

#### **11.11.D Proof of Performance**

##### **11.11.D.1 Inspection Points**

- 11.11.D.1.1 The Contractor must provide all the assistance and tools (giraffe with operator, scaffolding, ladder, etc.) to the representatives of the IA and the NACE inspector to enable the inspection of the work.
- 11.11.D.1.2 Each stage of the work must be inspected by the IA representatives and the NACE inspector.
- 11.11.D.1.3 The Contractor is responsible for organizing periodic inspections with ABS and the IA at least 24 hours prior to the inspection.
- 11.11.D.1.4 All stripping and coating must be inspected by the Contractor in accordance with the agreed Quality Assurance Plan, a copy of which must be provided to the TA every two weeks and must be subject to periodic inspection by the IA.
- 11.11.D.1.5 The surface profile must be measured in accordance with NACE International Standard RP0287 95.
- 11.11.D.1.6 Surface preparation inspection must be followed with reference to the following standards:
- a) SA-2½ or SSPC SP10 standards - Near White metal blast cleaning;
  - b) SA 2 or SSPC SP6 - Commercial Blast Cleaning;
  - c) SSPC Standard SP1 - Solvent cleaning;
  - d) RP0287 95 from NACE International - Field measurement of surface profile of abrasive blast cleaned steel surfaces using replica tape

##### **11.11.D.2 Testing/Trials - [Not Used]**

##### **11.11.D.3 Certification - [Not Used]**

##### **11.11.D.4 Documentation**

- 11.11.D.4.1 NACE inspection report.

11.11.D.4.2 A report including at least the products used, the thicknesses applied, the surface temperatures at each cure day.

11.11.D.5 **Training – [Not Used]**



## **11.12 LADIES BATHROOM RENOVATION (OPTIONAL)**

### **11.12.A Identification**

11.12.A.1 The objective of this item is to complete the renovation of the ladies bathroom in local #679 at the main deck.

### **11.12.B References**

#### **11.12.B.1 Equipment Data – [Not Used]**

#### **11.12.B.2 Drawings and Documents**

11.12.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>DRAWING TITLE</b>	<b>Number of Sheets</b>
222-H-101	General Arrangement	3
221-H-81	Linings	2
221-H-79	Deck Covering	2

#### **11.12.B.3 Regulations and Standards**

11.12.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

	Title	Included Yes/No
FSSM Procedures		
Publications		
	[Not Used]	
Standards		
Regulations		

**11.12.C Statement of Work****11.12.C.1 General**

- 11.12.C.1.1 The Contractor must supply all labor, tools, lifting equipment, and any other equipment or services required to perform the specified works.
- 11.12.C.1.2 The Contractor must provide all materials, hardware, paint, marine cement/flooring products, black vinyl baseboards (4 inches/10.16 cm), nosing, glue and all parts necessary to complete the specified work.
- 11.12.C.1.3 The Contractor must take all necessary measures to protect furnishings, walls, toilets, shower head, ceilings equipment and new floors against any damage. The Contractor is responsible for replacing or repairing any damaged items, at its own expense.
- 11.12.C.1.4 All precautions must be taken to prevent waste, cuttings and dust from leaving the work areas.
- 11.12.C.1.5 The Contractor must preserve access to floor drains, tank sounding plugs, fire station piping, pipes, grommets and any other penetrations in the floor, if any. The Contractor must supply, manufacture and install special adapters if they are required for these items and their cost will be covered by a PWGSC 1379 form.
- 11.12.C.1.6 All products used for floor repairs must be applied/installed according to the recommendations and instructions from the product's manufacturer.
- 11.12.C.1.7 Temperature of areas where work is taking place must be controlled and maintained within tolerance of glue/concrete manufacturers recommendation to ensure a quality and durable results once dried.
- 11.12.C.1.8 After each day, the workplace and surrounding areas must be in a state of cleanliness. Waste must be collected and removed from the vessel. The Contractor is responsible for removing from the ship and disposal of the waste.
- 11.12.C.1.9 When the work is completed, the bathroom, passageways, cabin entrances and stairways must be cleaned to return the vessel to the same state of cleanliness as before the work.
- 11.12.C.1.10 The bathroom area is 12 m<sup>2</sup>/130ft<sup>2</sup>.

**11.12.C.2 Work Steps**

- 11.12.C.2.1 The Contractor must dismantle and retain the countertop vanities, shower compartments, toilet compartments, toilets, poles, water supply pipes, stainless steel moldings without damaging the furniture to empty the room at full.

- 11.12.C.2.2 The Contractor must block the supply pipes in order to return the water to service for the remainder of the vessel. Remove and dispose of acrylic coating from shower walls and ceilings.
- 11.12.C.2.3 The Contractor must remove all floor, tile and concrete up to the steel of the main deck.
- 11.12.C.2.4 The thickness of the steel must be examined by the Contractor using an ultrasonic process, in places where the steel has been corroded (for submission, allow 20 readings). The condition of the steel must be submitted to the IA and TA in the form of a written report. Costs of potential steel replacement work will be treated using a PWGSC 1379 form.
- 11.12.C.2.5 The Contractor must replace floor drain and shower drains.
- 11.12.C.2.6 Once the steel has been accepted by the IA and TA, the Contractor must redo the concrete. Before laying the concrete, the Contractor must prepare the steel and apply a coat of concrete primer. Then apply the marine concrete to obtain an even surface with the existing marine concrete which is a Subkote # 1.
- 11.12.C.2.7 The Contractor must complete the reconstruction of the marine concrete from steel to top layer following these steps:
- a) Apply a layer of Neotex type concrete of an average thickness of 2 inches;
  - b) Apply a layer of malleable concrete type Dex-O Tex Subkote1 ¼ inch thick;
  - c) Apply a layer of concrete such as Dex-O-Tex Megabond Fine.
- 11.12.C.2.8 The Contractor must install a waterproofing membrane that goes up 6 inches on the edges and adjusted with the drain.
- 11.12.C.2.9 The Contractor must cover the floor with a 2-square-inch ceramic mosaic (Blue Lake Model OD.QC.LKB.0202.N). A concrete glue must be used to fix the ceramic.
- 11.12.C.2.10 The Contractor must build a 6 inch high ledge of 2 inch square ceramic mosaic all around the shower. (Lac bleu model OD.QC.LKB.0202.N) Schluter molding or equivalent. If the Contractor can't provide same flooring material, the selection of proposed replacement product must be presented to IA and TA for acceptance before placing orders.
- 11.12.C.2.11 The Contractor must supply and install an epoxy-based waterproof grout.
- 11.12.C.2.12 The Contractor must reassemble the inside of the showers to using new white acrylic panels of the same thickness as those that were removed, taking care to minimize joints.
- 11.12.C.2.13 The Contractor must replace the stainless steel moldings around the entrance to the shower. The Contractor must reinstall the original piping for the water supply, valves, accessories and protective guard.

- 11.12.C.2.14 The Contractor must supply and install a new stainless steel molding on the entrance threshold of the showers.
- 11.12.C.2.15 The Contractor must remove the existing arborite on the furniture and replace with either counter top Pionite Happy hour AB400-SD Textured AEGIS SECURE and the fronts and sides with Pionite old friend AG415SD textured suede. Put back in place. All samples are available on demand for the Contractor prior to order.
- 11.12.C.2.16 The Contractor must reinstall the faucets, toilets, sinks, water supply pipes and accessories. The toilet must be installed on a ¼" neoprene pad cut to the same shape as the toilet base. If the toilet needs to be leveled, a tight fitting Teflon base must be provided to put between the toilet and the new floor.
- 11.12.C.2.17 Shower doors must be reinstalled in same locations as they were.
- 11.12.C.2.18 Door panels and door frames (currently brown) must be painted with an latex matte paint in color sylvestre 409B.

#### 11.12.D **Proof of Performance**

##### 11.12.D.1 **Inspection Points**

- 11.12.D.1.1 The work must be performed at IA and TA's satisfaction.
- 11.12.D.1.2 The Contractor must coordinate all inspections with the IA for the following steps:
- 11.12.D.1.3 After installation of protections and before initiating the works;
- 11.12.D.1.4 After removing flooring;
- 11.12.D.1.5 After preparation of subfloor;
- 11.12.D.1.6 After completion of the works.

##### 11.12.D.2 **Testing/Trials**

- 11.12.D.2.1 Once reinstalled, all toilets, sinks, hand dryers, showers and drains must be tested with presence of IA and TA.

##### 11.12.D.3 **Certification**

- 11.12.D.3.1 The Contractor must provide a certificate of approval from TCMS or a recognized marine classification society for all the material used.

##### 11.12.D.4 **Documentation**

- 11.12.D.4.1 All technical documentation of all products used must be provided to the AI and TA.

**11.12.D.5 Training – [Not Used]**

## **11.13 SHIP'S OFFICE (OPTIONAL)**

### **11.13.A Identification**

11.13.A.1 The objective of this item is to complete the renovation of the Ship's Logistic Office.

### **11.13.B References**

#### **11.13.B.1 Equipment Data – [Not Used]**

#### **11.13.B.2 Drawings and Documents**

11.13.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>DRAWING TITLE</b>	<b>Number of Sheets</b>
222-H-101	General Arrangement	3
221-H-81	Linings	2
221-H-79	Deck Covering	2
	Bureau du navire – Ship Office layout	2

#### **11.13.B.3 Regulations and Standards**

11.13.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

	<b>Title</b>	<b>Included Yes/No</b>
<b>FSSM Procedures</b>		
<b>Publications</b>		
	[Not Used]	
<b>Standards</b>		
<b>Regulations</b>		

### 11.13.C **Statement of Work**

#### 11.13.C.1 **General**

- 11.13.C.1.1 The Contractor must supply all labor, tools, equipment, lifting equipment, and any other equipment or services required to perform the specified works.
- 11.13.C.1.2 The Contractor must provide all materials, hardware, paint, marine cement/flooring products, black vinyl baseboards (4 inches/10.16 cm), nosing, glue and all parts necessary to complete the specified work.
- 11.13.C.1.3 The Contractor must take all necessary measures to protect furnishings, walls, ceilings and new floors against any damage. The Contractor is responsible for replacing or repairing any damaged items, at its own expense.
- 11.13.C.1.4 All precautions must be taken to prevent waste, cuttings and dust from leaving the work areas.
- 11.13.C.1.5 The Contractor must integrate floor drains, tank sounding plugs, fire station piping, pipes, grommets and any other penetrations in the floor, if any. The Contractor must supply, manufacture and install special adapters if they are required for these items.
- 11.13.C.1.6 All products used for floor repairs must be applied/installed according to the recommendations and instructions from the product's manufacturer.
- 11.13.C.1.7 Temperature of areas where work is taking place must be controlled and maintained within tolerance of glue/concrete manufacturers recommendation to ensure a quality and durable results once dried.
- 11.13.C.1.8 After each day, the workplace and surrounding areas must be in a state of cleanliness. Waste must be collected and removed from the vessel. The Contractor is responsible for removing from the ship and disposal of the waste.
- 11.13.C.1.9 When the work is completed, the bathroom, passageways, cabin entrances and stairways must be cleaned to return the vessel to the same state of cleanliness as before the work.
- 11.13.C.1.10 The Ship's office area is 13m<sup>2</sup>/140ft<sup>2</sup>.

#### 11.13.C.2 **Work Steps**

- 11.13.C.2.1 The Contractor must dismantle dispose of the wall panels without damaging the ceiling.
- 11.13.C.2.2 The Contractor must remove and dispose all flooring without damaging the subfloor marine concrete.

- 11.13.C.2.3 The Contractor must correct defects in the subfloor while repairing locations where the marine concrete is damaged.
- 11.13.C.2.4 In any locations, if floor steel repair is required, it will be handled through PWGSC 1379 form.
- 11.13.C.2.5 Before installing the concrete, the Contractor must prepare the steel and apply a coat of concrete primer.
- 11.13.C.2.6 The Contractor must then apply the marine concrete in such a way as to create a surface even with the existing marine concrete which is a Subkote #1.
- 11.13.C.2.7 The Contractor must include 15% of the area with marine concrete surfaces to be rebuilt. The cost will be adjusted upward or downward via PWGSC 1379 form.
- 11.13.C.2.8 The Contractor must complete the reconstruction of the marine concrete from steel to top layer following these steps:
- a) Apply a layer of Neotex type concrete of an average thickness of 2 inches;
  - b) Apply a layer of malleable concrete type Dex-O Tex Subkote#1 ¼ inch thick;
  - c) Apply a layer of concrete such as Dex-O-Tex Megabond Fine.

11.13.C.2.9 Removed

11.13.C.2.10 Removed

11.13.C.2.11 Removed

11.13.C.2.12 Removed

11.13.C.2.13 Removed

11.13.C.2.14 Removed

11.13.C.2.15 Removed

Following numbering changed:

11.13.C.2.9 When the concrete is completed, the Contractor must obtain an even surface with the existing.

11.13.C.2.10 The Contractor must supply and install new flooring Streamo Karavel #0475 Bolero or equivalent. If the Contractor can't provide same flooring material, the selection of proposed replacement product must be approved for marine application and also presented to TA for acceptance before placing orders.



11.13.C.2.11 The Contractor must supply and install new wall paneling IMO certified with neutral frame of grade H1. Product and color must be presented to the TA for approval before procurement.

11.13.C.2.12 The Contractor must install a new 4" (10.16 cm) black vinyl baseboard at the base of the walls.

#### 11.13.D **Proof of Performance**

##### 11.13.D.1 **Inspection Points**

11.13.D.1.1 The work must be performed, inspected and accepted by the IA.

11.13.D.1.2 The Contractor must coordinate all the following inspections with the IA:

11.13.D.1.3 After removal of the existing wall panels and flooring tiles.

11.13.D.1.4 After concrete repairs (if any).

11.13.D.1.5 After new flooring is installed.

11.13.D.1.6 After new wall panels are installed.

##### 11.13.D.2 **Testing/Trials – [Not Used]**

##### 11.13.D.3 **Certification**

11.13.D.3.1 The Contractor must provide a certificate of approval from TCMS or a recognized marine classification society for all the concrete, vinyl and wall panelling products.

##### 11.13.D.4 **Documentation**

11.13.D.4.1 All technical documentation of all products used must be provided to the IA and TA.

##### 11.13.D.5 **Training – [Not Used]**

## **11.14 SINKS REPLACEMENT (OPTIONAL)**

### **11.14.A Identification**

**11.14.A.1** The objective of this item is to fabricate and replace 47 vanities in individual cabins on the ship.

### **11.14.B References**

#### **11.14.B.1 Equipment Data – [Not Used]**

#### **11.14.B.2 Drawings and Documents**

11.14.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>DRAWING TITLE</b>	<b>Number of Sheets</b>
222-H-101	General Arrangement	3
221-731-2	Grey Water Piping Arrangement	3

#### **11.14.B.3 Regulations and Standards**

11.14.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

	Title	Included Yes/No
FSSM Procedures		
Publications		
	[Not Used]	
Standards		
Regulations		

### 11.14.C **Statement of Work**

#### 11.14.C.1 **General**

- 11.14.C.1.1 The Contractor must supply all labor, tools, equipment, lifting equipment, and parts required to perform the specified works.
- 11.14.C.1.2 After each day, the workplace and surrounding areas must be in a state of cleanliness. Waste must be collected and removed from the vessel. The Contractor is responsible for removing from the ship and disposal of the waste.
- 11.14.C.1.3 Actually many cabins don't have vanity. Sinks are supported by metallic legs (see Annex 1 Before). These legs are not strong enough and constantly require to be fixed. On completion all sinks will be supported by vanities. There is a total of 46 cabins and 1 bathroom for which a new vanity is required. Sinks and faucet must be replaced.

Below is the list of cabins:

200	301	302	303	306	310	401	402	403	404
405	409	500	502	505	508	510	511	516	532
534	535	536	537	540	542	617	618	620	621
622	623	624	625	651	652	654	655	656	657
658	659	660	670	671	672	509-1			

#### 11.14.C.1.4

#### 11.14.C.2 **Work Steps**

- 11.14.C.2.1 The Contractor must fabricate and install the custom vanities for all the cabins listed above. The vanities must cover existing piping, have two doors with push locks, width and depth to be measured for each cabins and a standard height of 34 inches. Vanities must be made of Russian cherry plywood ¾" thick with thermally fused laminate color maple sunrise with 4" high backsplash (see Annex 2 After). Only local 509-1 must have thermally fused laminate coastal pear matte color.
- 11.14.C.2.2 Prior to initiate the assembly, the Contractor must provide to the IA and TA a drawing with a typical vanity model for approval. The drawings must have a list of all material used including colors and dimensions.
- 11.14.C.2.3 The Contractor must ensure that water valves are closed in all concerned cabins before removing existing vanities. Once water is closed, the sinks must be removed and disposed.
- 11.14.C.2.4 The Contractor must order 47 drop-in self-rimming sinks with one hole studio surface mount rectangular porcelain vitrified 21-1/4in x 17-3/4in, and simple hole lavatory sink faucet with volume control polished chrome finish.

- 11.14.C.2.5 The Contractor must fabricate custom vanities based on measurements taken in each cabins. Vanities must be installed with a transparent silicon sealant for bathroom applied on top, on the sides and on the floor.
- 11.14.C.2.6 The Contractor must install the sinks on the of the vanities using a transparent silicon sealant for bathroom.
- 11.14.C.2.7 The Contractor must install the faucet and reconnect water lines and drains. The Contractor must plan for some piping to adjust and connect back drains to new vanities.
- 11.14.C.2.8 Tests must be performed prior to inspection to ensure there is no leaks and everything is functional.

#### **11.14.D Proof of Performance**

##### **11.14.D.1 Inspection Points**

- 11.14.D.1.1 The Contractor must coordinate the inspections with IA after disassembly of the existing and after installation of the new vanities.

##### **11.14.D.2 Testing/Trials**

- 11.14.D.2.1 The Contractor must coordinate with the IA to demonstrate functional and watertightness tests of the faucets and drains once work is completed.

##### **11.14.D.3 Certification – [Not Used]**

##### **11.14.D.4 Documentation**

- 11.14.D.4.1 The Contractor must provide to the IA and TA a typical drawing for approval before launching production and one as built drawing in a PDF format.

##### **11.14.D.5 Training – [Not Used]**

**Annex 1 (before) :****Annex 2 (After) :**

## **11.15 DECK COATING (OPTIONAL)**

### **11.15.A Identification**

- 11.15.A.1 The objective of this item is to remove existing deck coating, prepare surface and apply new deck coating according to manufacturers specifications on all outside decks identified in drawing listed in section 11.15.B.2.1.

### **11.15.B References**

#### **11.15.B.1 Equipment Data - [Not Used]**

#### **11.15.B.2 Drawings and Documents**

- 11.15.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>Drawing / Document Title</b>	<b>Number of Sheets</b>
222-H-101	General Arrangement Amundsen	3
	Zone to be painted	1

#### **11.15.B.3 Regulations and Standards**

- 11.15.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	<b>Title</b>	<b>Included Yes/No</b>
<b>FSSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>		
ASTM D4060	Standard Test Method for Abrasion Resistance	No
ASTM D4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers	No
RP0287-95	Field measurement of surface profile of abrasive blast cleaned steel surfaces using replica tape	No
normes SA-2½ SSPC SP10	Near White metal blast cleaning	No
SSPC SP 1	Solvent Cleaning	No

<b>Regulations</b>		

### **11.15.C Statement of Work**

#### **11.15.C.1 General**

- 11.15.C.1.1 The Contractor must supply all materials and equipment to conduct the work.
- 11.15.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.
- 11.15.C.1.3 At all phases of the work the work areas must be available for observation by a representative of the coating manufacturer as well as IA and TA.
- 11.15.C.1.4 The TA or IA can hire and be accompanied by a certified inspector in NACE International standards to ensure that these equivalencies are met. The Contractor must allow site access to this inspector.
- 11.15.C.1.5 The Contractor must supply all staging, crantage, protective screens, heaters and other environmental control equipment, lighting and any other support services, equipment and material necessary to perform the tasks set out in this specification.
- 11.15.C.1.6 The Contractor must protect all deck equipment from sandblasting dust and debris including, but not limited to, cranes, mooring winches, davits.
- 11.15.C.1.7 Sand or grit used for the blast cleaning must not be permitted into any part of the vessel and the Contractor must coordinate with the IA to ensure that ventilation systems are isolated as necessary. The Contractor must protect any openings that may need to be blocked to prevent entry of sand or grit inside the vessel.
- 11.15.C.1.8 The Contractor must take measures to ensure that no damage, unnecessary cleaning or repairs, accrue from the sand or grit blasting and/or the application of the coating.
- 11.15.C.1.9 **The Contractor must assume that existing coating may contain lead.** Precautions must be taken to protect individuals and the environment from contamination during the removal process and for the safe disposal of all debris. This to be done according to Health and Safety protocols for lead abatement and disposal.
- 11.15.C.1.10 Prior to abrasive blasting of all steel surfaces, all deposits of grease or oil must be removed by the Contractor in accordance to SSPC SP1 with solvent and be washed with "Chlorid," to remove all contaminants from the surface. The Contractor must rinse the surface thoroughly to remove additives and residues. The Contractor must ensure that any chemical

contamination is neutralized according to coating supplier specifications before being flushed off.

- 11.15.C.1.11 In areas to be coated surfaces must be abrasive blasted to achieve SSPC-SP10/NACE No. 2 "Near White Blast Cleaning" with an anchor profile of 75 microns (3 mils). Precautions are to be taken to avoid flash rusting prior to the application of the primer.
- 11.15.C.1.12 The Contractor must remove all traces of sand and grit used for blast cleaning.
- 11.15.C.1.13 The coating system must protect the equipment from corrosion, cavitation, abrasion and electrolysis. To ensure the coating system is adequate for this application, it must meet following requirements:
  - 11.15.C.1.14 Have a minimum adhesive strength on steel of 4000psi;
  - 11.15.C.1.15 Minimum tensile strength of 5000psi;
  - 11.15.C.1.16 Minimum compressive strength of 20,000 psi;
  - 11.15.C.1.17 Minimum flexural strength of 12,000 psi, minimum hardness of 85 shore D;
  - 11.15.C.1.18 Minimum izod impact resistance of 3.5 ft-lb/in;
  - 11.15.C.1.19 Minimum dielectric strength of 15000 volts/mm;
  - 11.15.C.1.20 Dielectric constant of 3k;
  - 11.15.C.1.21 Maximum taber abrasion test CS-10 wheel of 0.05 mg loss/cycle.
- 11.15.C.1.22 The coating system must also have the following certifications and approvals:
  - 11.15.C.1.23 Class "A" flame spread index and smoke developed index per ASTM E-84-11a;
  - 11.15.C.1.24 Flash point of at least 27C per ASTM D3278;
  - 11.15.C.1.25 Have a VOC content below 280 g/L per ASTM D-2369;
  - 11.15.C.1.26 Tested and passed IMO performance Standard for Protective Coatings per IMO Resolution MSC 215 (82) :2006.
- 11.15.C.1.27 The Contractor must ensure that the coating system do not contain any of the following heavy metals or substances that could harm humans or marine life: Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Copper, Fluoride, Lead, Mercury, Molybdenum, Selenium, Silver, Tantalum, Thallium, Tungsten or Vanadium.



- 11.15.C.1.28 The Contractor must verify that all of these material properties are respected by providing test result, completed by an independent testing laboratory and must provide the tests report to the TA.
- 11.15.C.1.29 The coating system must have previous positive history of protecting equipment from corrosion, cavitation, abrasion and electrolysis for a minimum period of 10 years, or as long as the proposed warrantee. The previous positive history will be verified by references to be provided to the TA during contract period.
- 11.15.C.1.30 The coating system must be able to be applied at -5 °C if required.
- 11.15.C.1.31 The Contractor must apply new deck coating according to manufacturer's specifications.
- 11.15.C.1.32 The Contractor must follow these steps for coating unless otherwise specified by the manufacturer:
- 11.15.C.1.33 apply a base coat 18-20 mil to the deck surfaces;
- 11.15.C.1.34 Once dried, a light coat of top coat must be applied using a roller method with 12 grit anti-slip media broadcasted across the surface area;
- 11.15.C.1.35 Once dried, a coat of top coat must be applied by roller method as a final coat.
- 11.15.C.1.36 Each coat must be inspected by IA and NACE Inspector prior to application of the next coat. Areas found to contain runs, overspray, roughness or other signs of improper application will not be accepted must be repaired or recoated in accordance with the manufacturer's recommendations.
- 11.15.C.1.37 The completed coating of each type must have the minimum dry film thickness specified as determined by Elcometer gauge or comparable instrument. In areas where this thickness is not reached, sufficient additional coats must be applied to produce it.
- 11.15.C.1.38 All applied protections must be removed by the Contractor once work has been completed, inspected and accepted by IA and TA with support of NACE Inspector.

#### 11.15.D **Proof of Performance**

##### 11.15.D.1 **Inspection Points**

- 11.15.D.1.1 The following inspections must be carried out in the presence of the IA and NACE Inspector:
- a) Protection of equipment prior to sandblast and initial state of the deck;
  - b) Inspection of the deck after cleaning;
  - c) Inspection of base coat thickness;

- d) Inspection of final coat thickness;
- e) Degree of cleanliness after painting;
- f) Removal of protective materials after painting (without NACE).

11.15.D.1.2 All stripping and coating work must also be inspected by the Contractor in accordance with the agreed-upon quality assurance plan, of which a copy must be submitted to the TA, and will also be subject to inspection by the IA.

11.15.D.2 **Testing/Trials - [Not Used]**

11.15.D.3 **Certification - [Not Used]**

11.15.D.4 **Documentation**

11.15.D.4.1 Before the end of the contract, the Contractor must give to the IA and TA a comprehensive report detailing the work undertaken, defects, repairs made and measurements and readings taken.

11.15.D.4.2 The Contractor must submit an inspection report from the coating manufacturer's technical service representative.

11.15.D.4.3 The Contractor must provide the IA a detailed quality assurance report once the work is completed. This report must include, but not limited to, the inspection reports, dry film thickness (DFT) measurements and condition monitoring data during the coating application.

11.15.D.4.4 The Contractor must provide the technical data sheet of the paint products used.

11.15.D.5 **Training - [Not Used]**

## 12.0 **PROPULSION AND MANEUVERING**

### 12.1 **PROPELLER**

#### 12.1.A **Identification**

12.1.A.1 The objective of this item is to remove the propellers for dismantling and replacement of the shaft lines.

12.1.A.2 The Port side propeller must be replaced for a new one provided by CCG.

#### 12.1.B **References**

##### 12.1.B.1 **Equipment Data**

12.1.B.1.1 All special tools and equipment required to carry out this work will be supplied by the ship and must be returned to the CCG in good condition once the work is completed. Photos of the tools must be taken in the presence of a CCG representative and a shipyard manager. Copies of the photos must be given to both parties.

12.1.B.1.2 List of special tools supplied by the ship:

<b>Special tools for propeller removal/Installation</b>	
<b><u>Tools</u></b>	<b><u>Storage Location</u></b>
Lifting eyes (5) to be screwed to the hull and rudder stock	Steering gear compartment
Lifting eye (1) for propeller	Steering gear compartment
Round wrench for Pilgrim nut	Boat/flight deck near the helicopter hangar
Special studs (8) for propeller removal	Steering gear compartment
Special nuts (8) for propeller removal	Steering gear compartment
Support plate (1020 mm) propeller removal	Tunnel forward of the helicopter hangar
Hydraulic pumps (2)	Steering gear compartment
High-pressure hoses for hydraulic pumps	Steering gear compartment
Hydraulic pump connections and Dowty Seals hydraulic pump	Central Stores, see Chief Engineer

- 12.1.B.1.3 The Contractor must include in its bid, the handling of these tools, including returning them to their respective storage locations. These tools must be returned in the same working condition and cleanliness as before the work.

### **12.1.B.2 Drawings and Documents**

- 12.1.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>DRAWING TITLE</b>	<b>Number of Sheets</b>
23809M2	Stone Manganese Marine Ltd;	1
	Instruction booklet for Pilgrim type nuts	
	Instruction booklet for Morpress pump	
221-901-1	Propeller shafting "arrangement and details"	1

### **12.1.B.3 Regulations and Standards**

- 12.1.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

	<b>Title</b>	<b>Included Yes/No</b>
<b>FSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>	[Not Used]	
<b>Regulations</b>		

### **12.1.C Statement of Work**

#### **12.1.C.1 Inspection of Propellers:**

- 12.1.C.1.1 The rope guards must be removed in order to remove propellers and must be well preserved to be reinstalled. Upon completion of the work, rope guards must be reinstalled and must be welded continuously along their entire circumference; joints between half-sections must also be welded.

- 12.1.C.1.2 The propellers must be inspected by the Coast Guard IA, as well as a qualified service provider recognized by the propeller manufacturer, and by ABS. The Contractor must hire the service provider for the thorough inspection of the propellers.
- 12.1.C.1.3 The Contractor must do a dye penetrant on each blade edge (minimum width of 6 in) and at the root of the blade. The test must be done by a technician approved by Classification society.
- 12.1.C.1.4 A dye penetrant crack test must be conducted on the keyway of the two propellers.
- 12.1.C.1.5 If Starboard propeller is damaged, and after it has been assessed by a specialist, it must be loaded into a truck and sent for reconditioning to a qualified service provider. The specialized firm must provide a welding procedure approved by the propeller manufacturer. After welding repair, the propeller must be balanced. The specialist selected must be certified by a Classification Society recognized by TCMS. The Contractor must provide a report of the repairs made on the propeller and must be submitted to ABS. The Contractor must verify the pitch and the blade thickness of the propeller and produce a report. The cost of the reconditioning work will be established using a PWGSC 1379 form as per the subcontractor's invoice.
- 12.1.C.2 **Propeller Removal**
- 12.1.C.2.1 The IA must be present for the duration of the propellers removal operation.
- 12.1.C.2.2 After removing the cement, unbolt and remove the propeller cones and place the propellers at the bottom of the dry dock. These cones are filled with Tallow. The existing port propeller must be removed from the dry dock and loaded on a truck to be delivered to Port of Québec.
- 12.1.C.2.3 The Contractor must unbolt and remove the locking plates (locks) of the two Pilgrim nuts.
- 12.1.C.2.4 The Pilgrim nuts must be completely unscrewed from the propeller shafts and reinstalled, taking care to turn them around so that the nuts' internal surface (pressure ring) faces outwards and not toward the propeller hub. The threads of the propeller shaft must be properly cleaned to the satisfaction of the IA. The smallest amount dirt or steel shavings can cause the nut to seize on the shaft.
- 12.1.C.2.5 The Contractor must place the air release valve vertically on top to remove any trace of air. The O-rings and rubber seals of the internal face (stern tube side) of the propeller hub must be removed.
- 12.1.C.2.6 The eight special studs (supplied by the ship) can then be installed in the threaded holes of the propeller hub.

- 12.1.C.2.7 A special prefabricated plate, 6 inches thick by 4 foot in diameter (supplied by the ship), must be slipped on to the eight special studs and secured against the Pilgrim nut and propeller shaft by eight special nuts (supplied by the ship).
- 12.1.C.2.8 The Contractor must apply pressure using the Morpress hydraulic pump (supplied by the ship) to force the propeller off of the shaft taper. The inflatable nitrile rubber ring (Nitrile Tyre) must be purged of air using the Morpress pump. During this operation, the propellers must be supported by chain blocks. Special eye bolts that screw into the ship's hull will be supplied by the CCG.
- 12.1.C.2.9 The AI **must be** present during the propellers removal process. The pressure of the pump can easily exceed 10,000 psi. For information purposes, removal pressures during the 2013 dry docking were 9,000 psi and 14,500 psi, respectively, for the port and starboard propellers.
- 12.1.C.2.10 Once the propellers have been removed, the Pilgrim nuts must be protected and safely stored until it is reinstalled on the new propeller shafts.
- 12.1.C.2.11 The two propellers must be placed on suitable supports in the bottom of the dry dock and identified as "port propeller" and "starboard propeller."
- 12.1.C.2.12 The Contractor must include cost and take the necessary measures to remove the existing Port propeller from the bottom of the dry dock and prepare it for the transportation to Port of Quebec. CCG will organize and cover the costs for the transportation to the Port of Québec.
- 12.1.C.2.13 CCG will organize and assume cost of the delivery of the new Port Propeller to Contractor's site.
- 12.1.C.2.14 The Contractor must offload the new Port Propeller from transportation to the bottom of the dry dock.
- 12.1.C.3 **Propeller Fitting**
- 12.1.C.3.1 Upon completion of repairs and other associated works, each propeller must be fitted to its respective propeller shaft. Replacement shafts are reconditioned shafts (See item 12.5)
- 12.1.C.3.2 The Contractor must complete adjustments (fits) using Prussian blue on each propeller. Handling of propellers must be included. An adjustment (fit) of at least 85% is required. Adjustments of the propellers must be completed in position. The final propeller fits must be performed in the presence of the IA and ABS inspector.
- 12.1.C.3.3 The Contractor must have the capability to handle the propellers with power tools (hydraulic or electric) in order to complete the fits.

- 12.1.C.3.4 Final propeller adjustments must be made in the presence of the IA.
- 12.1.C.3.5 The Contractor must check the key between the shaft and the propeller, the shaft key and the key locking bolts for cracks by means of a liquid penetrant crack test. These tests must be performed in the presence of the IA and the ABS inspector.
- 12.1.C.4 **Propeller Installation**
- 12.1.C.4.1 Existing starboard and new port propellers must be reinstalled with new rubber seals on the inner surface of the hub. The seals must be supplied by the Contractor.
- 12.1.C.4.2 The propellers must be securely fixed onto the new shaft taper of their respective propeller shaft using the Pilgrim nuts and the Morpress hydraulic pump. The inflatable ring must be purged of air. Pilgrim nuts must be installed to allow the nut's pressure ring to push the propeller against the shaft taper.
- 12.1.C.4.3 The Contractor must mark the propellers final positioning on the new shafts. The hydraulic pressure exerted by the Morpress pump can easily exceed 10,000 psi. For information purposes, reinstallation pressures during the 2020 dry docking were 11,000 psi and 14,000 psi, on the port and starboard (respectively) shafts.
- 12.1.C.4.4 Once the propellers are in place, the nuts must be tightened and locked into place. New holes for locking devices must be drilled in the propeller hub. The propeller cones must be cleaned, filled with new Tallow, and reinstalled. The cone nut cavities must be filled with aluminous cement, once final tightening of the nuts has been completed.
- 12.1.C.4.5 Note: The CCG should have six (6) spare Dowty Seal connectors and one (1) nitrile rubber chamber (Nitrile Tyre) onboard the ship. The Contractor must provide same quantities as listed above back to the ship.
- 12.1.C.5 **Fabrication and Installation of Rope Guards (OPTIONAL)**
- 12.1.C.5.1 The Contractor must supply a cost for the material and labour required to fabricate and weld in place two new rope guards if the condition of the existing is determined to not be satisfactory.
- 12.1.C.5.2 They must be made of ¾ in. thick steel and formed to replace the old rope guards. The rope guards must be welded continuously around their entire circumference as well as on the joints between the half-sections.
- 12.1.C.5.3 Prior to welding, the rope guards must be sandblasted to Sa 2½ grade, and then painted on both sides with the same paint as the hull with the same criterias.
- 12.1.C.5.4

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

12.1.D.1.1 The IA and ABS inspector must inspect the following items:

- a) The mating surfaces between the propellers and the propeller shaft tapers;
- b) The bluing of surfaces and the quality of the fit of the propellers on the shaft tapers (ABS inspector must attend);
- c) The final tightening of all retaining nuts and propellers;
- d) The final installation of the Pilgrim nuts and lock devices;
- e) The Installation and welding of rope guards.

**12.1.D.2 Testing/Trials - [Not Used]****12.1.D.3 Certification**

12.1.D.3.1 Provide proof of acceptance of propeller condition by the ABS inspector.

**12.1.D.4 Documentation**

12.1.D.5 If determined as necessary, Contractor must provide preliminary propeller repair report no later than one week after receipt of the propeller at the subcontractor's facility.

12.1.D.6 The Contractor must provide final propeller repair report no later than one week after receipt of the propeller for reinstallation.

12.1.D.7 The Contractor must provide a quality assurance report demonstrating acceptance of the condition of the propellers and their installations by ABS. This report must be submitted before the vessel is released.

**12.1.D.8 Training - [Not Used]**



## **12.2 MECHANICAL SEAL**

### **12.2.A Identification**

- 12.2.A.1 The objective of this item is to completely replace the existing Manesal de Wartsila mechanical seals on both propeller shafts with SeaThigor seal D-15d mechanical seals from Thordon.
- 12.2.A.2 The Contractor must obtain the services of FSR from Thordon to supervise the installation of the new mechanical seal.
- 12.2.A.3 The two new mechanical seals SeaThigor will be supplied by the CCG.

### **12.2.B References**

#### **12.2.B.1 Equipment Data**

- 12.2.B.1.1 TBI Seathigor Seal srtp size 3D-15d
- 12.2.B.1.2 Adaptor plate

#### **12.2.B.2 Drawings and Documents**

- 12.2.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>DRAWING TITLE</b>	<b>Number of Sheets</b>
	SeaThigor Seal - Product Manual – Rev7Final 20181210	
	TG-ST-D-15D-00-MOD1	
VP-200806-01	SeaThigor Verification Plan	
	MA Inboard Seal Technical Manual	
H70737	G.A. of 710 mod 671 type MD seal	
AW201803	Stern tube gland	
AW201805	Stern tube	
AW302990	Aft Stern tube Bush	
AW302998	Fwd Stern tube Bush	

#### **12.2.B.3 Regulations and Standards**

- 12.2.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

FSM Procedures	Title	Included Yes/No
Publications		
Standards	[Not Used]	
Regulations		

### **12.2.C Statement of Work**

#### **12.2.C.1 Disassembly of the 2 existing mechanical seals**

- 12.2.C.1.1 The Contractor must carefully disassemble the two Maneseal mechanical seals to allow them to be reassembled and put into operation. The parts of the 2 mechanical seals must then be carefully packed for shipment to the CCG warehouse in Quebec City: 101 Champlain Boulevard, G1K 7Y7. Prior shipping, the joints must be reassembled and also carefully packed to facilitate their transport and storage. CCG will handle coordination of the pickup and pay for the transportation.

#### **12.2.C.2 Installation of the 2 new mechanical seals**

- 12.2.C.2.1 The Contractor must install the 2 new mechanical seals under the supervision of the manufacturer's seconded representative.
- 12.2.C.2.2 Installation work must be performed in accordance with the manufacturer's instructions: SeaThigor Seal - Product Manual – Rev7Final - 20181210.
- 12.2.C.2.3 The Contractor must drill holes in the stern tube in order to screw the housing module and safety seal module within the stern tube.
- 12.2.C.2.4 The Contractor must note that there are fuel tanks behind the bulkhead to be drilled.

### **12.2.D PROOF OF PERFORMANCE**

#### **12.2.D.1 Inspection**

- 12.2.D.2 All work must be accepted by the ABS classification society.

#### **12.2.D.1 Trials**

- 12.2.D.1.1 The Contractor must test the new mechanical seal in accordance with the manufacturer's instructions: VP-200806-01 SeaThigor Verification Plan.

12.2.D.1.2 In the presence of the CCG IA and the manufacturer's detached representative, the Contractor must test the inflatable seal once the vessel is afloat along the service dock.

12.2.E **Proof of Performance**

12.2.E.1 **Inspection Points - [Not Used]**

12.2.E.2 **Testing/Trials**

12.2.E.2.1 The Contractor must test the new mechanical seal in accordance with the manufacturer's instructions: VP-200806-01 SeaThigor Verification Plan.

12.2.E.3 **Certification - [Not Used]**

12.2.E.4 **Documentation**

12.2.E.4.1 Every week, the Contractor must submit a report to the TA detailing the hours and the work performed by the Thordon service representative and his recommendations.

12.2.E.5 **Training - [Not Used]**

## **12.3 TAILSHAFT STEADY BEARING**

### **12.3.A Identification**

- 12.3.A.1 The objective of this item is to complete the overhaul the two roller bearings (Cooper Bearing) to be able to remove the propeller shafts and certify the bearings by ABS for a period of five years.

### **12.3.B References**

#### **12.3.B.1 Equipment Data**

- 12.3.B.1.1 Cooper Bearing : 03 EBCPN 613.20MM EXILOG RJ ALF IH LAB TE SLUB

#### **12.3.B.2 Drawings and Documents**

- 12.3.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>Drawing / Document Title</b>	<b>Number of Sheets</b>
3L17287-1_D	Layout of 03 BCPN 613.2mm EXLOG - Cooper	1
7002781SO	ASSEMBLY, MAINTENANCE AND LUBRICATION INSTRUCTIONS - Amundsen 03 EBCPN 613.20MM EXILOG RJ ALF IH LAB TE SLUB	12
9500189ST Rev 2014	ASSEMBLY, MAINTENANCE AND LUBRICATION INSTRUCTIONS – Pierre Radisson 03 EBCPN 613.20MM EXILOG RJ ALF IH LAB TE SLUB	12
	Toolbox Details	1

#### **12.3.B.3 Regulations and Standards**

- 12.3.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	<b>Title</b>	<b>Included Yes/No</b>
<b>FSM Procedures</b>		
<b>Publications</b>	[Not Used]	

<b>Standards</b>		
<b>Regulations</b>		

### 12.3.C **Statement of Work**

#### 12.3.C.1 **General**

12.3.C.1.1 The Contractor must obtain the service of a SKF company technician to supervise the disassembly and inspection of Cooper bearings.

12.3.C.1.2 The Contractor must provide the grease and all necessary equipment recommended by the Cooper bearing manufacturer's representative. FSRs are required for 3 days or 36 hours. An allowance of \$5000 will be allocated for travel expenses. This amount will be adjusted as required and upon presentation of invoices to the contracting authority. All labour costs for this item must be included in the contractor's financial proposal.

12.3.C.1.3 The Contractor must temporarily remove the temperature sensors, then reinstalled on the bearings at the end of the work.

12.3.C.1.4 The Contractor must remove and reinstall the bearings in accordance with the reference instruction manual and the company's FSR.

### 12.3.D **Proof of Performance**

#### 12.3.D.1 **Inspection Points**

12.3.D.1.1 Disassemble and reassemble must be in the presence of the IA and FSR.

12.3.D.1.2 The cleaning of the parts, inspection and measurement of the parts must be in the presence of the IA.

#### 12.3.D.2 **Testing/Trials**

12.3.D.2.1 The Contractor must perform the tests as recommended by the manufacturer.

#### 12.3.D.3 **Certification**

12.3.D.3.1 The Contractor must provide proof of acceptance of the Cooper bearing condition by the ABS inspector.

#### 12.3.D.4 **Documentation**

12.3.D.4.1 The Contractor must provide a measurement log and a visual inspection report from Cooper bearing manufacture's representative.

12.3.D.5 **Training - [Not Used]**

## **12.4 FLANGE COUPLING**

### **12.4.A Identification**

- 12.4.A.1 The objective of this item is to remove the two Muff couplings from their respective tailshaft in order to perform the removal of the tailshafts from the vessel.

### **12.4.B References**

#### **12.4.B.1 Equipment Data**

- 12.4.B.1.1 Muff Couplings

#### **12.4.B.2 Drawings and Documents**

- 12.4.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>Drawing / Document Title</b>	<b>Number of Sheets</b>
AW-302302	Coupling for tailshaft	1
AW-302317	Arrgt for Flange Coupling Removal	1
222-620-1	Propeller shafting arrangement & details	1

#### **12.4.B.3 Regulations and Standards**

- 12.4.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
FSM Procedures		
Publications	[Not Used]	
Standards		
Regulations		

## 12.4.C **Statement of Work**

### 12.4.C.1 **General**

- 12.4.C.1.1 The Contractor must supply all the following equipment, not limited to, ventilation, staging, chain falls, slings and shackles or other necessary to perform the work. All lifting equipment must be appropriate for the expected duties, and be accompanied by valid certification indicating, or be permanently marked as to being, of an adequate safe working load for the expected duties. Any brackets or other welded attachments required in the performance of this item are to meet the welding requirement of this specification. On completion of work, all of the Contractor's work related tools and equipment must be removed from the vessel and repair according to the respective requirements of this estimate the surfaces damaged by the welding of fasteners.
- 12.4.C.1.2 In order to gain access to each Muff, the Contractor must move various interference items. These are, but not limited to, walkways, railings above pedestal bearings and the turning gear covers for each tailshaft. Upon completion of all work, the Contractor must return and reinstall these items to "as found" condition.
- 12.4.C.1.3 The Contractor must remove the sixteen (16) 3" diameter studs and nuts from each Muff coupling using a special tool supplied by the ship. Contractor must note that it is important that the last nut to be removed is the one facing the eyebolt. Before removing the 16th nut, the Contractor must install the chain block and connect it to the eyebolt.
- 12.4.C.1.4 The Contractor must remove the 1 1/2 x 1/2 inch flat steel water thrower, built in two (2) sections and forming a 2 feet 8 inches in diameter circle made of gauge 14 sheet metal. Both sections are secured with two (2) 1/2 inch diameter bolts.
- 12.4.C.1.5 The Contractor must remove the mechanical seals "Crane Seal" from the port and starboard stern tubes. See section 12.2.
- 12.4.C.1.6 Once the tail shaft is well supported inside and outside of the ship, the Contractor must proceed with partial removal.
- 12.4.C.1.7 The Contractor must partially withdraw each tailshaft aft in order to expose the end of each Muff coupling and its associated PILGRIM nut.
- 12.4.C.1.8 CCG supplied special removal tools will be supplied to the Contractor to allow him to remove the PILGRIM nut and the Muff couplings. These will include but not be limited to:
- a) one hydraulic pump c/w hydraulic hoses and fittings,
  - b) one 805 mm (31.69") long x 72 mm or 2.83" diameter stud,
  - c) special steel plate 640 mm (25") diameter x 120 mm thick,



- d) eight (8) special studs,
- e) two (2) special sleeves,
- f) special steel plate 1,020 mm (41") diameter x 160 mm (6.3") thick,
- g) One copy of service manual for the removal and re-installation of the PILGRIM nuts.

12.4.C.1.9 On completion of all work, these specialized removal tools must be cleaned and returned to the IA in the same condition as received.

12.4.C.1.10 Using the supplied hydraulic pump, the Contractor must remove each PILGRIM nut and carefully place it aside. The Contractor must protect the PILGRIM Nuts to prevent any damage to their internal mating surfaces.

12.4.C.1.11 The Controller must perform the following procedure to remove one muff coupling. The same procedure is to be applied to both couplings:

- a) The 805 mm long x 72 mm diameter stud is to be screwed into the end of each tailshaft.
- b) Once complete, the Contractor is then to install the special 640 mm steel plate and then the eight (8) special studs are to be inserted in the Muff coupling.
- c) Once installed, the eight (8) special studs will serve as a base for the second 1,020 mm diameter steel plate.
- d) The secondary steel plate is to be rigged and installed in such a way that the PILGRIM nut is between the two plates and mounted on top of the two (2) sleeves fitted on the two (2) lower Muff coupling studs.
- e) The Muff coupling is then to be jacked off its associated shaft using the PILGRIM nut and the hydraulic pump as defined in the Service Manual.

12.4.C.1.12 Once each coupling has been removed the Contractor must protect the mating surfaces to prevent any damage from occurring during the tailshaft withdrawal process. Any damage incurred as a result of not adequately protecting these machined surfaces must be to the Contractor's responsibility.

12.4.C.1.13 On completion of associated work and after the installation of the new tailshafts, the Contractor must install on its respective shaft each muff coupling in the reverse order of procedure above. The mechanical seals previously removed must be reinstalled in their respective locations following satisfactory blueing on the cone surfaces. Both the ABS and the IA must witness final hardening up of each Muff coupling and its associated PILGRIM Nut.

12.4.C.1.14 The Contractor must perform a dye check (liquid penetrant) on keyways by ABS classification society approved technician.

12.4.C.1.15 The Contractor must proceed to the adjustments (fits) with Prussian Blue. MUFF adjustments must be made in place. The Contractor must provide a fixed price for all necessary adjustments. An adjustment (fit) of at least 85% is required. The Contractor must demonstrate the final adjustment IA obtained.

12.4.D **Proof of Performance**

12.4.D.1 **Inspection Points**

12.4.D.1.1 The following inspections are required to be witnessed by the IA and ABS:

- a) Inspection of the machined mating surfaces between the shafts and the couplings,
- b) Hardening up of all retaining nuts.

12.4.D.2 **Testing/Trials**

12.4.D.2.1 Fits to Prussian blue to obtain an adjustment of at least 85% of the contact surface.

12.4.D.3 **Certification - [Not Used]**

12.4.D.4 **Documentation**

12.4.D.4.1 The Contractor must supply the TA, on an USB stick, not protected by a password and in a compatible format to Microsoft Office Word 2013 or more recent format, a report detailing the work undertaken, defects, repairs made and measurements and readings taken.

12.4.D.4.2 The Contractor must provide a Quality Assurance (QA) report indicating that all parts of the Muff coupling and inboard tailshaft ends have been inspected by the Contractor's QA Department for correct installation and fit.

12.4.D.5 **Training - [Not Used]**

## **12.5 TAILSHAFTS AND STERN TUBES**

### **12.5.A Identification**

- 12.5.A.1 The objective of this item is to remove and replace the port and starboard tailshafts and open up the stern tube bearings for replacement inspection and survey by the ABS Surveyor.
- 12.5.A.2 The objective of this item is also to replace the existing marine rubber DURAMAX ROMOR CUTLASS bearing system with the THORDON COMPAC system.
- 12.5.A.3 The new tailshafts and new Thordon sterntube bearings will be provided by CCG.
- 12.5.A.4 The work in this section must be coordinated by the Contractor with items: Removal of Muff Couplings, Propeller withdrawal inspection and installation, Tailshafts Mechanical Seals, Tailshafts Steady Bearings, Thrust Bearing and Turning Gear.

### **12.5.B References**

#### **12.5.B.1 Equipment Data**

##### **12.5.B.1.1 Dimensions of tailshafts**

- a) Weight : 37 tonnes
- b) Length : 46 ft 1 13/16 inches
- c) Diameter : 26 inches

##### **12.5.B.1.2 The shafts must not be supported on the rubber coating between the two bronze sleeves.**

##### **12.5.B.1.3 Type of EXISTING sterntube bearings:**

- a) Romor I : Class III Dove-Tailed, Plastic-backed Stave Bearings
- b) Dimension: 33 3/4 inches long (192) and 27 inches long (96)

##### **12.5.B.1.4 Type of NEW sterntube bearings:**

- a) **Item 1:** COMPAC 1200 Amundsen Aft Sterntube Bearing rough molded with 3/16" over and underbuild Customer to final machine, groove and machine slot to accommodate fixed key :
  - i) Reference proposal drawing TG25563 dated 19-Aug- 2018
  - ii) Shaft 680mm x Housing 741mm x Overall Length 2720mm supplied in 4 segments
  - iii) Segment Length 907mm + Chucking Allowance 50mm
  - iv) Scope of Supply per vessel : 3 COMPAC bearing billets (1 Fixed anti-rotation key, bronze, with mounting fasteners)

v) Quantity required: 2 Bearing sets consisting of 4 segments each

b) **Item 2:** COMPAC 1200 Amundsen Fwd Sterntube Bearing rough molded with 3/16" over and underbuild Customer to final machine, groove and machine slot to accommodate fixed key :

i) Production drawing TG25563 dated 19-Aug- 2018.

ii) Shaft 675mm x Housing 736mm x Overall Length 1333mm supplied in 2 segments

iii) (Segment Length 667mm + Chucking Allowance 50mm)

iv) Scope of Supply per vessel: 2 COMPAC bearing billets (1 Fixed anti-rotation key, bronze, with mounting fasteners)

v) Quantity required: 2 Bearing sets consisting of 2 segments each

### 12.5.B.2 Drawings and Documents

12.5.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Drawing Number	Drawing / Document Title	Number of Sheets
AW502334	Sterntube nut	1
AW201803	Sterntube gland (ancien arrangement)	1
AW201804	Tailshaft with liner	1
AW201805	Sterntube	1
AW302302	Coupling for tailshaft	1
AW302317	Arrgt for Flange Coupling Removal	1
AW302990	Aft Sterntube bush	1
AW302998	Forward Sterntube bush	1
221-620-1	Propeller shafting arrangement and details	1
221-620-2	Sterntube arrangement & details	1
221-H-52	Spectacle shaft brackets	1
06149M08	Remplacement du système "Cutlass" avant par Thordon Compac	
06149M09	Remplacement du système "Cutlass" arrière par Thordon Compac	
TG25563	Thordon Compac Sterntube bearing Assembly	1
2394-11-100	Sterntube Thordon Bearing Assembly Tail shaft	1
TG-ST-16a-ID	TBI seathigor seal SRTP size # D-16a installation drawing	1

### 12.5.B.3 Regulations and Standards

- 12.5.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
<b>FSM Procedures</b>		
<b>Publications</b>		
	[Not Used]	
<b>Standards</b>		
<b>Regulations</b>		

## 12.5.C Statement of Work

### 12.5.C.1 Preparation

- 12.5.C.1.1 The Contractor must prepare the equipment and arranging for all inspections required. The Contractor must consult with ABS prior to commencement of work, to determine an inspection schedule; at the required inspection point. The Contractor must advise the IA and the TA, 24 hours in advance, to allow their attendance.

12.5.C.1.2 The Contractor must hire and coordinate the presence of a Thordon representative throughout the project to supervise and offer guidance with regards to new bushing preparation and installation. An allowance of \$5000 will be allocated for travel expenses. This amount will be adjusted as required and upon presentation of invoices to the contracting authority. All labour costs for this item must be included in the contractor's financial proposal.

- 12.5.C.1.3 The Contractor must supply all equipment, chain falls, slings and shackles necessary to perform the work. All lifting equipment must be appropriate for the expected duties, and be accompanied by valid certification indicating, or be permanently marked as to being, of an adequate safe working load for the expected duties. Any brackets or other welded attachments required in the performance of this item must be welded into place by CWB-certified welders only.

- 12.5.C.1.4 While the vessel is still afloat, and not yet resting on the blocks, the Contractor must:

- a) Uncouple both the port starboard after tailshaft couplings;
- b) Take and record alignment readings (strain gauge method);

- c) Measure and record the axial clearance, height and parallelism between the coupling flanges when their spigot is released, but still bearing on the lip of the thrust bearing flange (spigot). Record the values obtained in the measurement logbook.
- d) Supply and install four (4) bolts, not fitted, on the couplings when measuring clearances.
- e) Take and record a second series of measures taken at 180° from the first readings.

12.5.C.1.5 These readings must be witnessed by both the IA and ABS surveyor.

12.5.C.1.6 Once the vessel is docked, the Contractor must remove the rope guards, measure and record the clearances between the tailshafts and the sterntube bearings. Additional information regarding rope guard are found on « Shafting Arrangement 222-620-01 ».

12.5.C.1.7 Using the turning gears, the Contractor must check and record the tailshafts wear down and concentricity at each stern tube end and on the propeller tapers in the measurement logbook.

#### 12.5.C.2 **Propeller removal**

12.5.C.2.1 The Contractor must remove both propellers as specified in section 12.1.

#### 12.5.C.3 **Tailshafts removal**

12.5.C.3.1 The Contractor must dismantle the tailshaft steady bearing to remove the tailshafts as specified in section 12.3.

12.5.C.3.2 The Contractor must retain each propeller shaft inside and outside the ship and withdraw the shafts sufficiently to perform the following work:

- a) Remove the "Pilgrim" nut from the inside of the cylindrical sleeves as specified in section 12.4;
- b) Lift the coupling off the shaft;
- c) Install the sled nut at the inner end of each shaft.

12.5.C.3.3 The Contractor must completely remove the shafts from the stern tubes. The Contractor must protect, support and retain them so as not to damage the bearings, threads, taper and rubberized coating between the two (2) sleeves (bronze liners).

12.5.C.3.4 The Contractor must properly support any tailshafts at all times along their entire length, to avoid any warping.

12.5.C.3.5 The Contractor must remove the existing tailshafts from the dry dock.

12.5.C.3.6 The Contractor must organize reception of the new tailshafts and manoeuvring to bring them down in the dry dock.

- 12.5.C.3.7 The Contractor must include cost and take the necessary measures to remove the existing shafts from the bottom of the dry dock and prepare them for the transportation to Port of Quebec. The shafts must be properly supported at all times along their entire length (except in way of the rubber coating). CCG will organize and cover the costs for the transportation to the Port of Québec.
- 12.5.C.3.8 When maneuvering the shafts, the Contractor must pay particular attention to the following parts:
- a) Forward and aft keyways on shaft tapers;
  - b) Forward and aft shaft tapers;
  - c) Forward and aft ends of each of the two liners where they meet the tailshaft ends;
  - d) Forward and aft pilgrim nuts and threads on shafting;
  - e) Liner wear and condition of bearing staves;
  - f) Forward end of forward liner in way of mechanical seal "Crane Seal";
  - g) Vulcanized rubber coating between bronze sleeve liners.
- 12.5.C.4 **Sterntubes Bearings**
- 12.5.C.4.1 The existing bronze backed rubber staves must be removed, the bearing carrier must be line bored and new Thordon COMPAC, bushings installed.
- 12.5.C.4.2 All activities undertaken are to be witnessed and accepted by IA and ABS Surveyor.
- 12.5.C.4.3 All activities undertaken are to be fully documented by the Contractor. The information must be maintained updated and available for IA and TA.
- 12.5.C.4.4 The Romor staves must be adequately protected to allow cleaning of the center area of the stern tube.
- 12.5.C.4.5 The Contractor must clean and repair both stern tubes in the mid-section, between the two bearings housings using sand blast complying with the SA 2- 1/2 grade. Before doing so, the bearings areas will be properly protected against sandblast.
- 12.5.C.4.6 Once the tubes blasted and cleaned, the cavities and porosities must be filled with an epoxy metal repair compound compatible with Belzona Ceramic R Metal. The Contractor must include in their price five (5) kg of this product per tube, which will be increased or decreased using the PWGSC 1379 form. The Contractor must provide a unit price per kilo for this purpose. Application of this product must be done following manufacturer's recommendations and under the CCG IA supervision. The date of manufacture of each package is to be given to the CCG IA to ensure the product is not expired.

- 12.5.C.4.7 Once the product fully cured, a mechanical preparation will be done by the Contractor on the repaired spots to roughen the surface. Clean the tubes in order to remove all fine particles and prepare for painting. Apply two (2) coats of coating adapted for stern tubes with glass flakes reinforcement, the final coat must be a light color to facilitate future inspections.
- 12.5.C.4.8 Fore sleeves: remove the mechanical seal and set aside. The man holes giving access to these two (2) tanks must be closed with new gaskets.
- 12.5.C.4.9 The Contractor must retain the services of a marine shaft alignment company to verify shaft alignment (strain gauge method) before the vessel docks, advise on stern tube boring alignment and detail and confirmation of alignment on completion of all work on the shafts and stern tubes.
- 12.5.C.4.10 Depending on the current alignment of the carrier tube with new shafting, the concentricity and lay of the new stern tube centre line, the amount of line boring required may vary. Therefore, residual stave grooves might remain once the minimum wall thickness of the carriers is reached. Any residual stave grooves must be filled with Belzona, Chockfast or equivalent epoxy metal approved by ABS for use in a sterntube, and finish machined to final carrier ID in order to create a smooth and continuous cylindrical carrier surface to support the Thordon COMPAC bushings. If required will be negotiated using PWGSC 1379 form.
- 12.5.C.4.11 The existing aft retaining ring must be inspected by CCG and Thordon FSR for reuse. If the ring is not in good condition, a new retaining ring must be provided by the Contractor via a PWGSC 1379 form and installed to provide for secondary retention of the bushings. Contractor to provide a unit cost for the fabrication of a new retaining ring (ref. dwg AW502334).
- 12.5.C.4.12 The forward bushings must be provided with means of retention at forward end. Final methodology must be approved by the TA and ABS surveyor.
- 12.5.C.4.13 Please consider that whatever method is selected, clear water flow passage must be maintained for both the seal and especially for the bearing lubrication cooling water.
- 12.5.C.4.14 The new Thordon COMPAC bushings will be CCG supplied. They will be provided in a semi-finished condition. They will be supplied with a small overbuild on the OD, the ID and the length including a chucking allowance for ease of machining. The Compac bushings must be finish machined both the internal, external diameters according to the dimensions calculated by the Thordon Sizing program. Dimensions must be based on the measured final dimensions of the housing and the shaft liners. The keyway will be machined after the bushing internal bores are machined. The bearings will be supplied in segments (three aft and two forward) for each shafts. All segments will require finish machining.



- 12.5.C.4.15 The Contractor must machine a slot to accommodate the fixed anti-rotation key. Shaft 675mm x Hole 736mm.
- 12.5.C.4.16 The Thordon COMPAC bushings must then be freeze fitted into position. Either pelletized dry ice or liquid nitrogen may be used to shrink the bushings.
- 12.5.C.4.17 Fabricate a cylinder of sufficient dimensions that is to serve as a nitrogen basin to cool the THORDON COMPAC sleeves before they are inserted into the four (4) bronze sleeves on the stem tubes. The procurement and costs for all tools required to position the THORDON COMPAC sleeves is the shipyard's responsibility.
- 12.5.C.4.18 At any given time, the shaft must not be turned without water flow to the stern tube.
- 12.5.C.5 **Install Thordon COMPAC bearings**
- 12.5.C.5.1 Preparation of the stern tube to receive the Thordon COMPAC bushings will encompass the following main points (this scope does not include modification for fitting the new SeaThigor seal) :
- 12.5.C.5.2 The Contractor must remove the existing bearing staves from the stern tube carrier. **Contractor to note that some difficulty has been encountered with stave removal in the past.** Machining out of the staves might be necessary.
- 12.5.C.5.3 The Contractor must provide the services to machine the dove tailed grooves from the bronze carrier. These dove tail grooves must be removed to the maximum extent possible while maintaining the carrier wall thickness and trueness. Under no circumstances should the wall thickness be reduced to a thickness less than the thinnest wall existing in the carriers. At this stage if any adjustments are needed as a result of the planned check alignment, the machining set-up must take the alignment into account.
- 12.5.C.5.4 The Contractor must take measurements of the final machined carrier housing internal diameters. These measurements are to be provided to the Thordon Representative who must provide the dimensions for the final OD of the new bearings. The Contractor is responsible for machining the bearing to the supplied dimensions. Machining must be performed by a Contractor approved by Thordon.
- 12.5.C.5.5 The Contractor must measure the new propeller shaft bronze liners. The Contractor must record the new shaft liners outside diameters and provide to the Thordon representative for use in Thordon Sizing Program. The Thordon representative must provide the dimensions that the Contractor must machine the Thordon bushing internal diameter to.
- 12.5.C.5.6 The Contractor must also machine a circumferential chamfer at 45 degrees to the same depth of the grooves on the end of each bushing where there is a butt joint. This must ensure a clear water passage in the event of minor groove misalignment during freeze fitting process.

- 12.5.C.5.7 The Contractor must install both forward and aft anti-rotation key, with supplied fasteners.
- 12.5.C.5.8 The Contractor must contact RMH industries (418-878-0875) or Thordon local authorized representative with all measurements to carry out the machining calculations. All bushing sections to have the ID and OD finish machined as per Thordon supplied measurements based on the carrier ID and the shaft journal OD. Including machining of a keyway in the Thordon bushing. Surface finish to be in accordance with Thordon Marine Installation Manual – available upon request from RMH or Thordon local authorized representative.
- 12.5.C.5.9 The Contractor must provide the necessary equipment for preparing, handling and rigging equipment for bearing installation. For the aft stern tube bearings a scaffolding platform will be required with overhead rigging for lifting the segments and sliding them into the stern tube. For the forward segments, the hatches to the motor room will need to be opened-up and the segments lowered into the space by crane and then rigged into position in the stern tube from the motor room side. Bearing segments weights are approximately as follows: AFT segments 450 lbs each, FWD segments 300 lbs each.
- 12.5.C.5.10 The Contractor must make provisions to shrink the bushing segments by freezing either with liquid nitrogen or with pelletized dry ice.
- 12.5.C.5.11 Once each segment in turn has been confirmed shrunken down by measurements to its minimum OD, they must be transported to their installation location, (with temporary insulation blankets if needed) and fitted into the stern tube. The forward most aft segment and aft most forward segment are fitted with a 1/4" gap between the carrier shoulder and the bushings.
- 12.5.C.5.12 Subsequent segments must be fitted with a slight gap (1/4"– 3/8") between the segments to allow for thermal expansion in the axial direction. Although not critical, given the machined circumferential chamfer machined in the bearings.
- 12.5.C.5.13 When the bearings are fitted the external and internal axial retention rings must be (re)installed.
- 12.5.C.5.14 When the bearings have warmed to ambient temperature installation is completed. Final installed internal dimensions in at least 8 locations are to be recorded for future reference and in support of ABS wear down measurements.

Stern Tube bearings	Aft bearing mm	Forward bearing mm
Bearing staves internal diameter	681.35	676.35
Housing internal diameter	704.14	700.5
Housing internal diameter at bottom of stave grooves	731.92	726.9

<b>Housing Internal diameter after removal of stave grooves plus allowance for alignment adjustment</b>	736	741
<b>Bearing length housing length (existing)</b>	3440	1373

## 12.5.C.5.15

12.5.C.6 **Reinstallation**

- 12.5.C.6.1 Upon completion of Thordon COMPAC bearings installation, the Contractor must re-assemble all shafting, turning gears, brakes, propellers, rope guards, mechanical seals and couplings. All equipment must be assembled to a fully operable condition and as per manufacturer's recommendations where applicable.
- 12.5.C.6.2 The Contractor must coat the stern tubes bearing staves end the bronze sleeve with non-polluting water soluble grease. According to Thordon recommendation for the new Thordon bearing.
- 12.5.C.6.3 The Contractor must verify the fits of the taper connection between each propeller and its associated the tail shaft taper. Verification of fits must be by machinist bluing process with a minimum surface contact area between the flanges and tapers of 75% to 80%. Final fit and hardening up of the propellers must be witnessed by the ABS Surveyor, the IA and the TA. Report copies of all readings must be provided to the IA and the TA. This report must be given 2 days after inspection took place. The Contractor must install the MUFF couplings on the new tailshafts and screw the PILGRIM nuts inside.
- 12.5.C.6.4 The Contractor must use chain blocks to match the coupling of the propeller shaft with the thrust bearing shaft in order to install the sixteen (16) 3 inches diameter bolts with their nuts and locking plates. The Contractor must take care to insert the bolts in their specific hole (#1 bolt in hole #1, etc.). The Contractor must fit these bolts in the coupling's face.
- 12.5.C.6.5 Before tightening the couplings, the Contractor must check their parallelism, before the shaft coupling is on the motor coupling spigot. This verification must be done twice at a 180° angle. The Contractor must use non fitted bolts, Contractor supplied, when the measurements are taken. The Contractor must register the readings.
- 12.5.C.6.6 The Contractor must complete the coupling tightening on the tail shaft taper using the hydraulic pump and the PILGRIM nut. The Contractor must drill new holes in the locking plates and install them at their specified location.
- 12.5.C.6.7 The Contractor must reinstall the shaft line steady bearing as specified in section 12.3.

12.5.C.6.8 The Contractor must remove the brackets installed for the purpose of establishing rigging points, grind flush the affected areas, and apply a surface treatment to match the existing paint schedule of the surrounding areas. Proceed to an Ultrasonic inspection.

12.5.C.6.9 The Contractor must present the test results to the IA and the TA prior to the flooding of the dock to re-float the vessel.

#### 12.5.D **Proof of Performance**

##### 12.5.D.1 **Inspection Points**

12.5.D.1.1 All steps of the work must be completed, presented and approved IA, Thordon FSR and the attending ABS surveyor.

12.5.D.1.2 The following inspections are required to be verified by the IA, the TA, Thordon FSR and the ABS Surveyor:

- a) Inspection & Testing - SCM Notation Baseline Survey
- b) Witnessing of readings taken of tailshaft alignment and clearances prior to and after docking of the vessel;
- c) Witnessing of readings taken of tailshaft/bearing clearances prior to removal and after re-assembly;
- d) Witnessing of NDT testing;
- e) Witnessing of shaft run-out verification;
- f) Witnessing of stern tube bearing clearances;
- g) Blueing of surfaces of tapers (minimum of 85% of contact);
- h) Hardening up of all retaining nuts and propellers

12.5.D.1.3 Prior to undocking of the ship, the stern tube bearings and new shafting final inspection must be completed together with the IA, Thordon FSR and ABS Surveyor. Following points must be verified/witnessed:

- a) Absolute bearing clearances must be recorded and accepted by attending surveyor
- b) Baseline wear down readings reported to attending surveyor
- c) Water Quality Package verifications (also see item 12.6)
- d) Any other tests or verifications as required by the attending ABS surveyor

##### 12.5.D.2 **Testing/Trials**

12.5.D.2.1 Dock trial

- a) On completion of all work, each shaft must be turned for a period of one (1) hour using the vessel's turning gear in order to test for any leaks of the system.
- b) A one (1) hour dock trial must then be conducted using the vessel prime movers to turn the shafts in order to check for overheating and/or vibration.

#### 12.5.D.2.2 Sea trials

- a) After the vessel has been afloat for a minimum twenty-four (24) hours, the Contractor must take shaft alignments readings and compare them to those taken previously. These alignment readings must be witnessed by the IA and ABS Surveyor if so requested. Any corrections made necessary due to misalignment must be at the Contractor's expense.

#### 12.5.D.2.3 Upon completion of all refit work, but prior to Acceptance; a four (4) hour sea trial must be conducted. A series of evolutions, involving a gradual increase of speed and reversals must be undertaken to test the ship's equipment. The Contractor must submit the trials program to the TA and the IA at least 2 weeks prior to start of the trials for approval.

- a) The vessel must be gradually worked up to full speed; the Contractor must have shipyard personnel in attendance to monitor the shafting system on a continual basis for both this sea trials and the dockside trial noted above. Any overheating or vibration must be remedied at no expense to Canada.

#### 12.5.D.3 **Additional measures**

##### 12.5.D.3.1 Before the refloating, the Contractor must take the wear down measurement of the propeller shafts. The Contractor must record these readings and provide a copy to the TA before the vessel is refloated.

#### 12.5.D.4 **Certification - [Not Used]**

#### 12.5.D.5 **Documentation**

##### 12.5.D.5.1 The Contractor must supply the TA, on an USB stick, not protected by a password, in a Microsoft Office Word 2013 or more recent format, and on a paper copy, a report detailing the work undertaken, defects, repairs made and measurements and readings taken.

##### 12.5.D.5.2 The Contractor must also provide a copy of ABS survey credit to the TA before refloating the vessel.

##### 12.5.D.5.3 The Contractor must provide a Quality Assurance (QA) report indicating that all parts of the tailshafts and sterntubes shafts bearings have been inspected by the Contractor's QA Department and certifying that the installation and adjustment work has been carried out in accordance with the requirements of this specification. This report must be submitted to the TA 48 hours after completion of the sea trials.

12.5.D.5.4 The Contractor must provide an alignment report to the IA and the TA.

12.5.D.6 **Training - [Not Used]**

## **12.6 WQP (WATER QUALITY PACKAGE)**

### **12.6.A Identification**

12.6.A.1 The objective of this item is to procure and install a filtration system for the lubrication water of the stern tubes.

### **12.6.B References**

#### **12.6.B.1 Equipment Data**

12.6.B.1.1 All material will be supplied by the Contractor for item 12.6 WQP.

12.6.B.1.2 The Contractor must supply the following equipment.

a) Water Quality Package consisting of :

- i) centrifugal pumps (2 off) with an integral mounted electrical motors connected to single separators (2 off), rated at 40-75 GPM., is a self-contained supply, conditioning and monitoring package to ensure an adequate flow of clean water: (Minimum flow required - 102 LPM per shaft x 2 shaft = 204 LPM
- ii) Operational flow required - 255 LPM )is consistently being delivered to both the forward seal and the bearings.
- iii) Design must allow for pumps to be switched automatically and act as a redundancy feature.
- iv) A flow alarm is incorporated to alert the operator to any low water flow condition to the bearing.
- v) The unit must be designed with a manifold at the outlet to split the flow to 2 shaft lines, complete with 2x individual flow meters and 2x individual globe valves.
- vi) The system must be able to integrate to the ship's automation system that will control all monitoring and auto start functions.
- vii) The Water Quality Package must be built to remove suspended solids with a specific gravity of 1.2 or higher and greater than 100 micron within the water supply.
- viii) Motors are totally enclosed fan cooled type IP 44 with type IP 55 terminal boxes and removable covers. The motor insulation is rated to Class F with Class B temperature rise based upon an ambient of 40°C.

12.6.B.1.3 The Contractor must supply marine class approved Stainless duplex sea strainer.

### 12.6.B.2 **Drawings and Documents**

- 12.6.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Drawing Number	DRAWING TITLE	Number of Sheets
TG-29127	Double-double WQP.60hz with flowmeter 24Vdc Ctrl	2
TG-32697	(40-75) GPM – Special double-double with manifold	1
222-670-7	Arrangement of Shipside Valves	4
222-670-2	S.W. Circ. System diagram	1
221-670-2 r1	Water Quality Package System (P&Id) As built Radisson	1

### 12.6.B.3 **Regulations and Standards**

- 12.6.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

	Title	Included Yes/No
<b>FSSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>		
ASME B16.5	Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard	
<b>Regulations</b>		

### 12.6.C **Statement of Work**

#### 12.6.C.1 **General**

- 12.6.C.1.1 The Contractor must supply a water quality package that is consistent with the shaft bearing seal installed. The water quality package must allow the required water flow to keep the warranty on the shaft bearing and be approved by the shaft bearing manufacturer. The characteristics of the unit are in the equipment data section.
- 12.6.C.1.2 The Contractor will supply material and accessories (pipes, valves, fittings, elbows, reducers, fasteners, flanges, brackets, supports and gaskets) for the involved piping. That includes the piping to be fabricated and the existing piping that has to be modified. All piping will be hot galvanized.



- 12.6.C.1.3 The Contractor must supply and install piping for the water from the seabay in the aft engine room and from the propulsion engine room.
- 12.6.C.1.4 All joints will be welded or flanged using ASME B16.5, 150 class flanges unless specified. NPT fittings or any screw-on type will not be accepted.
- 12.6.C.1.5 The WQP unit must be installed at bulkhead frame 30 Port Side.
- 12.6.C.1.6 The Contractor must also make modifications to the ship's compressed air to supply each water quality assembly.
- 12.6.C.1.7 The Contractor will provide material and labour for the fabrication and installation of a base, capable of supporting a weight of 1200lbs allowing for typical icebreaker vibration conditions.
- 12.6.C.1.8 The base for WQP will be sandblasted and painted with two (2) coats of marine primer prior installation. The Contractor will install the WQP unit on the base, using stainless steel bolts (supplied by shipyard). Threaded holes in the base will be used to fix the WQP.
- 12.6.C.1.9 The Aft Deep Tank Port (#202) will be opened, drained, gas freed and cleaned for inspection purposes (**see item 11.7**). The Contractor must have a certificate for clean air posted at the entrance of the tank and kept up to date for the entire duration of the item. Once completed, reinstall covers with new gaskets and nuts supplied by the shipyard.
- 12.6.C.1.10 The suction piping will be 3'' diameter, SCH80 steel piping, starting from the motor room seabay and ending at the WQP pumps suction for a total of 130 ft. An opening will be created on the top of the two seabays, then the flanged extension pipe assembly will be fabricated (hot dip galvanized) and installed on the seabays. Flanges must be 8 inches high above the seabays and extension pipe must be 4 feet deep in the seabays. Install a 3'' 90° angle ABS certified bronze valve (Contractor supplied) on the extension assembly. A bulkhead penetration must be installed to allow the pipe to go through the bulkhead at frame 61. The 2 suction lines will be T together.
- 12.6.C.1.11 The Contractor must install a suction strainer duplex type ABS approved (supplied by Contractor), including the fabrication and installation of all necessary supports and brackets. The Contractor must include in this work the necessary modifications of the floor plates in order to install the strainer. The strainer must be installed between the WQP and the closest suction. The strainer must also be as close as possible to the suction. Final position of the strainer will be determined by the TA. The Contractor must supply and install two (2) female ½'' NPT fittings, welded on the 3'' piping, one close to the strainer's inlet and the other close to the strainer's outlet. The Contractor must supply and install two (2) stainless steel ½'' ball valves, 150psi with the required stainless fittings. The Contractor must supply and install two (2) ½'' NPT plugs at the end of the ball valves.

- 12.6.C.1.12 The Contractor must fabricate and install a manifold between the WQP pumps suction and the strainer of the 3'' suction piping. The flanges that will be bolted to the pumps must be PN16 50mm DIN flanges. Two (2) 50mm butterfly valves (supplied by the Contractor) must be installed between the pumps suction and the manifold with stainless steel bolts (supplied by the Contractor). The total length of the 3'' piping is approximately 35 feet.
- 12.6.C.1.13 The stern tube feed water system will be connected to the WQP double outlets. The Contractor must install two (2) 2'' butterfly valves (Contractor supplied) on the WQP outlet flanges with Stainless steel bolts (Contractor supplied). The feed piping will be 2'', SCH80. The two pipes will be routed and fitted to the two stern tube feed lines. A flanged joint will be installed on each pipe connexion to the existing system. Total length of the piping to be made is 80 feet.
- 12.6.C.1.14 The flushing system must be connected to the WQP twin flushing outlets, then routed to the existing discharge overboard pipe (#3) at FR36, starboard side. The piping will be SCH80, 2''. Install two (2) 1'' butterfly valves (supplied by the Contractor) on the WQP flushing outlet flanges, using stainless steel bolts (supplied by the Contractor). Fabricate and install a manifold to fit the twin 1'' outlets and finish in only one 2'' flanged outlet. The flushing line to be fabricated will be connected to this flange. The existing piping (discharge overboard) will be modified with the addition of a flanged joint to connect the 2'' WQP flushing line. Total length of the piping to be made is 20 feet.
- 12.6.C.1.15 The Contractor must supply, install and terminate all wiring to allow power and operation of the chosen WQP. The ship's automation system must control all monitoring and auto start functions.

#### 12.6.D **Proof of Performance**

##### 12.6.D.1 **Inspection Points**

- 12.6.D.1.1 All new piping fabricated by the Contractor must be tested for integrity and leakage at 150 PSI before being hot dip galvanized.
- 12.6.D.1.2 The Contractor must complete NDT testing on the weldings made on the saybay and provide results to the IA.
- 12.6.D.1.3 Visual inspection of 100% of the pipe weldings must be completed by the IA.
- 12.6.D.1.4 Pipe circuits, assembly and welding must be inspected and approved by ABS surveyor.
- 12.6.D.1.5 Hydrostatic tests at 100 psi on the system must be completed by the Contractor in presence of IA and ABs surveyor. The WQP systems components like the pumps, separators and flowmeters must not be pressurized.

**12.6.D.2     Testing/Trials**

- 12.6.D.2.1     The Contractor must do the start-up of the system in presence of the manufacturer FSR and the IA.

**12.6.D.3     Certification**

- 12.6.D.3.1     The Contractor must provide factory tests certificate of the WQP to the TA before the installation period.
- 12.6.D.3.2     The Contractor must provide valves certificates to the TA before the installation period.

**12.6.D.4     Documentation**

- 12.6.D.4.1     The Contractor must provide all manufacturer manuals to the TA before the end of the work period.
- 12.6.D.4.2     The Contractor must provide as fitted plans of installation of pipings, WQP seats, power supply and control wiring.

**12.6.D.5     Training - [Not Used]**

## **12.7 EXHAUSTS CONDITION SURVEY**

### **12.7.A Identification**

- 12.7.A.1 The objective of this item is to complete the following works on the six (6) main engines, three (3) ship service and emergency generator exhausts from turbo output to the top of the stack compartment including silencers:
- a) Asbestos abatement by a qualified company;
  - b) Internal cleaning;
  - c) Visual inspection;
  - d) Ultrasonic thickness survey report to CCG;
  - e) Flange gaskets replacement;
  - f) Any other repairs required based on inspection and survey results.
- 12.7.A.2 The purpose of this item is also to remove asbestos from Emergency Air Compressor, Incinerator and boilers exhausts in stack compartment (Approx. 90 ft high).

### **12.7.B References**

#### **12.7.B.1 Equipment Data**

- 12.7.B.1.1 The list of diesel engines for which exhausts must be surveyed are the following: DP1, DP2, DP3, DP4, DP5, DP6, DA1, DA2, DA3 and Emergency Generator.
- 12.7.B.1.2 Silencers technical information:
- DP Silencers Manufacturer: Maxim  
Model: MSA-2  
Dimensions: 54 in. dia. × 161 in. length, 22 in. inlet/outlet  
(See Annex 1 for picture)
- 12.7.B.1.3 Exhaust lines information:
- Exhaust flange gaskets must be Spiral wound high temp INCONEL/THERMICULITE type or equivalent.
  - DP Exhaust line from turbo to tip excluding silencers (each):  
Dimensions: 22 in. dia. × 95 ft. length
  - DA Exhaust line from turbo to tip excluding silencers (each):  
Dimensions: 16 in. dia. × 95 ft. length

- Emergency Generator Exhaust line from turbo to tip excluding silencers (each):  
Dimensions: 12 in. dia. × 45 ft. length
- Emergency Compressor exhaust line (section in stack) :  
Dimensions: 3 in. dia. × 80 ft. length
- Incinerator Exhaust line (section in stack) :  
Dimensions: 10 in. dia. × 70 ft. length
- Boiler Exhaust lines (2X) (section in stack) :  
Dimensions: 18 in. dia. × 76 ft. length

### 12.7.B.2 **Drawings and Documents**

- 12.7.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Drawing Number	Drawing / Document Title	Number of Sheets
M-B0003	22" MSA-2 Spark Arresting Silencer	1
171-09529-67_NGCC_Amundsen_HazMat2020_20200731_signe.pdf	Suivi annuel de la gestion des matières dangereuses	50
221-750-1	Arrangement of Diesel engine and Boiler exhausts	6
12041944	Data Book for R Class Icebreakers CCGS Sir John Franklin - part 1 (exhausts and silencers)	193
222-H-101	General Arrangement Amundsen	3

### 12.7.B.3 **Regulations and Standards**

- 12.7.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
<b>FSM Procedures</b>		
<b>Publications</b>		
	[Not Used]	

<b>Standards</b>		
<b>Regulations</b>		

## 12.7.C **Statement of Work**

### 12.7.C.1 **General**

- 12.7.C.1.1 The Contractor must supply all labour, materials, tools, lifting equipment, scaffolding and cleaning products to perform all specified work. Following the inspections, the Contractor must make any repairs deemed necessary by the IA and TA and perform pressure testing upon completion of the work.
- 12.7.C.1.2 On each level, the Contractor must plan to install a work platform in the stack through the silencers and frames over an approximate area of 20 ft. by 20 ft. on each levels. Upon completion of the work, the Contractor must remove the platforms/scaffolding.
- 12.7.C.1.3 The stack is 8 levels high (80ft).
- 12.7.C.1.4 The silencers, that are 14 ft. high, are mounted in the stack at the Boat deck level. The lower flange can be accessed from the previous level, identified as the Upper deck. The upper flange can be accessed from the Officers' deck. The Contractor must remove 10 sections of removable handrail for ease of work. Upon completion of the work, the Contractor must reinstall the handrails.
- 12.7.C.1.5 The Contractor must put safety measures in place to prevent any parts, tools or debris from falling to lower levels. Upon completion of the work, the Contractor must remove and dispose of these protections.
- 12.7.C.1.6 The Contractor must remove and dispose of waste materials from the work areas at the end of each day.
- 12.7.C.1.7 Upon completion of work, the Contractor must return all work areas to their original state of cleanliness and working order.

### 12.7.C.2 **Abestos Abatement**

- 12.7.C.2.1 The Contractor must hire a qualified company for Asbestos testing and abatement including removal of existing removable covers on some sections of the exhausts. This has to be completed before proceeding with inspection, survey and repairs.

- 12.7.C.2.2 The Contractor must dispose of the Asbestos and other hazardous material following the safety and environmental measures and regulations in force. Same procedure must be applied for removal and disposal of existing removable covers which have been identified as containing ceramic fibers.
- 12.7.C.2.3 The Contractor must provide a certificate of disposal for the identified hazardous materials during the works.
- 12.7.C.2.4 The Contractor must provide a detailed schedule and safety plan for Asbestos abatement divided in 4 zones for CCG for approval. The schedule must be provided and approved by CCG TA two weeks after ship's arrival at Contractor's facility. The compartment priority list is the following:
- a) Propulsion room (refer to Sprinkler Tank item 15.1 in the SOW)
  - b) Aft engine room
  - c) Fwd engine room
  - d) Stack compartment on every levels
- 12.7.C.2.5 The Contractor must have all Asbestos insulation removed from other exhaust pipes (emergency compressor, boilers (2) and incinerator) in the Stack compartment only.
- 12.7.C.2.6 The Contractor must coordinate and include Asbestos abatement work required in specification 15.1.
- 12.7.C.3 **Cleaning, Inspection and repair works**
- 12.7.C.3.1 The exhaust lines to be cleaned and inspected are for DP1, DP2, DP3, DP4, DP5, DP6, DA1, DA2, DA3 and Emergency Generator.
- 12.7.C.3.2 The silencers to be cleaned and inspected are for DP1, DP2, DP3, DP4, DP5 and DP6.
- 12.7.C.3.3 All exhaust flange gaskets for DP1, DP2, DP3, DP4, DP5, DP6, DA1, DA2, DA3 and Emergency Generator must be replaced for new ones.
- 12.7.C.3.4 For the six silencers identified above, the Contractor must unbolt the upper part of the flexible joint located just below the silencer and insert a blanking plate to stop any debris that falls into the exhaust duct. The Contractor must then remove this blank after pressure testing upon completion of the work.
- 12.7.C.3.5 The Contractor must remove the two inspection doors of the DP Silencers. The Contractor must perform internal cleaning of carbon and other residue. The Contractor must dispose of all residue in accordance with the Federal/Provincial Standards in force.

- 12.7.C.3.6 The Contractor must conduct an internal and external visual inspection. The Contractor must take 100 ultrasonic thickness measurements for each exhaust line including 20 measurements per DP silencer. The Contractor must provide a measurement report to the IA and the TA. Thickness measurements must be taken by a certified technician. The Contractor must provide a copy of the technician's certificate to the IA prior to completing the thickness measurements survey.
- 12.7.C.3.7 The Contractor must check around the support legs, the angle bars that are welded to the lower part of the silencer and along the exhausts lines, for cracks.
- 12.7.C.3.8 The Contractor must assess the internal and external steel repairs required. The Contractor must provide the IA and the TA with an inspection report identifying the repairs to be made.
- 12.7.C.3.9 The Contractor must provide all the labour and materials required for the repairs for which costs will be negotiated on PWGSC 1379 form. The Contractor must provide certificates for the materials. The steel for the exhaust pipes and in the silencers is high-temperature steel. The Contractor must provide a CWB-approved welding procedure for performing welding repair work.
- 12.7.C.3.10 The Contractor must empty the spark box carbon collectors on each silencer. The four 3-in. NPT plugs of the top carbon collectors must be removed and replaced with new ones sealed with high-temperature paste.
- 12.7.C.3.11 The Contractor must clean the sealing surfaces and replace the door gaskets with 1/8-in. Klingerit K1000 gaskets, or the equivalent.
- 12.7.C.3.12 Non-reusable fasteners must be replaced with the equivalent, in grade and classification. Non-reusable fastenings will be treated using a PWGSC 1379 form.
- 12.7.C.3.13 Upon completion of the work, the Contractor must pressure test each silencer. The Contractor must blank off the upper part of the silencer with a 22-in. blanking flange, as well as the bottom one. The Contractor must ensure that any openings are sealed for a 3 psi air test. The Contractor must provide new gaskets for the test. This test must be witnessed by the IA and the ABS Inspector.
- 12.7.C.3.14 The Contractor must re-bolt the flanges after removing the blank plates. The bolts must be coated with high-temperature anti-seize compound.
- 12.7.C.3.15 The Contractor must supply and install new removable insulating covers with stainless steel wire, or the equivalent, to replace existing removable covers previously removed. The new removable insulating covers must have the resistance capability to a minimum of constant 1000 deg F. The Contractor must provide MSDS files of proposed replacement products to



TA for approval prior to purchase and install. The new insulating covers must not contain ceramic fibers or other carcinogenic material.

- 12.7.C.3.16 Where permanent insulation containing Asbestos have been previously removed, the Contractor must install a new permanent exhaust insulation material. The new material must have the resistance capability to a minimum of constant 1000 deg F. The Contractor must provide MSDS files of proposed replacement products to TA for approval prior to purchase and install. The new insulating material must not contain ceramic fibers or other carcinogenic material.
- 12.7.C.3.17 Once covered, the Contractor must identify every exhausts on every levels in the stack compartment with high temperature resistant identification nameplates.
- 12.7.C.3.18 The Contractor must reinstall all accessories as originally installed and to the satisfaction of the IA.

#### **12.7.D Proof of Performance**

##### **12.7.D.1 Inspection Points**

- 12.7.D.1.1 The Contractor and the IA must inspect the silencers to identify visible repairs to be made prior to commencing the work.
- 12.7.D.1.2 The Contractor must give the IA the opportunity to inspect the condition of the silencers before final close-up.
- 12.7.D.1.3 The Contractor must coordinate with the IA to make a final cleanup inspection before unsealing the asbestos abatement zones.

##### **12.7.D.2 Testing/Trials**

- 12.7.D.2.1 The Contractor must complete a 3 psi pressure test on the six silencers.

##### **12.7.D.3 Certification**

- 12.7.D.3.1 The Contractor must provide to the TA the certification that no Asbestos traces are left after abatement PRIOR to initiate following works.
- 12.7.D.3.2 The Contractor must provide a certificate of disposal for the identified hazardous materials.

##### **12.7.D.4 Documentation**

- 12.7.D.4.1 The Contractor must provide a report on the thickness measurements. The Contractor must provide a copy of the certified technician's certificate.

- 12.7.D.4.2 The Contractor must provide a report outlining the details of the inspection with mentions of work and repairs required for each exhaust line including silencers.
- 12.7.D.4.3 The Contractor must provide inspection reports outlining the details of the repairs completed.
- 12.7.D.5 **Training – [Not Used]**

**Annex 1 (DP silencer):**



## **12.8 TURNING GEAR**

### **12.8.A Identification**

- 12.8.A.1 The objective of this item is to perform the five-year review and inspection of the two shaft turning gears. Currently, both turning gears have oil leaks when in operation.

### **12.8.B References**

#### **12.8.B.1 Equipment Data**

- 12.8.B.1.1 Shaft Turning Gear :

- a) Supplier : R.D.M.
- b) Manufacturer : J. Kobelt Manufacture
- c) Model Number : TG95846-2 (bâbord) et TG95846-3 (tribord)

#### **12.8.B.2 Drawings and Documents**

- 12.8.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>Drawing / Document Title</b>	<b>Number of Sheets</b>
AW201810	Turning Gear Assembly	1

#### **12.8.B.3 Regulations and Standards**

- 12.8.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
FSM Procedures		
Publications		
	[Not Used]	
Standards		
Regulations		

**12.8.C Statement of Work****12.8.C.1 General**

- 12.8.C.1.1 The Contractor must provide material and labour to completely overhaul the 2 shaft line turning gears.
- 12.8.C.1.2 The Contractor must completely disassemble the 2 turners.
- 12.8.C.1.3 The Contractor must clean and inspect all parts. Check the condition of the gears, bearings and straightness of the shafts. The inspection of the parts must be carried out in the presence of the IA. Parts deemed defective will be replaced using PWGSC 1379 form. The Contractor must replace all seals, couplings and bearings. No parts will be provided by CCG.
- 12.8.C.1.4 The Contractor must disconnect the 2 motors and send them to a specialized firm to be refurbished, dismantled, cleaned, and reassembled with SKF or equivalent (Sealed Bearings) first quality bearings.
- 12.8.C.1.5 The Contractor must included cost for transportations of the motors.
- 12.8.C.1.6 The Contractor must check the straightness of the rotor. Carry out tests confirming the electrical insulation (Megger), and the proper functioning of the motors. The Contractor must clean the outside of the motor to remove the paint and paint the motor enclosure with first quality grey epoxy paint. The Contractor must provide a detailed report of the work performed and the parts replaced. The bearing numbers are SKF54213U and FAG54322.
- 12.8.C.1.7 The Contractor must protect his working environment.

**12.8.D Proof of Performance****12.8.D.1 Inspection Points**

- 12.8.D.2 The Contractor must coordinate the inspections with the various inspection authorities.
- 12.8.D.3 All work must be presented and accepted by the IA.

**12.8.D.1 Testing/Trials**

- 12.8.D.1.1 Tests must be conducted in the presence of the IA. The Contractor must demonstrate the proper functioning of the turning gears to the IA.

**12.8.D.2 Certification**

- 12.8.D.2.1 The system test certificates must be submitted to the IA before the end of the work period.

**12.8.D.3 Documentation**

- 12.8.D.3.1 The Contractor must provide a complete report detailing the work performed, the cause of the failures (if any), the modifications required and the parts replaced.
- 12.8.D.3.2 The Contractor must provide the IA and TA with an electronic copy in PDF format of the report prior to the vessel's departure.
- 12.8.D.4 **Training – [Not Used]**

## **12.9 RETRACTABLE THRUSTER SYSTEM REPLACEMENT**

### **12.9.A IDENTIFICATION**

- 12.9.A.1 The objective of this item is to include all work items necessary for the Contractor to complete the appropriate installation, commissioning, dock and sea trials for: two Government supplied ABS Class Wartsila type FS175/750MNR, 1000kW, 1.65m diameter z-driven azimuth type retractable thrusters and auxiliary equipment, Wartsila Controls and E-Drives, Wartsila DP system; and all integration requirements on the CCGS Amundsen.
- 12.9.A.2 The Contractor must review Wartsila's Installation Planning Instruction (IPI) documents to safeguard that the correct storage temperatures, protections, and pre-assembly processes are maintained for the Thruster and DP System equipment supply. Wartsila Canada has developed a step by step installation process which has been reviewed. Installation of the thruster system and auxiliary equipment is possible through the bottom of the vessel as detailed in Wartsila's IPI: IPI\_SNL20064 Amundsen.
- 12.9.A.3 The Contractor must record the progress of all work in accordance with the General Section of this specification.
- 12.9.A.4 The Contractor must remove the existing retractable thruster units and auxiliary systems, including but not limited to the following: hydraulic power system, thruster control system, consoles and alarm panels, E-Drives and DC-AC power conversion variable frequency drives (VFDs) and DP System, under the technical assistance and guidance of Wartsila Site Management.
- 12.9.A.5 The Contractor must modify the steel structure and install the new Wartsila retractable thruster system complete with forward and aft azimuth type retractable thrusters, auxiliary systems, E-drive motors, VFD's and DP System under the technical assistance and guidance of Wartsila Site Management and FSRs. The installation of the retractable thrusters must be performed in dry dock with the vessel docked at a minimum vertical clearance height of 5ft (1.524 m) from dock floor to base line ship and at minimum vertical clearance of 9'-10" (3m) in way of the retractable thrusters to ease the mounting of the thruster assembly.
- 12.9.A.6 The Contractor must install and integrate the new Wartsila retractable thruster propulsion controls and DP system for the vessel complete with all sensors, displays, indicators, meters, alarms and other informational devices under the technical assistance and guidance of Wartsila Site Management and FSRs.
- 12.9.A.7 The Contractor must upgrade the existing Wartsila Bow Thruster System controller and HMI using the Bow Thruster Upgrade documents under the technical assistance and guidance of Wartsila Site Management and FSRs.

- 12.9.A.8 The Contractor must assist Wartsila in completion of commissioning activities, dock trials, sea trials and all aspects of the retractable thruster and DP system to ensure the new system is fully functional. For approximately the last 4 weeks of the dry dock period, the CCG crew will be available to assist with equipment start-up procedures, monitoring, operations and trials.
- 12.9.A.9 The CCG has provided Wartsila Canada with a separate contract for Project and Site Management for the duration of this work item and their time must **NOT** be included within the bid for this specification item. Wartsila Project Management will be available for consultation and technical input to the Contractor throughout the contract. It is projected that this block of work will take approximately 4 continuous months. The Contractor must develop their plan for this specification item and inform the CCG of their schedule for this block of work to allow Wartsila Canada enough time to organize their overseas resources. The successful Bidder must develop a schedule that includes the input and assistance of Wartsila Site Management and FSRs.
- NOTE: The Contractor must allow the IA, TA and Wartsila Canada free access at all times to the work spaces and allow inspection of all work as it is completed. Wartsila Canada will work with the IA, TA and will be given access to all planning, technical and scheduling information developed by the Contractor to complete the scope of work for this specification item.
- 12.9.A.10 **The Contractor is to bid on all aspects of the work identified in this section.** The specification is written in conjunction with the Wartsila IPI's and the Contractor must confirm their work plan and design with respect to the reference documents provided and the information gathered at the viewing. For this work item, the Contractor must complete the existing system removal, new system installation, commissioning and trials.
- 12.9.A.11 The work must be carried out in conjunction with specification item 18.4 Wind Sensors Integration.

## 12.9.B **REFERENCES**

### 12.9.B.1 **Equipment Data – [Not Used]**

### 12.9.B.2 **Drawings and Documents**

- 12.9.B.2.1 The following documents have been supplied in the Thruster System Reference Documents to assist with task requirements of this section.

## 1. Vessel Information (Existing)

Folder	Document Title
CCG Amundsen Drawings	222-H-101-T Amundsen General Arrangement
CCG Amundsen Drawings	222-H-131 Amundsen Docking Plan
CCG Amundsen Drawings	222-H-146 Amundsen Capacity Plan
CCG Amundsen Drawings	2000-02-A-002_Rev C Fwd Thruster Room Arrangement (PDF and CAD)
CCG Amundsen Drawings	2000-02-A-003_Rev B Amundsen Motor Room Arrangement (PDF and CAD)
CCG Amundsen Drawings	2000-02-H-003_Rev F Fwd Thruster Room Structure (PDF and CAD)
CCG Amundsen Drawings	2000-02-H-005_Rev E Aft Thruster Room Structure (PDF and CAD)
CCG Amundsen Drawings	2601450300-Layout1 Aft Outer Well Structure
CCG Amundsen Drawings	2604450300-Layout1 Fwd Outer Well Structure
CCG Amundsen Drawings	GA 2000-02-H-003_Rev F-FWD Thruster Room Structure (PDF and CAD)
CCG Amundsen Drawings	GA 2000-02-H-005_Rev E-AFT Thruster Room Structure (PDF and CAD)
CCG Amundsen Drawings	LM626-010-AL Amundsen Antennas
Existing HRP Thruster System	Amundsen Retractable Azimuth Thruster System Condition Assessment - November 2019
Existing HRP Thruster System	Baldor - Connection Diagram 1600 HP Drive-1
Existing HRP Thruster System	Baldor - Connection Diagram 1600 HP Drive-2
Existing HRP Thruster System	Baldor - Connection Diagram 1600 HP Drive-3
Existing HRP Thruster System	Dynamic Positioning System - Beier Radio IVCS 2000 DP-1 Manual
Existing HRP Thruster System	Elettra EMotor - Name Plate
Existing HRP Thruster System	Elettra EMotor - Type HS Motor Frame ET6810L WP-1 Enclosure
Existing HRP Thruster System	HRP 6111RT - One Line
Existing HRP Thruster System	HRP 6111RT - Technical Specification
Existing HRP Thruster System	HRP Controls Cable Diagram



Existing HRP Thruster System	HRP Hydraulic Diagram
Existing HRP Thruster System	HRP Hydraulic Power Pack
Existing HRP Thruster System	HRP Thruster Installation Manual

## 2. General Arrangement Drawings (Wartsila Design)

Folder	Document Title
Aft Thruster	5379002-263-003 Rev.A Foundation aft retractable thruster Model (PDF and CAD)
Aft Thruster	DAAF480160-SH001-B (Aft Thruster Arrangement)
Forward Thruster	5379002-263-004 Rev.B Foundation fwd retractable thruster Model (PDF and CAD)
Forward Thruster	DAAF480161-SH001-B (Forward Thruster Arrangement)

## 3. Thruster Installation (Wartsila Design)

Folder	Document Title
Thruster Installation (Wartsila Design)	DAAF505247-SH001 (Thruster Installation Steps)
Thruster Installation (Wartsila Design)	IPI_SNL20064 Amundsen_a4
Thruster Installation (Wartsila Design)	Thruster Propulsion Control Cable_List_Amundsen
IPI_SNL20064 Amundsen General	DBAE450427 A - Introduction to the manual DBAE450427 A - Warnings & cautions DBAA042536 F - Damage report form DAAF503330 - Classification data sheet DAAF480160 C - Arrangement of the thruster AFT DAAF480161 C - Arrangement of the thruster FWD DAAF510733 - Block diagram thruster installation DAAF510208 B - I/O and settings list thruster installation mechanical parts DAAK101641 G - Paint specification DAAF326648 B - Table of oils - EAL T003000092 O - Table of lubricants - Curved tooth coupling and hydraulic steering system T002005099 M - Info on loctite products T002050443 G - Torque manual T003004029 B - Mounting flange coupling T002050610 F - SKF pump unit assembly T002016527 A - Interference protocol T002006192 D - Keyless propeller mounting T002009909 3 - Taper fit datasheet DAAF512264 - Transport drawing POD and Nozzle DAAF511940 - Transport drawing stem section DAAF509021 - Transport drawing mounting plate and intermediate plate DBAE450427 A - Storage, preservation and handling of equipment

	T003005945 F - Storage longer than 6 months
IPI_SNL20064 Amundsen Installation	DAAF509960 C - Mounting Instruction DAAF505247 - Step plan for mounting thruster DAAF506713 - Thruster mounting parts DAAF511756 - E-motor flange (part of floating shaft) T002010625 F - Operation manual for curved tooth couplings DAAF526230 - E-motor lifting procedure B5_500 B3 DAAF526231 - E-motor lifting procedure B5_500 V1/V10 T002007926 H - Assembling instructions piping T003002114 I - Cleaning specification for piping T003004137 2 - Flushing hydraulic system DBAE450427 A - Cathodic protection DBAE450427 A - General activities during commissioning
IPI_SNL20064 Amundsen Assembly	DAAF503584 - Quick connect clutch DAAK115550 C - Installation Quick connect coupling - Standard manual DAAF292547 A - Installation Quick connect coupling - Clamping with cylindrical shaft DAAK113090 - Pneumatic control panel for quick connect clutch DAAF511494 - Mounting plate assembly for mounting quick connect clutch DAAF509036 - Intermediate plate DAAF504692 - Mounting plate assembly (to ship) DAAF503359 A - Mounting plate assembly (Hyd. cly & manhole) DAAW018802 A - Hydraulic cylinders DAAK111513 - Switch assembly DAAF503338 A - Thrust beam assembly DAAF522906 A - Guiding rod assembly DAAK106424 B - Locking hooks assembly DAAF519271 - E-motor foundation (Installation drawing for yard) DAAF513346 - E-motor foundation FWD (Installation drawing for yard) DAAF519143 - E-motor foundation AFT (Installation drawing for yard) DAAF513347 - Underwater guides (Installation drawing for yard) DAAF506776 - Underwater guides AFT DAAF518374 - Underwater guides FWD DAAW018434 A - Intermediate shaft assembly DAAF384139 A - Stem section DAAK006530 A - Diagram azimuth feedback unit DAAF384132 - Upper gearbox T003001143 K - Brake calipers DAAK100231 - Pneumatic brake control panel DAAK112633 - Speed transmitter PAAI018938 F - Nozzle assembly DAAF504927 - Anode plan DAAF504935 - Propeller PAAI015841 - Propeller mounting DAAF503417 - POD assembly

IPI_SNL20064 Amundsen Auxiliary Parts	DAAF510623 A - Lubrication and Hydraulic connections DAAF516122 - Flexible hoses assembly DAAF510209 - Cooling water system DAAK113526 B - Steering/Retraction diagram DAAK113525 B - Steering/Retraction power pack DAAK015612 B - Steering System Counter Balance DAAF510734 B - Lubrication oil diagram DAAF360606 - Lubrication pump unit LGB DAAK113202 B - Lubrication oil tank LGB DAAF520479 A - Lubrication pump unit UGB DAAK113202 B - Lubrication header tank UGB DAAK113534 B - Lubrication oil cooler UGB DAAK113446 B - Water separator DAAK119708 A - Monitoring system DAAK003033 B - Starter hydraulic steering DAAK003053 B - Starter Lubrication oil pump LGB and Monitoring System DAAK100869 - Starter lubrication oil pump UGB
IPI_SNL20064 Amundsen Controls	DSCA00290009 A - Propulsion Control Unit IPI DAAF509411 B - Cable connection diagram DAAF509412 A - Bridge starboard wing DAAF509413 A - Layout control cabinet DAAF509414 B - Propulsion control Unit (schematics) DAAF509415 A - Bridge panel layout port wing DAAF509416 A - Bridge panel layout starboard wing DAAF509417 A - Bridge wings (schematics)
IPI_SNL20064 Amundsen E-Drives	DAAF522186 - E-Drive propulsion IPI DAAF514112 - Variable frequency drive AFT - NX15006 AIR IP54 DAAF514111 - Variable frequency drive FWD - NX15006 AIR IP54 DAAF511313 - E-motor Drawing AFT - 1000kW TB Left DAAF511314 - E-motor Drawing FWD - 1000kW TB Top DAAF522014 - E-Drive Cable Diagram AFT DAAF522015 - E-Drive Cable Diagram FWD DAAF522021 - Filter Box DAAF522022 - Junction Box

#### 4. DP Installation (Wartsila Design)

Folder	Document Title
DP Installation (Wartsila Design)	27000000WI-690-B (DP System Drawings)
DP Installation (Wartsila Design)	27003061PS-690-A (System Configuration)

DP Installation (Wartsila Design)	27004005WI-690-B (Cable Specification DP system)
DP Installation (Wartsila Design)	27005000PS-690-B (System Specification DP system)
DP Installation (Wartsila Design)	27005290PS-690-B (IO Points List)
DP Installation (Wartsila Design)	Installation Manual DP (ID 240842)
DP Installation (Wartsila Design)	P19131 (DP Architecture Diagram)

## 5. Bow Thruster Upgrade (Wartsila Design)

Folder	Document Title
Bow Thruster Upgrade (Wartsila Design)	New Bow Thruster Drawings With DP
Bow Thruster Upgrade (Wartsila Design)	X2 pro 7, X2 marine 7, X2 control 7, X2 motion 7, (Bow Thruster Panel Cut-out Drawing)

## 6. Trials (Wartsila Design)

Folder	Document Title
Trials (Wartsila Design)	27000001TP-690-A - (Sea Trials Test Procedure DP system)
Trials (Wartsila Design)	27000004TP-690-A - (Dockside Trials Test Procedure DP system)

### 12.9.B.3 Regulations and Standards

12.9.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

- CSA W47.1-03, Certification of Companies for Fusion Welding of Steel
- CSA W47.2-M1987(R1998), Canadian Welding Bureau Standard for the Fusion Welding of Aluminum and Aluminum Alloys
- CSA W59-03, Welded Steel Construction (Metal Arc Welding)
- CSA 17, Canada Shipping Act - Tackle Regulations
- CSA 28, Canada Shipping Act - Hull Construction Regulations
- CSA 33, Canada Shipping Act – Marine Machinery Regulations
- CSA 29, Canada Shipping Act - Hull Inspection Regulations
- CSA 57, Canada Shipping Act – Safe Working Practices Regulations
- MOSHR, Canada Labour Code – Marine Occupational Safety and Health Regulations

- IACS Electrical Installations, Test Specification for Type Approval
- IEEE STD 45 – 1998, Recommended Practice for Shipboard Electrical Installations
- IEC 60092-504, Electrical Installations in Ships – Part 504: Special Features – Control and Instrumentation
- CSA C22.1, 98 Canadian Electrical Code Standard Part I Safety Standard for Electrical Installations
- CSA C22.2 No. 0-10, General Requirements – Canadian Electrical Code Part II
- ULC –S102.4-1987(R1998), Underwriters Laboratory of Canada Standard for Test for Fire and Smoke Characteristics of Electrical Wiring and Cable
- DGTE-69 (70-000-000-EU-JA-001), Specification for the Installation of Shipboard Electronic Equipment
- IEC 60034-1, Rotating Electrical Machines: Rating and Performance
- IEC 60529, Degrees of Protection Provided by Enclosures (IP Code)
- ISO 10816-6, Mechanical Vibration - Evaluation of Machine Vibration by Measurements on Non-Rotating Parts
- ISO 12944, Corrosion Protection of Steel Structures by Protective Paint Systems
- IACS No. 47 Shipbuilding and Repair Quality Standard (1996) Part B – Repair Quality Standard for Existing Ships
- MOSH, Maritime Occupational Health and Safety Regulations (MOSH)
- Classification Society Rules, Rules of a recognized Classification Society as identified under Section 2(1) of the Marine Machinery Regulations. e.g. Lloyd's Register Part 5 (Main and Auxiliary Machinery), Lloyd's Register Part 6 (Control and Electrical); Lloyd's Register's Rules for the Manufacture, Testing and Certification of Materials
- American Bureau of Shipping Regulations (ABS)
- Canada Shipping Act 2001, Machinery Regulations
- IACS Unified Procedure 31, Inclining Test Unified Procedure
- ASTM F1321-14, Standard Guide for Conducting a Stability Test

NOTE: In case of conflict between any of the standards listed, then the most stringent requirements will prevail.

### 12.9.C **SCOPE OF WORK**

- 12.9.C.1 The Contractor must perform the following scope of work under the technical assistance and guidance Wartsila Site Management, whom will, under the supply contract for the new retractable thruster system, organize FSRs, and provide guidance on all aspects of this specification item. Wartsila Site Management is to provide the Shipyard with technical guidance for all aspects of the removal and installation of equipment but the Shipyard is responsible for all work and scheduling as indicated in the specification. The Shipyard must, in conjunction with Wartsila Site Management, develop inspection points in the schedule to insure the quality of the work is to the satisfaction of the TA and Wartsila Site Management.

<b>Thruster System Renewal Work Scope (4 months)</b>
Receipt of Delivery: Identification of Equipment, Review, Quality Check
Existing Thruster System Removal
Structural Work

Mechanical Installation
Electrical and Controls Installation
DP System Installation
Trials and Acceptance

- 12.9.C.2 The Contractor must meet all relevant ABS rules and regulations. The Contractor is to follow Wartsila's IPI documents and the General sections of this specification. The thruster removal and new installation work scope will include, but not be limited to the following activities: hoisting, mounting, welding, grinding, painting, equipment alignment, installation of hydraulic piping and electric cabling, terminations, and first time oil fill for all new equipment to the correct working levels.
- 12.9.C.3 The Contractor must review and observe the transport and storage instructions provided in Wartsila's IPI's. The components of the existing retractable thruster system and new retractable thruster system are of significant weight/size and must be treated with special care and attention. The weights the existing thruster system components can be found in the HRP Thruster Installation Manual. The weights for the new components have been provided in Wartsila's IPI: DAAF509960 - Mounting Instruction. The Wartsila DP equipment contains sensitive electronic equipment and it must be handled appropriately. The weight of the DP equipment will be marked on the packing crates. The Contractor is to supply personnel and lifting arrangements as necessary for the safe removal and mounting of equipment.
- 12.9.C.4 The Contractor must develop a plan to install suitable certified lifting lugs and lifting appliances capable of safely lifting and moving the existing equipment out of the vessel and moving the new equipment into position. The Contractor must test and provide certificates for all new lifting lugs installed. Newly installed lifting lugs must have a minimum safety factor of 2.5 times the estimated highest component weight. The Contractor must consult with the TA to determine if the lifting lugs can remain or must be removed from the vessel. Where lifting lugs are removed the Contractor must grind all weld scabs and repair all paint in the area of the work.
- 12.9.C.5 The Contractor is responsible for the removal of all interference items required to assist with the removal of the existing system and the relocation of interference items to accommodate the installation of the new system. Several components have large dimensions and will need extra space during operation and maintenance and the Contractor must work with Wartsila Site Management to insure that these components are mounted appropriately for accessibility. The Contractor must restore all components removed from the vessel to the same condition as prior to starting the work. The Contractor will be required to repair any components damaged in the removal or installation of components. The Contractor will be

required to touch up all paint, per Wartsila's IPI: DAAK10164 - Paint specification and the General sections of this specification.

12.9.C.6 The Contractor may disassemble the existing equipment and components at their discretion for ease of removal from the vessel. All equipment and components from the existing system must be appropriately disposed of in accordance with all Federal, Provincial and Municipal regulations, with the exception of the fwd and aft seawater coolers.

12.9.C.7 The Contractor must install all new equipment per the instructions and details provided in Wartsila's IPI: IPI\_SNL20064 Amundsen. If the Contractor determines that disassembly of the equipment is required, the disassembly and reassembly is to be completed in consultation with Wartsila Site Management. In order to maintain the equipment warranty, all work must be viewed and meet the satisfaction of Wartsila Site Management.

12.9.C.8 The Contractor must map out transit routes for all equipment being removed and installed. The Contractor must include all costs for the removal and reinstallation of all interference items in their bid. There are various transit routes for the removal of major components. The intention is for the components to exit and enter the vessel through the forward and aft thruster wells at the bottom of the vessel. Any piping, manholes, parts and/or equipment and structures requiring removal to carry out the specified work and/or to gain access must be refitted upon completion with appropriate welding, jointing, anti-seize compound, clamps and brackets as applicable (Contractor supply). The option to remove the top hats above the thruster compartments is available to the Contractor. If this is to be included in the work plan, the Contractor must include in their bid proposal, all costs to open up, ventilate and provide certification for all tanks and spaces that require entry. This must include the certification of tanks for hot work, as well as maintaining the appropriate certification until the tanks have been closed. The Contractor is responsible for closing all tanks and replacing removed structure.

NOTE: Temporary lighting and/or temporary ventilation required by the Contractor to carry out any item of this specification must be supplied, installed and maintained in safe working condition by the Contractor and removed on completion of the related work.

12.9.C.9 The Contractor must plan the routing for all communication and power cables for the new equipment mounted on the Bridge to the machinery spaces, utilizing the existing cable runs and transits. The Contractor is responsible to open up the transits and reinstall all components in as new condition.

12.9.C.10 The Contractor must electrically isolate all power supplies and disconnect, label and protect all power cables to the equipment. The Contractor must assess all major power and feeder cables for re-use. The Contractor must provide all cabling other than the special cables

identified by Wartsila's IPIs. The cable lists, schematics and diagrams have been provided in the following Thruster System Reference Documents:

- Thruster Propulsion Control Cable\_List\_Amundsen
- DAAF509411 - Cable connection diagram
- DAAF509417 - Bridge wings (schematics)
- DAAF509414 - Propulsion control Unit (schematics)
- DAAF522014 - E-Drive Cable Diagram AFT
- DAAF522015 - E-Drive Cable Diagram FWD
- New Bow Thruster Drawings with DP
- 27004005WI-690-B (Cable Specification DP system)

NOTE: The motor cabling between the VFD's, Terminal Boxes, Junction Boxes, and Motor are relatively short. The Contractor will be responsible for extending the motor cabling between the Junction Boxes and the E-motor as specified in DAAF522186 - E-Drive propulsion IPI.

12.9.C.11 The Contractor must disconnect and remove and dispose all redundant electrical cabling associated with all respective services, communication devices, gauges, control devices, and indication devices associated with the equipment removal. Wiring that is to be reused must be properly labelled, pulled back, and protected for re-installation. The Contractor must adhere to the referenced standards when performing any and all work on the electrical systems. The Contractor must seal up all wire transits where the redundant cabling has been removed with approved electrical components and transit seals. To facilitate this installation, it is intended that all existing communication and electrical cabling will be re-used ONLY if the performance requirements as specified by Wartsila have been met. The Contractor must develop a cable condition report and identify in the report all cables to be removed and all cables that will be reused. Prior to reuse, the Contractor must conduct continuity and insulation testing on the existing cabling and verify its suitability for re-use. Any cables that have been intended for re-use with inadequate continuity or insulation readings must be replaced by submitting a PSPC Form 1379 for approval. The ESD precautions and installation instructions for the DP System have been provided in Wartsila's Installation Manual DP (ID 240842).

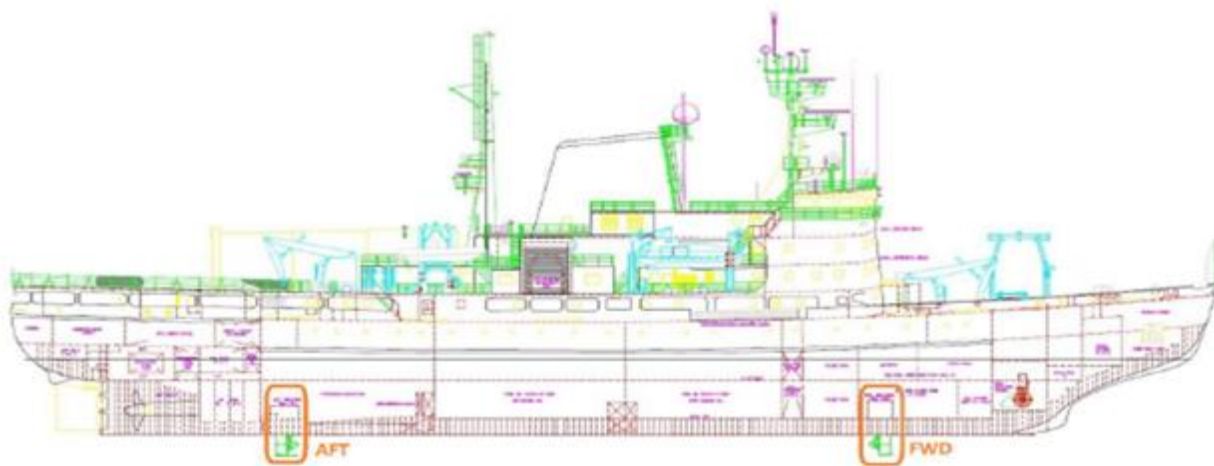
12.9.C.12 The Contractor will be provided with the following special tools listed in Wartsila's IPI: DAAF509960 - Mounting Instruction:

- Propeller (de)mounting hydraulic tools (Part T002050610)
- Transport tools; and
- Blanking plugs.



The Contractor must return the special tools in a non-damaged condition to the TA upon completion of retractable thruster system work items per the General Section of this specification.

- 12.9.C.13 The Contractor must be responsible for providing all standard tools for the completion of the work items, including but not limited to: hoisting slings, shackles, hoisting eyes, hard and soft wood, bolts washers and nuts, welding equipment, test equipment, lightening, chain hoists, and protection sleeves. It must be the responsibility of the Contractor to insure that all lifting components are certified for the weights and service they are to be used for. The Contractor is responsible for providing temporary hydraulic power packs and flushing equipment as required.
- 12.9.C.14 The Contractor must provide the TA with a list of all interrupted services to complete the retractable thruster removal, installation, testing, commissioning and trials. If there is a requirement to interrupt the vessel systems or crew safety systems, the Contractor must consult with the TA prior to taking any action. The TA will determine if temporary backup systems are required (i.e. the fire detection system or fire suppression system). The Contractor is responsible for all costs to setup the temporary system and to return the main system to operation. The Contractor must inspect, return all interrupted services to operating conditions, and re-certify systems or equipment if required.
- 12.9.C.15 **Existing Retractable Thruster System Removal**



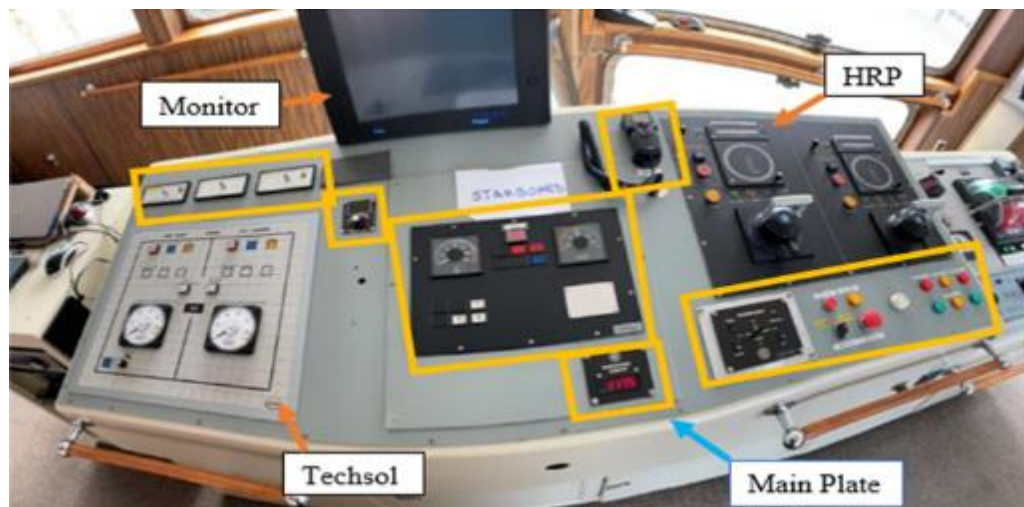
- 12.9.C.15.1 The Contractor must adhere to all guidelines for work supplied the General Section of this specification. Prior to starting the removal of equipment the Contractor must work with Wartsila Site Management to identify the components, cabling and pipe systems that will be removed and/or relocated and re-used. The Contractor must appropriately disconnect and isolate all services and systems prior to removing wiring, cables, hoses, equipment and components. This will include, but not be limited to the following: isolation of the electrical

and hydraulic systems, and the draining of all hydraulic and gearbox oil fluids. The Contractor must bid on the disposal of 2000L of used oil and appropriately dispose of all oils in accordance with all Federal, Provincial and Municipal environmental regulations. The Contractor must provide certificates for the used oil disposal.

12.9.C.15.2 The Contractor must disconnect and remove the existing retractable thruster system controls and equipment fitted on the Bridge Port/Starboard wing consoles and vessel crawlspace. This will include, but not be limited to the following: electrical controls, hardware, wiring, all components fitted internally in the consoles associated with the old equipment, for the operator interfaces listed below.

- a) Bridge Starboard and Port upper console top plates must be removed. The controls highlighted in yellow are to be retained for installation on the new Port and Starboard, Government supplied top plates. This includes all gauges, control devices, lamps/LEDs, wiring, wiring system components, communication devices.

**NOTE: Some controls on the existing upper console top plates will be retained and the top plate for the Port and Starboard must be utilized to develop the cut out patterns for the new Government supplied top plates. The mosaic tiles from the existing panel in the upper top plates must be retained for re-use in the lower plates to fill space around the new components where required.**



*Starboard Upper Console Top Plate*



*Port Upper Console Top Plate*

- b) Bridge Starboard and Port wing lower console Beier Radio DP Control components only must be removed from the lower console top plate. The controls highlighted in red, below, must be removed.

*Starboard wing lower console*



*Port wing lower console*



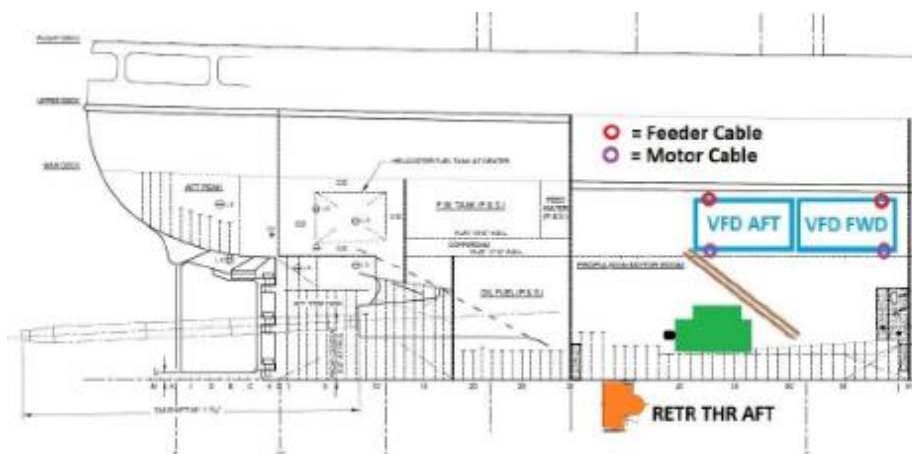
- c) The Contractor must disconnect and remove the existing forward and aft thruster control cabinets from the crawlspace in the Wheelhouse.



*Wheelhouse Crawlspace Thruster Control Cabinets*

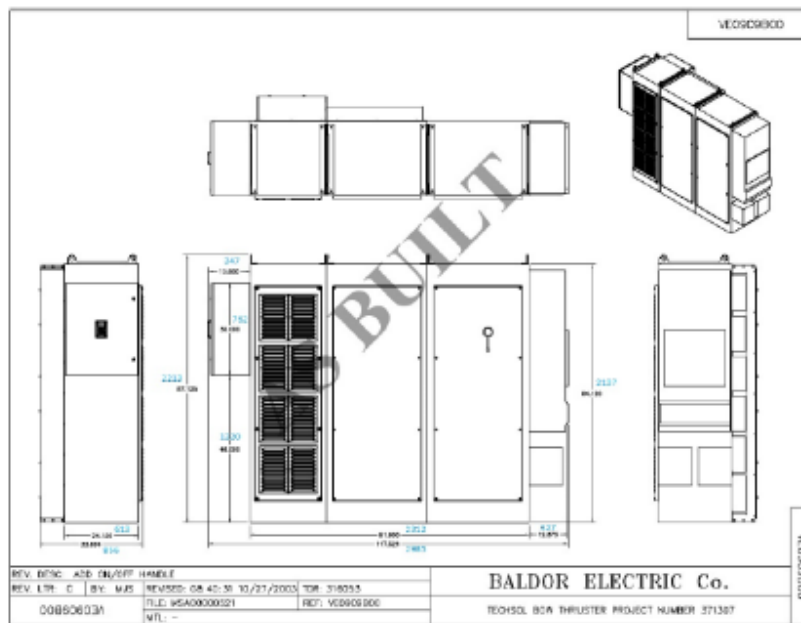
- d) The Contractor must disconnect and remove the existing thruster system VFDs and drive system control panel in the Propulsion Motor Room. This will include, but not be limited to the following: Baldor FWD/AFT VFDs/AC system/drive system transformer, Techsol drive system control box, electrical controls, hardware, wiring and operator interfaces. The Contractor must dispose of the refrigerant in the VFDs AC Unit appropriately, per government regulations.

NOTE: The existing cabinet seats and control box mounts are to be re-used by the Contractor. Modification or replacement of the existing seats and mounts will be treated with a 1379, if required. All redundant seats and mounts must be removed and disposed of by the Contractor. The power, feeder and motor cables are to be re-used and the cable entry points must be considered when the new cubicles and cabinets are mounted.



*2000-02-A-003\_Rev B Amundsen Motor Room Arrangement*





*Baldor AC-DC Variable Frequency Drives*



*Baldor Variable Frequency Drives*

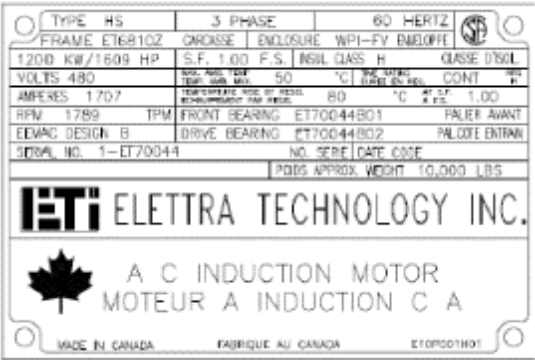


*Techsol Drive System Control Box*

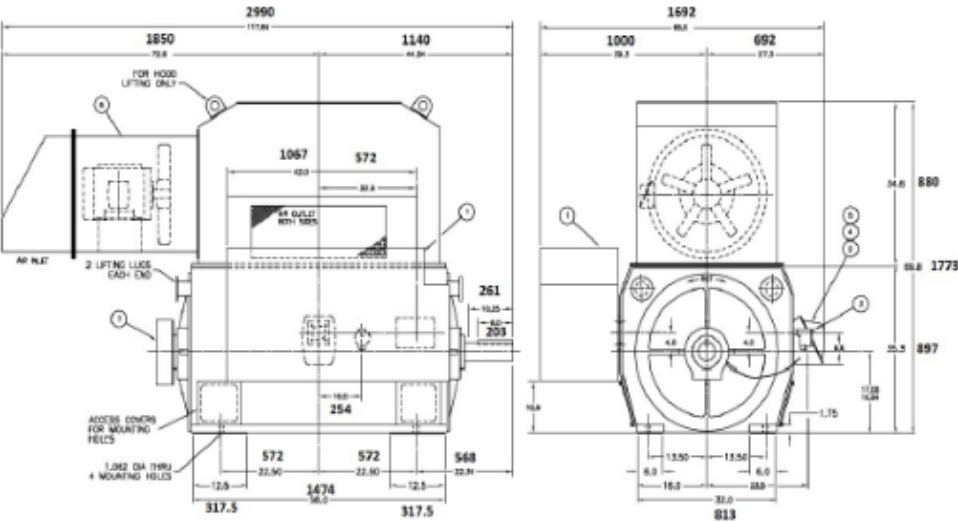
- e) The Contractor must disconnect and remove the existing Forward and Aft Electric Drive Motors and control boxes from the Thruster Compartment and Propulsion Motor Room, respectively. This will include, but not be limited to the following: Elettra electric drive motors, drive shafts and couplings, electric drive system control boxes, electrical controls, hardware, wiring and operator interfaces.

NOTE: The existing motor support structures and control box mounts are to be reused as per Wartsila's IPI: IPI\_SNL20064 Amundsen. The cable support trays must be reviewed

for retention and reused if possible. The Contractor is responsible to build permanent mounts for the new E-motors and clutch arrangements. The Contractor must manufacture chocks and shims or utilize chock fast to align all components. The power and feeder cables are to be reused and the cable entry points must be considered when the new motors and cabinets are mounted. After final installation and alignment of all equipment, the Contractor must install tapered pins or dowels to ensure the alignment is maintained.



Elettra Electric Drive Motor Plate



Elettra Electric Drive Motors



*Forward Elettra Electric Drive Motor (Forward Thruster Compartment)*



*Motor Cabling from VFD, filter box, Forward E-motor*



*Aft Elettra Electric Drive Motor (Propulsion Motor Room)*



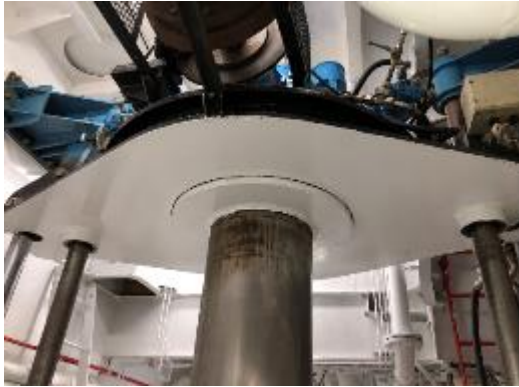
*Motor Cabling from bottom of VFD cabinet (Propulsion Control Room) to Aft E- Motor Terminal Box (Propulsion Motor Room)*

- f) The Contractor must disconnect and remove the existing Forward and Aft Hydraulic Power Pack Steering and Retraction System from the Thruster Compartment, Propulsion Motor Room, Station de Pompage Avant Valve Control Room (Fr 146 to 150 on Upper Dk), and Unit de Ventilation 5 (port of central line Fr. 13 to 31 on Upper Dk). This will include, but not be limited to the following: hydraulic power units, motors, seawater cooling system, control cabinets, oil header tanks, hydraulic hoses, electrical controls, hardware, wiring and operator interfaces.

NOTE: The intent is to utilise all existing piping connections from the ships services (oil and air systems), hydraulic power unit structures, control box mounts, and oil header tank support structures as they are fitted to the vessel. The power and feeder cables are to be evaluated and re-used if possible. The hydraulic piping and cable entry points must be considered when the new hydraulic power units and cabinets are mounted.

**NOTE: The existing seawater cooling system must be removed without damage, secured on a pallet, and stored safely on board the vessel for the TA.**





*Forward Thruster (Fwd Thruster Compartment)*



*Aft Thruster (Aft Thruster Compartment)*



*Forward Thruster UGB (Fwd Thruster Compartment)*



*Aft Thruster UGB (Aft Thruster Compartment)*



*Forward Thruster Hydraulic Power Unit (Fwd Thruster Compartment)*



*Forward Thruster Control Cabinets (Fwd Thruster Compartment)*



*Forward Oil Header Tank (Station de Pompage Avant Valve Control Room)*



*Aft Thruster Hydraulic Power Unit and Control Cabinet (Propulsion Motor Room)*



*Aft Thruster Control Cabinet (Aft Thruster Compartment)*



*Aft Oil Header Tank (Unit de Ventilation 5)*

- g) The Contractor must remove and dispose of the existing Forward and Aft retractable thruster system equipment and auxiliary components from the thruster compartments. This will include, but not be limited to the following: upper gearboxes, hydraulic friction clutches, steering gears, vertical stems, base plates, support brackets, guide bars, gaskets, flanges, transmission couplings, intermediate shafts, hydraulic actuators, hydraulic thruster control system, control boxes, hydraulic hoses, electrical controls, hardware, wiring and operator interfaces.
- h) The Contract must inspect the thruster compartments, wells, and thruster seats for alignment, and perform appropriate flatness checks and measurements after the existing retractable thruster units have been removed, with the technical guidance and assistance

of Wartsila Site Management and the alignment criteria provided in Wartsila's IPI: IPI\_SNL20064 Amundsen.

NOTE: The existing thruster support structures, control box mounts are to be reused per Wartsila's IPI: IPI\_SNL20064 Amundsen. The cable support trays must be reviewed for retention and reused if possible. The power and feeder cables are to be reused and the cable entry points must be considered when the new motors and cabinets are mounted.

- i) The Contractor must remove the existing retractable thruster system units from the thruster wells by cutting out both hull closing plates. The Contractor must keep the extent of cuts in the ships external shell structure to a minimum. It must be the responsibility of the Contractor to develop an approved cutting and installation method for all openings that cut into the ships structure with regard to ABS approval.
- j) The removal of the existing thruster system components will include, but not be limited to the following: underwater gearboxes, underwater support bars, securing hooks, guide bars, hydraulic cylinders, 4-bladed propeller, nozzles, anodes, and hull closing plates.

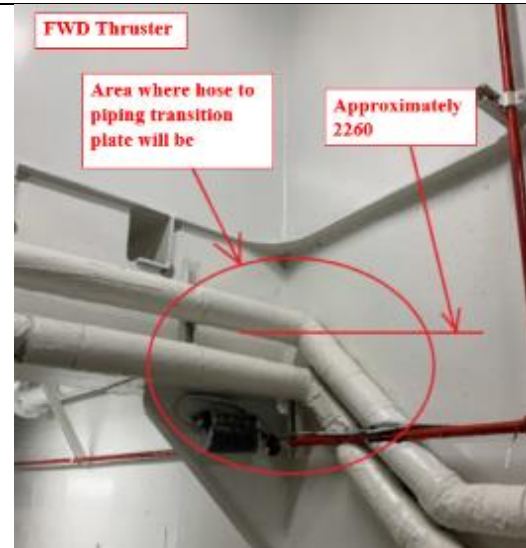
12.9.C.15.3 The Contractor must reposition all obstruction items in way of the thruster system installation to suitable locations. The Contractor must include all costs to move obstruction items. The Contractor must re-install all components removed from the vessel to the same condition as prior to starting the work. The Contractor will be required to repair any components damaged in the removal, re-installation, or installation of new components. The Contractor must fit new gaskets and fasteners to any disturbed piping and manholes.

12.9.C.15.4 The Contractor must be responsible for the removal of all interference items required to assist with the removal of the existing system and the installation of the new system.

12.9.C.15.5 The following items have been identified as possible interference items that may require configuration changes with respect to the new retractable thruster system equipment. The Contractor must include in their bid the relocation of equipment to satisfy their intended work plan. Final location of all equipment must meet all regulations and allow the equipment to be fully functional and accessible for service:

Location	Specifics
<i>Forward Thruster Compartment</i>	<u>Relocation of Steam lines</u> The new USG lube oil cooler will be installed on the side wall opposite the flume tank. The steam heater lines may need to be rerouted to allow space for the flexible hoses between the thruster and lube oil cooler.





### *Forward Thruster Compartment*

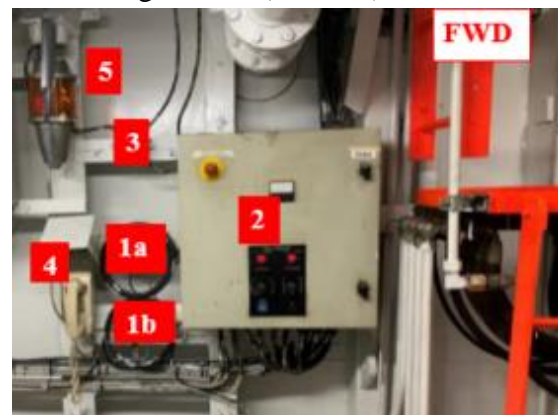




### Relocation of Interference Items in way of Fwd Thruster Control Cabinet

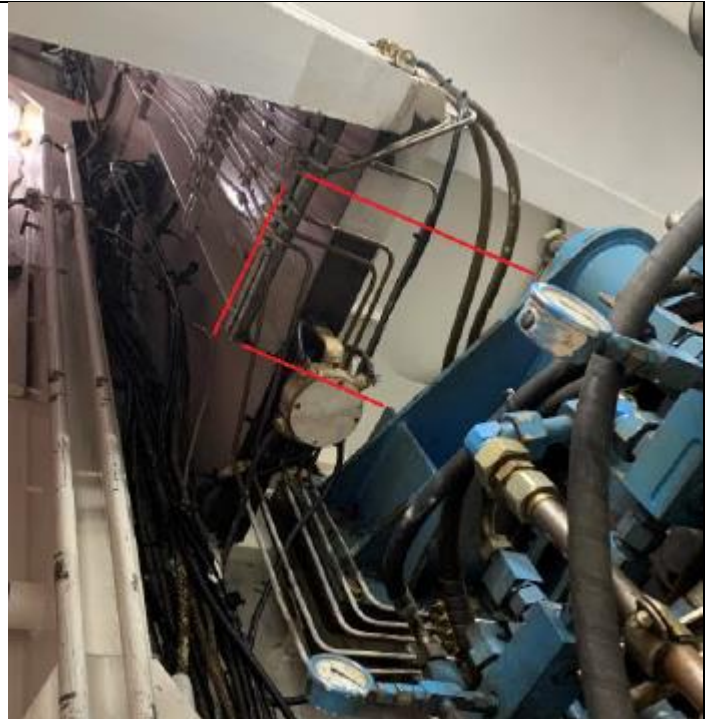
The existing Fwd HRP control cabinet will be replaced by a new Fwd Thruster Control Cabinet.

This installation will require the removal of the HRP control cabinet and mounting points (no. 2) and relocation of the following components and associated wiring:

- 1a and 1b. Techsol interface cabinets (relocate)
2. HRP Control Cabinet and mounting points (remove)
3. Local wiring terminal box (relocate)
4. Telephone and splash guard (relocate)
5. Flashing beacon (relocate)

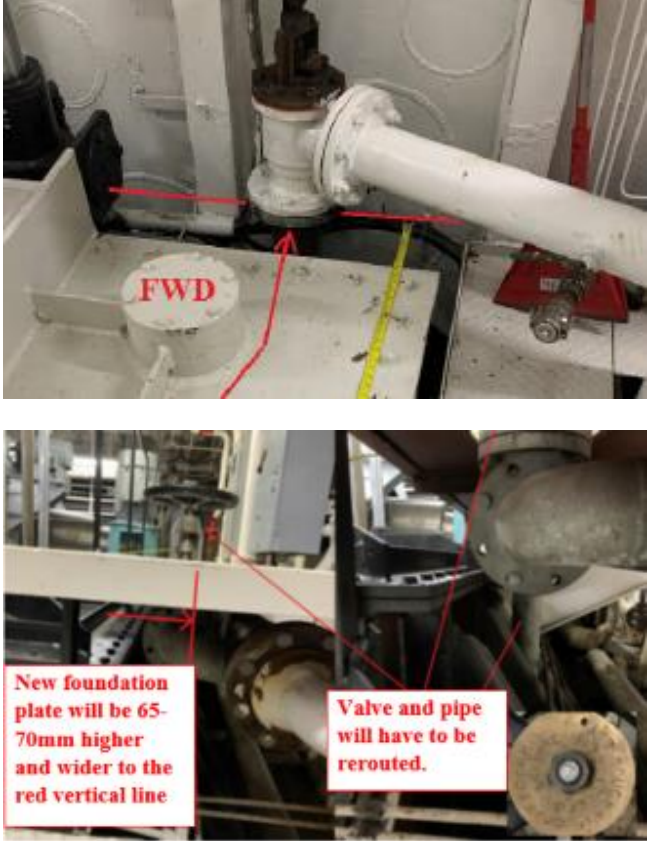

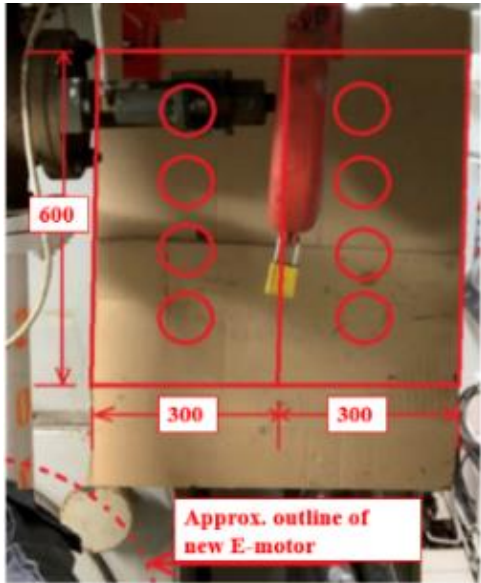


<i>Aft Thruster Compartment</i> 	<u>Relocation of Interference Items in way of Aft Thruster Control Cabinet</u> The existing Aft HRP control cabinet will be replaced by a new Aft Thruster Control Cabinet. This installation will require the removal of the HRP control cabinet and cables and relocation of the CO2 discharge pipe (red), to the left of the cabinet. <ol style="list-style-type: none"><li>1. CO2 discharge, red pipe (relocate)</li></ol> 
<i>Forward Thruster Compartment</i>	<u>Relocation of Quick Closing Valves in Fwd Thruster Compartment</u> The quick closing valve lines above the thruster, leading through the Fwd Thruster well must be re-routed.



The new foundation plate for the Fwd Thruster will be 65-70mm higher and the following valve must be re-routed:



	 <p>New foundation plate will be 65-70mm higher and wider to the red vertical line</p> <p>Valve and pipe will have to be rerouted.</p>
<p><i>Fwd Thruster Compartment</i></p> 	<p><u>Valve Rotation in Fwd Thruster Compartment</u></p> <p>A Junction Box will be installed between the cabling from the VFD to the E-motor and upon installation, the following valve may require rotation:</p>  <p>Approx. outline of new E-motor</p>



#### 12.9.C.16 **Structural Work**

12.9.C.16.1 The Contractor must provide all materials for the new thruster system support structures and reinforcements. All steel is to be of Lloyds Grade A quality and supplied with Lloyd's Class certification. The Contractor must follow all applicable structural construction details and steel grades provided in Wartsila's IPI: IPI\_SNL20064 Amundsen and General Arrangement Drawings:

- 5379002-263-003 Rev.A Foundation aft retractable thruster Model
- 5379002-263-004 Rev.B Foundation fwd retractable thruster Model

**NOTE: Wartsila Canada will be providing the new hull closing plates based on Wartsila design. The cost to fit the closing plates and the associated hull structure, including treatment and paint, per the Underwater Paint Specification for the vessel, will be treated through a 1379.**

12.9.C.16.2 The Contractor must follow Wartsila's alignment, drilling and mating procedures for the mounting and welding of the intermediate and closing plates. The sequence for fixing and fastening the gaskets must be followed in accordance to the details provided in Wartsila's IPI: IPI\_SNL20064 Amundsen and DAAF509960 - Mounting Instruction.

12.9.C.16.3 The Contractor must develop a complete welding schedule with a weld inspection and test plan, for the reinstallation of all cut steel, and new steel structures including, the hull closing plates, thruster well modification and thruster system equipment support structures. The welding work schedule must be in accordance with the General Section of this specification, Wartsila's IPI: DAAF509960 - Mounting Instruction, and must be approved by ABS prior to commencement of the structural work. The Contractor must take all necessary precautions to prevent distortion of the thruster well during welding operations. The Contractor must protect all parts and equipment from damage during welding.

12.9.C.16.4 The Contractor must be responsible for isolating all equipment, piping systems, wiring, electrical fixtures, and fittings in way of the installation route and ensure the aforementioned are re-installed to original condition after the equipment is installed.

12.9.C.16.5 The Contractor must be responsible for all temporary supports required to maintain the integrity and shape of the vessel structure during this phase of the project.

12.9.C.16.6 The Contractor must be responsible for all final finishing and cleaning in accordance to the General Section of this specification.

#### 12.9.C.17 **Mechanical Installation**

- 12.9.C.17.1 The complete retractable thruster units must be fitted to the hull with the technical assistance and guidance of Wartsila Site Management and FSRs. The Contractor must adhere to the General Sections of this specification and Wartsila's IPI: IPI\_SNL20064 Amundsen and document DAAF509960 B - Mounting Instruction when performing all mechanical installation activities.
- 12.9.C.17.2 The Contractor must prepare the Wartsila equipment supply for mounting and installation. The new retractable thrusters and auxiliary equipment must be unpacked from their respective shipping crates and inspected by Wartsila Site Management prior to installation. The Contractor must be responsible for the disposal of all packing materials. Some equipment will require pre-assembly and partial assembly as specified in Wartsila's IPI: IPI\_SNL20064 Amundsen and document DAAF509960 B - Mounting Instruction. The shipping supports for the large components have been designed to assist in moving the equipment into the vessel. The Contractor must follow all applicable recommendations for the complete retractable thruster system with respect to transportation and storage, preservation, equipment handling, preparation, warnings, surface pre-treatment, masking and protection, blasting, hoisting, cleaning, assembly, torqueing, mounting, installation, alignment, and commissioning.
- 12.9.C.17.3 The Contractor must assemble and install the complete thruster system, which will include, but not be limited to the: thruster propellers and pods, E-motor flanges, couplings, quick connect clutch, quick connect coupling, pneumatic control panel for quick connect clutch, intermediate plate, mounting plate, hydraulic cylinders, switch assembly, thruster beams, guiding rods, locking hooks assembly, E-motor foundations, underwater guides, stem sections, upper gearboxes, brake calipers, pneumatic break control panels, speed transmitters, nozzle assembly, cooling systems, lubrication pump units and tanks, monitoring systems, water separator units (EnduraPacs), steering system counter balances, steering and retraction power packs, and cables, piping, and hydraulic hoses into the vessel in accordance to the instructions provided in Wartsila's IPI: IPI\_SNL20064 Amundsen and DAAF509960 - Mounting Instruction under the technical assistance and guidance of Wartsila Site Management and FSRs.

NOTE: The Contractor must adhere to the details provided in the drawings with respect to the assembly of the equipment. The Contractor must review the details for the nozzle assembly drawing and bid on the details in Section A of the drawing. The Contractor must supply and install the fasteners noted on Wartsila's installation drawings and instructions.

- 12.9.C.17.4 The Contractor must torque all fasteners and bolts per the instructions provided in Wartsila's IPI: IPI\_SNL20064 Amundsen.

Torque tables, details and sequence for fasteners and bolts has been provided in:

- DAAF509960 - Mounting Instruction

- T002050443 - Torque manual
- T002010625 - Operation manual for curved tooth couplings
- T002007926 - Assembling instructions piping
- DAAK115550 - Installation Quick connect coupling - Standard manual

- 12.9.C.17.5 The Contractor must fit the seats for the hydraulic equipment and install the fwd and aft hydraulic system with respect to the installation instructions provided in Wartsila's IPI: IPI\_SNL20064 Amundsen under the technical assistance and guidance of Wartsila Site Management and FSRs.
- 12.9.C.17.6 The Contractor must install and mount the starter cabinets and equipment so that they remain accessible for inspection, maintenance and service. The Contractor must utilize the existing support mounts and frames where possible and supply all additional steel frames and mounts in accordance with the guidance provided by Wartsila Site Management and Wartsila's IPI: IPI\_SNL20064 Amundsen.
- 12.9.C.17.7 The Contractor must retain the existing hydraulic piping where possible, utilizing all applicable piping passing through the retractable thruster compartment to other spaces. The Contractor must supply, arrange and install all new lube and hydraulic piping, cabling, gaskets, domestic air supply, and interconnections required between the hydraulic pumps, motors, EnduraPac units, tanks, seawater coolers and controllers in accordance with Wartsila's IPI: IPI\_SNL20064 Amundsen.
- 12.9.C.17.8 The Contractor must connect the ships domestic air system to the Aft (Propulsion Motor Room) and Forward (Carpentry Workshop) EnduraPac units in the Engineers Store room and Forward Thruster compartment. The Contractor must ensure that the supply pressure is correct and supply the required regulators to achieve the correct operating pressure.
- 12.9.C.17.9 The Contractor must perform all cleaning protocols to prevent contamination, flushing processes, mounting of bite type fittings, pre-assembly, and final assembly per Wartsila's IPI: IPI\_SNL20064 Amundsen. The hydraulic piping and hoses must be pressure tested according to the Wartsila's recommendations. The Contractor must label and mark all piping and cabling per Classification Regulations. The tests must be conducted under the technical assistance and guidance of Wartsila Site Management and FSRs to ensure the condition of the hydraulic system is acceptable. The test results must be documented by the Contractor and supplied to the TA.
- 12.9.C.17.10 The Contractor may isolate and remove piping at their own expense during the removal and installation of the retractable thruster to prevent damage or allow access for welding. Piping must be returned to its original position and condition prior to the completion of the contract at the Contractor's expense. All hydraulic piping must be labelled and marked appropriately. The Contractor must clean and flush the entire system including all piping and joints prior

to operation and testing. The Contractor must provide all equipment and oils for flushing the system and the cost for oil disposal.

12.9.C.17.11 The Contractor must supply and install all required hydraulic fluids and gearbox oils. The Contractor must supply 1600L of Shell - Naturelle S4 Gear Oil for the Thruster System and 300L of Petro Canada - Hydrex AW32 for the Steering System as well as oil for flushing the system. The Contractor must insure that the required fluids are available for filling and flushing the hydraulic system per DAAF509960 - Mounting Instruction – Filling with oil.

12.9.C.17.12 The Contractor must perform all installation, intermediate and final alignment checks on the hydraulic power pack steering and retraction system under the technical assistance and guidance of Wartsila Site Management and FSRs with respect to the details provided in Wartsila's IPI: IPI\_SNL20064 Amundsen.

12.9.C.17.13 The Contractor must set the limit switches and conduct pressure and leak testing for all new and reused piping under the technical assistance and guidance of Wartsila Site Management and FSRs.

12.9.C.17.14 The Contractor must install the Aft and Forward pneumatic brakes and control panels under the technical assistance and guidance of Wartsila Site Management and FSRs, per Wartsila's IPI: IPI\_SNL20064 Amundsen and the following documents:

- T002010625 - Operation manual for curved tooth couplings
- T003001143 - Brake calipers
- DAAK100231 - Pneumatic brake control panel

12.9.C.17.15 The Contractor must clean the brake piping in accordance to Wartsila's IPI: IPI\_SNL20064 Amundsen and T003002114 - Cleaning specification for piping. The Contractor must connect the pneumatic brake control panels to the ships domestic air supply system and ensure that the supply pressure is correct. The Contractor must supply the required regulators to achieve the correct operating pressure.

12.9.C.17.16 The Contractor must clean, inspect, and perform re-alignment where required on the retractable thruster system components and equipment under the technical assistance and guidance of Wartsila Site Management and FSRs. All alignment must meet the tolerances stated in the reference documentation, which includes, but is not limited to: structural components, couplings, sensors and individual motor sets.

12.9.C.17.17 The Contractor must attach the Wartsila supplied anodes per to Wartsila's IPI: IPI\_SNL20064 Amundsen and DBAE450427 - Cathodic protection, under the technical assistance and guidance of Wartsila Site Management and FSRs.

12.9.C.17.18 The Contractor must carry out all coatings and touch-ups in accordance with the paint manufacturers' recommendations as indicated in Wartsila's IPI: IPI\_SNL20064 Amundsen, DAAK101641 - Paint specification and the General Section of this specification. The inspection of all work is to be witnessed by the TA, IA and Wartsila Site Management.

12.9.C.17.19 The Contractor must assist Wartsila Site Management and FSRs with the testing, commissioning and set to work activities following the mechanical installation.

12.9.C.18 **Electrical and Controls Installation**

12.9.C.18.1 The Contractor must install the electrical and control system to provide a fully functional retractable thruster system in accordance with Wartsila's requirements and the General Section of this specification. The electrical equipment, VFDs, E-Drives, filter boxes, junction boxes, control cabinets and consoles must be fitted with the technical assistance and guidance of Wartsila Site Management and FSRs. The Contractor must adhere to the instruction details provided in Wartsila's IPI: IPI\_SNL20064 Amundsen and documents DSCA00290009 - Propulsion Control Unit IPI and DAAF522186 - E-Drive propulsion IPI when performing all electrical and controls installation activities.

12.9.C.18.2 The Contractor must evaluate the re-use of the existing mounting arrangements with Wartsila Site Management. The Contractor must supply additional or mounting arrangements, brackets and fasteners where required for the electrical equipment, control panels, cabinets, and terminal and junction boxes in accordance with Wartsila's IPI: IPI\_SNL20064 Amundsen.

12.9.C.18.3 The Contractor must fit the seats and mountings for the electrical control panels and cabinets in such a way that the units remain accessible for all inspections, maintenance and service. All panel doors must have free opening and all equipment maintenance clearances must be considered.

12.9.C.18.4 The Contractor must supply all additional cabling required per the cable lists provided by Wartsila. This must include all cabling, cable strain reliefs, cableways, safety interlocks, protection and the necessary deck and bulkhead penetrations for the cables.

12.9.C.18.5 The Contractor must utilize existing cable trays where possible. In locations where new (intermediate) trays are required, these must be supplied and mounted by the Contractor in accordance with ABS regulations. Cables for communication, monitoring and signal cables, are to be mounted a safe distance from power cables in order to prevent interference. Special attention in this respect must be given to the cable installations in the Propulsion Control Room, Propulsion Motor Room, the Bridge, and Thruster Compartments. The Contractor must secure all cables as per electrical standards.

- 12.9.C.18.6 The Contractor must install the VFDs, E-motors, Quick connect clutches, motor cabling between the VFDs and Forward and Aft E-motors, filter and junction boxes utilizing the existing cabling if possible, per Wartsila's IPI: IPI\_SNL20064 Amundsen, under the guidance and supervision of Wartsila Site Management and FSRs.
- 12.9.C.18.7 The Contractor must supply all extended motor cabling requirements for the E-motor installation, per DAAF522014 - E-Drive Cable Diagram AFT and DAAF522015 - E-Drive Cable Diagram FWD. The E-motor drive flange must be mounted on the shaft end prior to installation. The E-motors must be mounted and aligned with respect to Wartsila's recommendations under the technical guidance and supervision of Wartsila Site Management and FSRs.
- 12.9.C.18.8 The Contractor must align the Thruster System and auxiliary equipment in accordance with the instructions and tolerances provided in Wartsila's IPI: IPI\_SNL20064 Amundsen. The Contractor must provide all alignment readings to Wartsila Site Management and the TA for review. The Contractor must ensure that all equipment is locked in position such that the alignment is maintained under all operating conditions.
- 12.9.C.18.9 The Contractor must install the new retractable thruster controls cabinets and bridge consoles under the guidance and supervision of Wartsila Site Management and FSRs in accordance with Wartsila's IPI: IPI\_SNL20064 Amundsen, DSCA00290009 - Propulsion Control Unit IPI and the following reference documents:
- DAAF509411 - Cable connection diagram
  - DAAF509412 - Bridge starboard wing
  - DAAF509413 - Layout control cabinet
  - DAAF509414 - Propulsion control Unit (schematics)
  - DAAF509415 - Bridge panel layout port wing
  - DAAF509416 - Bridge panel layout starboard wing
  - DAAF509417 - Bridge wings (schematics)
- 12.9.C.18.10 The Contractor must install the Forward and Aft control cabinets in such a way that the units remain accessible for all inspections, maintenance and service.
- 12.9.C.18.11 The Contractor must relocate and re-install all interference items, piping and cabling, post cabinet installation, under the guidance and supervision of Wartsila Site Management and FSRs.
- 12.9.C.18.12 The Contractor must subcontract Techsol Marine to complete the following aspects of the electrical, automation and propulsion controls installation:

- Controls adjustments for the port and starboard wing stations on the Bridge
- I/O integration and configuration to the DP and AMS
- Alarm and Monitoring Station Thruster AMS interface and integration
- Mosaic panel adjustments in the Machine Control Room to represent the new system

12.9.C.18.13 The Contractor must make a cut out per X2 pro 7, X2 marine 7, X2 control 7, X2 motion 7, (Bow Thruster Panel Cut-out Drawing) in the Bow Thruster Control Cabinet Door, under the guidance and supervision of Wartsila Site Management and FSRs.

12.9.C.18.14 The Contractor must refer to New Bow Thruster Drawings With DP and install, connect, label and terminate: new cables J1, J2, J3, and J4, as well as a new signal for the lamp indicator for DP/JS, under the guidance and supervision of Wartsila Site Management and FSRs.

12.9.C.18.15 The Contractor must connect all wiring, signal interfacing to the Bow Thruster control stations on the port and starboard Bridge wing consoles under the guidance and support of Wartsila Site Management and FSRs.

12.9.C.18.16 The Contractor must assist Wartsila Site Management and FSRs with the testing, commissioning and set to work activities following the electrical and controls installation.

#### 12.9.C.19 **DP System Installation**

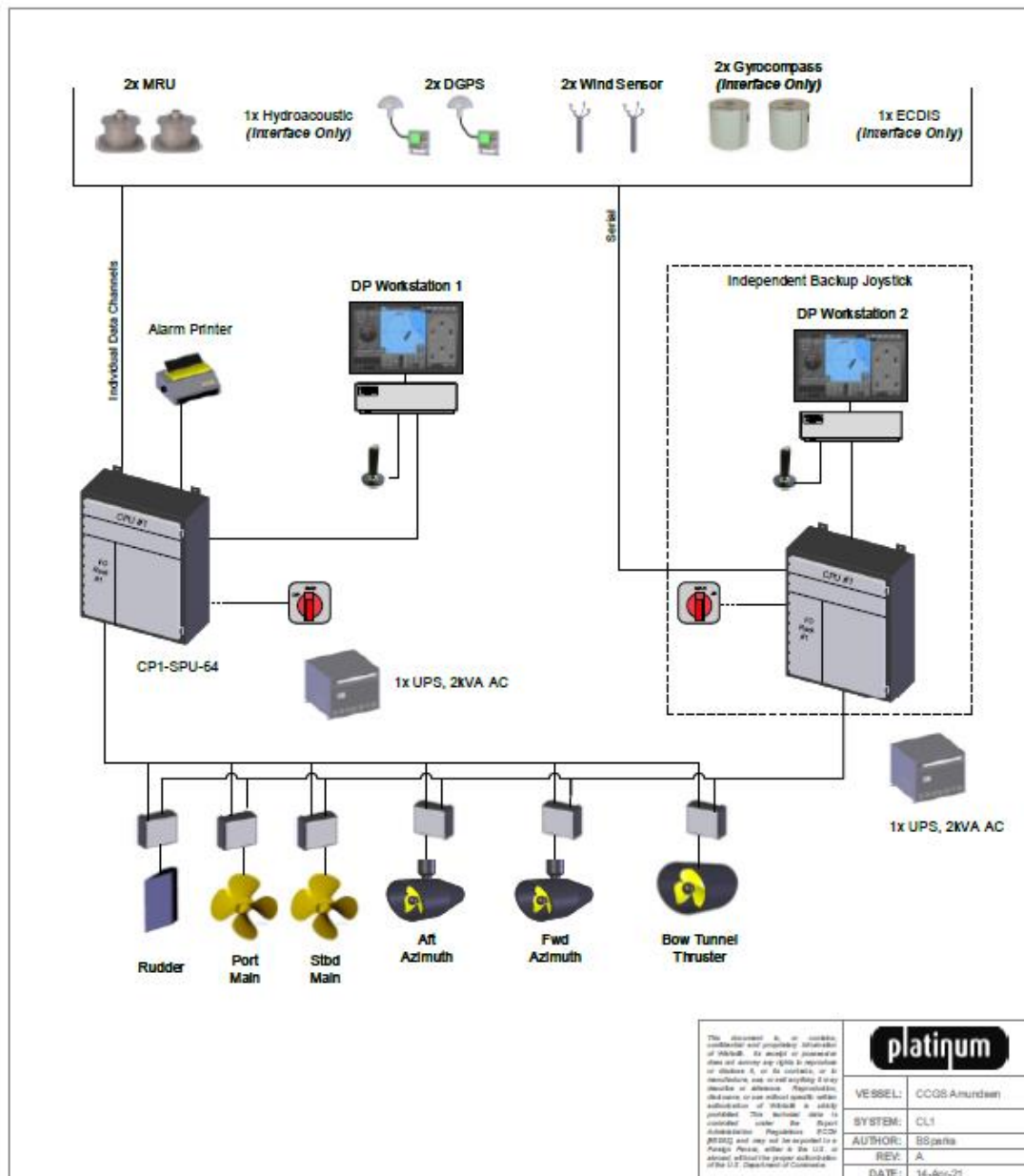
12.9.C.19.1 The Contractor must install and interface two DP Operator Workstations (DP MFD and JS MFD) with peripherals, DP and JS Signal Processing Units, Alarm/Screen Printer, System Selector Switches, on the Port and Starboard Bridge consoles under the guidance and supervision of Wartsila Site Management and FSRs, in accordance with the following reference documents:

- Installation Manual DP (ID 240842)
- 27000000WI-690-B (DP System Drawings)
- 27003061PS-690-A (System Configuration)
- 27004005WI-690-B (Cable Specification DP system)
- 27005000PS-690-B (System Specification DP system)
- 27005290PS-690-B (IO Points List)

12.9.C.19.2 The Contractor must install and interface the following position, heading and environmental sensors through the Signal Processor Units Control Processor computers: DGPS 1 and 2 (Fugro Seastar 9205), Hydroacoustic System, Motion Reference Unit 1 and 2 (SMC IMU-007 and 108) per Wartsila's Installation Manual DP (ID 240842), under the guidance and supervision of Wartsila Site Management and FSRs.

12.9.C.19.3 Removed

12.9.C.19.4 The Contractor must interface the heading and environmental sensors through the Signal Processor Units Control Processor computers: Gyrocompass 1 and 2 (Anschutz Standard 20), and ECDIS (Aldebaran Navigation Suite and Navaid Module) per Wartsila's Installation Manual DP (ID 240842), under the guidance and supervision of Wartsila Site Management and FSRs.



DP Architecture Diagram (P19131 DP Architecture Diagram)



- 12.9.C.19.5 The Contractor must install the DP control cabinets in the crawl space under the Wheelhouse on the port and starboard with appropriate mounts and supports according to Wartsila's Installation Manual DP (ID 240842), under the guidance and supervision of Wartsila Site Management and FSRs.
- 12.9.C.19.6 The Contractor must supply and connect all associated wiring, transits, and strain reliefs for the environmental and position sensors in accordance with the System Interfaces communication protocol and baud rates provided by Wartsila, under the guidance and supervision of Wartsila Site Management and FSRs.
- 12.9.C.19.7 The Contractor must supply and install all brackets required for the new equipment, under the guidance and supervision of Wartsila Site Management and FSRs.
- 12.9.C.19.8 The Contractor must supply and install the propulsion interfaces and required cabling for the DP System per the propulsion configuration details provided by Wartsila, under the guidance and supervision of Wartsila Site Management and FSRs.
- 12.9.C.19.9 The Contractor must install the diesel generator interfaces for the DP System per the power distribution one line configuration, vessel's generator interfaces, and electrical switchboard interface provided by Wartsila, under the guidance and supervision of Wartsila Site Management and FSRs.
- NOTE: The Propulsion Control System is provided by ABB. The Contractor may be required to consult with ABB to determine the correct interface with the new DP System. There may be a requirement to have an ABB representative present for commissioning and trials. The Contractor must indicate to the TA if there is a requirement for ABB input. The ABB work will be paid through a separate PWGSC 1379 form.
- 12.9.C.19.10 The Contractor must assist Wartsila Site Management and FSRs with the testing, commissioning and set to work activities following the DP System installation.

#### 12.9.D **Proof of performance**

##### 12.9.D.1 **Inspection Points – [Not Used]**

##### 12.9.D.2 **Tests and Trials**

- 12.9.D.2.1 The Contractor must assist Wartsila Site Management and FSRs to perform commissioning, testing and performance trials in accordance with Wartsila's Retractable Thruster acceptance protocols, 27000004TP-690-A (Dockside Trials Test Procedure DP system), 27000001TP-690-A (Sea Trials Test Procedure DP system), provided by Wartsila.
- 12.9.D.2.2 The Dock and Sea Trials must be completed with the assistance of the Canadian Coast Guard crew who will operate the equipment under the direction of Wartsila Site Management and

FSRs. The Contractor must supply a test and trials plan, procedures and schedule for the TA and Classification Society for review.

- 12.9.D.2.3 The Contractor must record and supply a final report detailing all system measurements and data to establish the “as commissioned” conditions for future use.
- 12.9.D.2.4 The Contractor must satisfy classification and safety requirements by demonstrating the performance and operation of the retractable thruster system. The Contractor must prepare and supply a trial agenda to the TA and ABS for approval prior to the trials.
- 12.9.D.2.5 The Contractor must ensure that, during all testing and commissioning procedures, there is sufficient depth below the vessel prior to deploying the retractable thruster units.
- 12.9.D.2.6 The Contractor must carry out all tests with the assistance and guidance of Wartsila Site Management and supplied FSRs. The testing must be performed in the presence of the TA and Classification Society. After final commissioning the Contractor must prove that all equipment operates safely, as designed, and to ABS requirements.
- 12.9.D.2.7 The Contractor must test and commission the retractable thruster system under the technical assistance and guidance of the Wartsila Site Management and FSRs post installation activities, in order to prove the operation of all components, equipment, and the retractable thruster system as a whole. For bidding purposes all Contractors are to bid for 8 days of Dock Trials, at 10 hours per day, for 5 personnel and for 4 days of Sea Trials, at 10 hours per day, for 5 personnel. This will include, but not be limited to:
- a) Inspection of the mechanical and electrical control systems of the retractable thruster system installation, including electrical wiring, piping, and hydraulic fluid levels.
  - b) Adjustment of the settings on the hydraulic pump units and electric drive motors.
  - c) Testing the Retractable Thruster rotation and controls of the azimuthing functions.
  - d) Testing of all function to deploy and retract the thrusters and stow in safe and secure position.
  - e) Testing of the operation of the retractable thruster system and DP remote controls from all stations and adjusting where required.
  - f) Gathering initial system measurements and data to establish the “as commissioned” system settings.
  - g) Demonstrating the auxiliary steering and clutch control functions.
  - h) Testing of all safety devices and all possible failure modes, including loss of power.
  - i) Presentation of the retractable thruster system and DP system installation to the IA, TA and ABS Surveyor.

**NOTE: Additional time, if required, will be treated through a PWGSC 1379 form.**

- 12.9.D.2.8 The Contractor must review the parameters supplied by Wartsila and assist the FSRs with the acceptance protocols for the Thruster Room Equipment, Local Control in the Thruster Room, Remote Control Panel Functions, Alarms and Monitoring, Dock Trials and Sea Trials. The Contractor must record all checklist results for the Sea Trials, Hydraulic Steering, Pitching and Lubrication, Retraction Hydraulics, E-Motor Data, and Running-in.
- 12.9.D.2.9 Any and all deficiencies resulted from work performed by the Contractor during the trials must be rectified by the Contractor under the technical assistance and guidance of Wartsila Site Management and FSRs prior to acceptance by the TA. Additional work required to repair deficiencies from the work performed by the Contractor, must be completed at the Contractor's expense.
- 12.9.D.2.10 The Contractor must arrange and be responsible for the operational and load testing of the retractable thruster system after final installation. The operational and load tests must be performed in accordance with Wartsila and ABS requirements.
- 12.9.D.2.11 Any leaks found during system testing must be remedied by the Contractor at the Contractor's expense.
- 12.9.D.2.12 ABS, TA, Wartsila Site Management and Wartsila FSRs must witness all tests and the Contractor must prove that the retractable thruster system functions as per the performance requirements set out in these specifications.

12.9.D.3 **Certification**

- 12.9.D.3.1 The system test certificates must be submitted to the IA before the end of the work period.

12.9.D.4 **Documentation**

- 12.9.D.4.1 The Contractor must develop certified (ABS reviewed) installation documentation and drawings for the retractable thruster system in accordance with the General Section of this specification. This must include, but not be limited to the following:
- a) Retractable Thruster System structural arrangement including structural stiffening, interconnection with the hull, thruster wells and surrounding framing;
  - b) Welding schedule for hull openings upon completion of the retractable thruster system installation;
  - c) Structural supports and/or stiffening and/or seating arrangements for all equipment;
  - d) Detailed cable diagrams showing the location and routing of all cables for the installation;
  - e) Detailed cable diagrams showing the location of all power supplies and circuit breakers for the installation; and

- f) All “As Fitted” drawings affected by the installation of the retractable thruster system.

12.9.D.4.2 Final versions of the drawings must be delivered to the TA and the IA. Copies of all ABS reviewed drawings must be delivered to the TA prior to completion of the contract.

12.9.D.4.3 The Contractor must deliver the following certificates and reports:

- a) Lloyd’s steel certificates for all new plates and structural steel;
- b) Cable condition reports;
- c) Hydraulic and air leak and pressure test reports;
- d) Oil sampling reports;
- e) Weld inspection reports;
- f) Operations and load test reports;
- g) E-motor alignment reports;
- h) Retractable thruster system alignment reports; and
- i) Dock and sea trials reports.

12.9.D.5 **Training**

12.9.D.5.1 Course design and delivery has been built into the supply contract for the retractable thruster system with Wartsila Canada. The Wartsila training team will conduct training sessions with the vessel crews on the proper operations and maintenance of the retractable thruster system, DP system, and Bow Thruster.

## **12.10 VIBRATION ANALYSIS**

### **12.10.A Identification**

- 12.10.A.1 The objective of this item is to conduct two (2) vibration analysis on the lower sections of the vessel. One must be conducted on the way to the dry dock period and one during sea trials.

### **12.10.B References**

#### **12.10.B.1 Equipment Data - [Not Used]**

#### **12.10.B.2 Drawings and Documents**

- 12.10.B.2.1 All Drawings are listed in the General Notes. The following drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>Drawing / Document Title</b>	<b>Number of Sheets</b>
20-0240-01	Rapport des tests de vibration réalisés sur le navire CCGS AMUNDSEN	16

#### **12.10.B.3 Regulations and Standards**

- 12.10.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	<b>Title</b>	<b>Included Yes/No</b>
<b>FSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>		
	[Not Used]	
<b>Regulations</b>		

### **12.10.C Statement of Work**

#### **12.10.C.1 General**

- 12.10.C.1.1 The Contractor must hire a specialized company to conduct the two (2) vibration analysis.
- 12.10.C.1.2 The Contractor must provide to the TA all valid certificates of calibration of measurement equipment and certification of the technician(s) prior beginning of the work.
- 12.10.C.1.3 The specialized company must provide two reports. The first one must be provided to CCG within a month after it has been conducted. The second one must be provided to CCG a week after it has been conducted.
- 12.10.C.1.4 For the first analysis, the Contractor must include cost for the specialized technician to travel during the transit from CCG Quebec base to Contractor's location. For bidding purposes, the Contractor must evaluate 10 hours of work onboard.
- 12.10.C.1.5 The second analysis conducted during the sea trials must be attended by the TA and IA and results must be immediately shared and compared to prior ones compiled in the first vibration analysis report completed before dry dock.
- 12.10.C.1.6 The Contractor must provide cost for an optional additional analysis for the new retractable thrusters (FWD and AFT) including installation of four (4) new permanent sensor threaded socket bases and a complete detailed report.
- 12.10.C.1.7 Vibration measurements must be taken on all the following locations:
  - 12.10.C.1.8 Port - Mechanical Seal
  - 12.10.C.1.9 Port - Tailshaft Steady (Cooper) Bearing
  - 12.10.C.1.10 Port – Thrust Bearing
  - 12.10.C.1.11 Port – Electrical Propulsion Motor
  - 12.10.C.1.12 Stbd - Mechanical Seal
  - 12.10.C.1.13 Stbd - Tailshaft Steady (Cooper) Bearing
  - 12.10.C.1.14 Stbd – Thrust Bearing
  - 12.10.C.1.15 Stbd – Electrical Propulsion Motor
- 12.10.C.1.16 For each location mentioned above, measurements must be taken at the following speeds:
  - a) 60 Rpm – Forward and Reverse
  - b) 80 Rpm – Forward only
  - c) 100 Rpm – Forward and Reverse

- d) 120 Rpm – Forward only
- e) 140 Rpm – Forward and Reverse
- f) 150 Rpm – Forward only

12.10.C.1.17 For each speed and for each location mentioned above, measurements must be taken for each of the following conditions:

- a) Port Motor working only
- b) Stbd Motor working only
- c) Both Motors working

12.10.C.1.18 Vibration measurement must be presented in Hertz (Hz).

12.10.C.1.19 Vibration measurement results for each scenario must be presented in a detailed report including tables and comparison chart with distinctive colored “curves” for each location.

#### 12.10.D **Proof of Performance**

##### 12.10.D.1 **Inspection Points**

12.10.D.1.1 All vibration analysis reports must be provided to TA and IA.

##### 12.10.D.2 **Testing/Trials – [Not Used]**

##### 12.10.D.3 **Certification**

12.10.D.3.1 The Contractor must provide to the TA all valid certificates of calibration of measurement equipment and certification of the technician(s) prior beginning of the work.

##### 12.10.D.4 **Documentation**

12.10.D.4.1 The specialized company must provide two reports. The first one must be provided to CCG within a month after it has been conducted. The second one must be provided to CCG a week after it has been conducted.

##### 12.10.D.5 **Training - [Not Used]**

## **13.0 POWER GENERATION SYSTEMS**

### **13.1 REPLACEMENT BASES GENERATORS**

#### **13.1.A Identification**

- 13.1.A.1 The objective of this item is to modify the mounting type of the engines, the alternators and the bases of the ship service generators.
- 13.1.A.2 As stated in section G1.7, the Contractor must coordinate the actual spec item 13.1 with works planned with WAJAX to complete the 30,000 hours of service overhaul of generator DA3.
- 13.1.A.3 The engines and alternators of the ship service generators are currently rigidly mounted on the base, which is mounted with resilient mounts on the seat. Once completed, the diesel engines and alternators will be supported by resilient mounts and the base will be rigidly mounted on the seat.
- 13.1.A.4 Some tasks will be performed by the ship service generator manufacturer's representative, these tasks will not be described in this specification.
- 13.1.A.5 All installed material must be new and in accordance with the applicable regulation requirements and any specific requests from Fisheries & Oceans Canada, Canadian Coast Guard (DFO-CCG), American Bureau of Shipping (ABS) and Transport Canada Marine Safety (TCMS).
- 13.1.A.6 The work progression will be monitored by the CCG.
- 13.1.A.7 The works must be subject to follow-up and inspection from the following organizations: ABS and CCG up to the engine commissioning.
- 13.1.A.8 Except if otherwise mentioned in this specification, the Contractor must supply the manpower, the technical assistance, the tools, the material and all the equipment required for the execution of the works. The Contractor must also supply all the services required for the dismantling, reassembly, handling and transportation of all equipment related to the work including disposal of all liquid or solid rubbish. All these products and services must be accounted for and included in every related items of the tender proposal.

#### **13.1.B References**

##### **13.1.B.1 Equipment Data**

- 13.1.B.1.1 The weights and the sizes of the components to be removed and/or installed are as follows:



**Table 1 : Ship service generator (DA)**

Length	190 in
Width	82 in
Height	90 in (with the exhaust reducer disassembled)
Weight	25 000 lb

**Table 2 : Alternator**

Length	80 in
Width	36 in
Height	54 in
Weight	5 100 lb

**Table 3 : Diesel engine**

Length	94 in
Width	64 in
Height	78 in (with the belows and exhaust reducer disassembled)
Weight	13 029 lb

**Table 4 : Base**

Length	155 in
Width	51 in
Height	14 in
Weight	5 013 lb

**13.1.B.2 Drawings and Documents**

13.1.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Drawing Number	Drawing / Document Title	Number of Sheets
221-H-139	Profile and Deck, March 1978	2
222-H-146	Capacity Plan	1
DDACE, DDACE-59300000057 rev. C	MTU 8V4000M23S with Marathon 575 Generator and Skid	1
SS534729 révision A	Outline 575FR-Custom FT - 3.375 x 7.85 – CLS CPL #00 – SPL BARS	1
XZ59300000048	Engine F/External cooling	1
2434-12-001 Rev_C	Location of Control Panels of Service Gensets	1
2434-12-100 Rev_C	Compressed air	1
2434-12-101 Rev_E	Seawater supply and return	1
2434-12-102 Rev_C	Oil supply and return	1

2434-12-103 Rev_C	Supply, return and fuel leaks	1
2434-12-104 Rev_C	Exhaust	1
2434-12-105 Rev_C	Connection Diagram of Gensets Cooling System to Fresh Water Evaporators	1
2740-18-500 Rev_A	Seat Modification – Ship Service Generator	1
2740-18-501 Rev_0	Lifting Supports and Lugs Positioning	1
2740-18-502 Rev_B	Bases Modification - Ship Service Generator	1

### 13.1.B.3 **Regulations and Standards**

- 13.1.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
<b>FSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>		
ASTM Standards volume 01.07	Section one Iron and Steel Products	No
SSPC-PA 2	Procedure for determining dry coating thickness requirements	No
CSA Z432-04	Safeguarding of Machinery	No
CSA Z460-05	Control of Hazardous Energy-Lockout and other methods	No
CSA Z259	Work in height	No
Safety code for construction work, Section 3.21	Work in an enclosed space	No
Rule CSA for identification in work environment	Rule CSA for identification in work environment	No
ASTM F708-92	Standard Practice for Design and Installation of Rigid Pipe Hangers, 1992 (Reapproved 2008)	No
CT-043-EQ-EG-0001-E	Welding Specification	No
18-080-000-SG-003	Paints and Coatings Standard	No
30-000-000-ES-TE-001	Color Coding Standard for Piping System	No
<b>Rules</b>		
DORS/90.264	Marine Machinery Regulations	No

13.1.B.3.2 The statement of requirements takes precedence over the plans;

13.1.B.3.3 Dimensions take precedence over measurements to scale;

13.1.B.3.4 Detailed plans take precedence over general plans;

### 13.1.C **Statement of Work**

#### 13.1.C.1 **General**

13.1.C.1.1 All dimensions, drawings and specifications supplied to the Contractor must be verified by the Contractor onboard prior to the beginning of the works by obtaining the necessary information from the different suppliers. Prior to the start of the works, the Contractor must compile and verify all compatibility measurements for the existing and new equipment and any incompatibility found must be communicated to the Owner's representative for appropriate instructions.

13.1.C.1.2 The Contractor must not begin any modification or any supplemental work without the express written consent of the Owner's representative. The consent must specify the nature of the work, delay and cost if applicable.

#### 13.1.C.2 **Ship Usage**

13.1.C.2.1 None of the ship's equipment must be used by the Contractor for the complete works period.

13.1.C.2.2 The Contractor must supply all sanitary installations necessary for his workforce. None of the ship's equipment or installations must be used for this purpose.

#### 13.1.C.3 **Office of Primary Interest**

13.1.C.3.1 The table below provides a summary of the distribution of the principal activities to perform in the present section by Office of Primary Interest (OPI):

**Table 5: OPI Activities**

ACTIVITIES	EXECUTION
Disassembly / reassembly of the machines, which refers to any part to be removed / added to the generators, excluding piping connections.	The generator manufacturer's representative.
Uncoupling / coupling (engine-alternator)	The generator manufacturer's representative.
Disconnecting / reconnecting (electric-power)	The generator manufacturer's representative.
Disconnecting / reconnecting (all other low voltage electrical connections and controls)	Contractor

ACTIVITIES	EXECUTION
Remove existing alternators from the vessel / enter new alternators on the vessel.	Contractor
Modification of the ship's piping systems connected to the DA.	Contractor
Modifications – Structure of the ship service generator's bases	Contractor
Modifications – Ship's structure (seats)	Contractor
Lifting operations	Contractor
Disconnecting / reconnecting of the piping systems and ship's equipment, including draining and elimination of current fluids, supply and filling with new liquids.	Contractor
DA commissioning	The generator manufacturer's representative.
DA trials	The generator manufacturer's representative

#### 13.1.C.4 **Works Extent**

- 13.1.C.4.1 This specification addresses the main works to be executed by the Contractor in order to modify the mounting type of the ship service generators on the seats.
- 13.1.C.4.2 The ship service generators installed in 2013 are resiliently mounted between the bases of the ship service generators and the seats. The work described in this specification addresses, the modifications to be made to the ship and to the ship service generators by the Contractor in order to modify the assembly of the alternators/engines on their bases and the mounting of the bases on the seats.
- 13.1.C.4.3 This specification covers the main works to be performed by the Contractor for the uncoupling of the diesel engine system piping, the handling of the components (alternator, diesel engine and base) and the hot works for the modification of the seats and the bases.
- 13.1.C.4.4 The Contractor must provide the services of a ship service generator manufacturer's representative to perform the coupling and connection of the new alternator's power and control electrical connections.
- 13.1.C.4.5 The alternator coupling by the ship service generator manufacturer's representative must include the alignment and the balancing of the entire shaft line following the coupling of the alternator with the diesel engine and must be in accordance with the manufacturer's requirements.
- 13.1.C.4.6 The Contractor must provide the services of the DA manufacturer's representative for the disconnection and reconnection of power and control cables and wires connected to DA's.

This specification excludes, with the exception of sections 13.1.C.16.10 and 13.1.C.17.8, all the works related to the electrical and control disciplines not related to the DA's.

13.1.C.5 **Work Environment**

13.1.C.5.1 The Contractor must take the necessary measures to maintain appropriate temperature and environmental conditions in the welding and painting zones.

13.1.C.5.2 The Contractor must make sure that the compartments affected by the works are well ventilated for the whole period of the works. A special care must be taken to ensure that fumes and smokes are well evacuated so that they do not disturb the persons onboard. The ventilation must function 24 hours a day.

13.1.C.6 **Responsibility**

13.1.C.6.1 The Contractor must be responsible for all removed equipment from the beginning of the works until the end of the works.

13.1.C.6.2 The Contractor must be responsible for all equipment provided by the Owner from the time they are delivered on the works site and all equipment or material to be installed on the ship and this until the end of the works.

13.1.C.6.3 Any damage to the ship surface, equipment, furniture and accessories caused by the Contractor or one of his sub-Contractor during the works must be repaired at the Contractor's expenses.

13.1.C.6.4 The Contractor must also be responsible for any damage or drawback detrimental to the ship operation of which the source is under the Contractor's responsibility.

13.1.C.7 **Frames Numbering**

13.1.C.7.1 The Contractor must supply the workforce, the equipment and all the material necessary to identify the frames number in the works zone.

13.1.C.8 **Sequence and Work Schedule**

13.1.C.8.1 The Contractor must submit to the Owner a detailed work schedule including the start and finish dates for each of the tasks and stages to be performed. He must also provide an inspection plan indicating the stages for which the presence of the Owner, his representatives and ABS inspector will be required. The inspection calls must be issued at least 24 hours before the beginning of the inspection.

### 13.1.C.9 **Works To Be Performed**

13.1.C.9.1 The following works must be performed by the Contractor in addition to the works of disassembly-reassembly described previously (the tasks enumerated below are not necessarily in sequence):

- a) Preparation of the work zone, work place safety and existing equipment protection;
- b) Install the lifting lugs and beams as shown on drawing 2740-18-501 ;
- c) Design, manufacture, install and dismantle temporary supports as required on drawing 2740-18-501;
- d) Modify the seats as indicated on drawing 2740-18-500 ;
- e) Modify the bases of the ship service generators as indicated on the drawing 2740-18-502 and provide a report of surfacing surveys of the contact surfaces of the resilient mounts of the diesel engines;
- f) Install the diesel engines and alternators on their respective bases using resilient mounts;
- g) Install the ship service generators on the seats using the self-leveling rigid mounts.

### 13.1.C.10 **Installation Procedures**

13.1.C.10.1 The Contractor must take note and strictly conform to the ship service generators installation instructions supplied by the manufacturer. Any request for deviation from the installation instructions must be submitted to the Owner and to the manufacturer and a ten (10) working days delay must be applicable for the emission of an answer.

### 13.1.C.11 **Cleaning**

13.1.C.11.1 The Contractor must clean, degrease and drain all surfaces, structures, compartments, or equipment located in the works zone.

13.1.C.11.2 Cleaning must be done regularly and no accumulation of waste or harmful substances or substances affecting the safety of the work place must be tolerated onboard.

13.1.C.11.3 The Contractor must clean the entire works zone to leave the place in the same condition it was before the works.

### 13.1.C.12 **Degassing**

13.1.C.12.1 **This section has to be coordinated with section 11.7 of the actual SOW.**

13.1.C.12.2 Several tanks must be degassed for hot work before the beginning of the works. The Contractor must document the soundings of all fuel, oil and oily water tanks on board. He must remove the fuel from the vessel and store it, then refuel the vessel once the tanks have

been inspected and the work completed. The Contractor's bid must include the removal, storage and return of 20,000 liters of marine distillate for the vessel. The Contractor must provide the unit price for the removal, storage and return of 100 l of distillate and will be used to adjust the total price by the actual quantity on board at the time of the vessel's arrival at the Contractor's facility. At a minimum, the following tanks must be degassed :

a) No. 2 D.B. OIL FUEL TANK (P) 101.55 m<sup>3</sup>

b) No. 2 D.B. OIL FUEL TANK (S) 112.00 m<sup>3</sup>

13.1.C.12.3 The Contractor must establish his own list and schedule of tanks to be emptied and degassed at least 2 weeks before the start of work.

13.1.C.13 **Material**

13.1.C.13.1 All installed material must be new, except if otherwise mentioned, and in accordance with the applicable regulation and Owner's requirements.

13.1.C.14 **Welding**

13.1.C.14.1 All the welding must be performed according to TCMS, ABS and the Canadian Welding Bureau (CWB) standards.

13.1.C.14.2 All the welds dimensions must be as indicated on the drawings except for any particular case to be brought to the attention of the Owner, ABS and TCMS's representatives.

13.1.C.14.3 In general, welds must be made from the fixed end of the piece to the free end or to the center.

13.1.C.14.4 Temporary welds must be maintained to a minimum and must not in any case restrict the structural expansion during the final welding. Welds on seats, bases and on added elements for lifting must be verified by X-ray performed by a third party with a CSA W178.2 Level 2 qualification, and this at the expenses of the Contractor. All other welds must be subject to a visual inspection by a third party with a CSA W178.2 Level 2 qualification, also at the expense of the Contractor. A weld inspection report must be submitted to the Owner once the inspections have been completed. TCSM / ABS may require verification of other welds by a method to be determined by TCSM / ABS, all at the expense of the Contractor. The Contractor must fully collaborate with the personnel affected to the welds inspection and must supply the necessary support during this work.

13.1.C.14.5 All personnel assigned to the welding must be certified by the CWB for the work pertaining to the ship modification. All personnel must wear visibly at all times a plastic-coated identification card with photo showing the CWB certification number. Deviation from the above requirements by the personnel affected to the welding could cause a stop work and at

the Owner's choice, an exhaustive X-ray examination of all performed welding, this at the sole expense of the Contractor.

- 13.1.C.14.6 Any weld found deficient according to a recognized inspection method must be redone, at the sole expense of the Contractor, in accordance with a procedure to be approved beforehand by each of the regulatory bodies concerned by the quality of the welding.

13.1.C.15 **Lifting and Handling**

13.1.C.15.1 General

- a) The Contractor must prepare and submit to the Owner the detailed procedures for all the lifting and handling operations of the equipment presented in section 3.
- b) He must also submit detailed drawings and certificates for all the equipment that he will use and manufacture for lifting and handling operations.
- c) The Contractor must obtain from manufacturers the capacities and limits of use of the equipment lifting lugs and survey their condition. All procedures and plans relating to the lifting and handling operations of the equipment must be signed and sealed by a member in good standing of the association of professional engineers of the province where the physical works are to be performed.

13.1.C.15.2 Lifting and Handling Operations of DA1 and DA3

- a) Lifting of the alternator and 90°rotation for storage on a temporary support in front of the base (center about frame 116);
- b) Alignment of the center of gravity of the engine with frame 108 (forward movement with anchor point with lug at bulkhead stiffner frame 95);
- c) Lift the engine using the lugs of web frame at frame 118, place on a temporary support under bridge 17' FLAT;
- d) Lift the base using the lugs and 90°rotation, place on a temporary support under the bridge 17' FLAT;
- e) Seat modification;
- f) Move the base above the seat and modification of the base;
- g) Installation of the base on the modified seat with self-leveling rigid mounts;
- h) Installation of the engine on the modified base with resilient mounts;
- i) Installation of the alternator on the modified base with resilient mounts.

13.1.C.16 **Disassembly of the Existing Equipment**

13.1.C.16.1 General



- a) All the equipment located in the work zone that will be disassembled must be stored in a dry and secure place. The following elements represent the main equipment requiring the Contractor's intervention. This list is not exhaustive and all elements that might interfere with the works or might be damaged during the works must be moved or disassembled by the Contractor at his own expense.
- b) The Contractor must note the location of each item to be disassembled and identify each of them for their future installation.
- c) A list of non-reusable items, including a budgeted replacement price, must be produced once the disassembly is over. This list must then be transmitted to the Owner.
- d) ANNEX 1 present different photos showing equipment, piping and ventilation to dismantle.

#### 13.1.C.16.2 Seats of ship service generators DA no 1 and DA no 3

- a) Existing collision stoppers (24 in total, 8 per ship service generator) as well as bolting platforms for resilient mounts (18 in total, 6 per ship service generator) of the three ship service generators, will have to be dismantled up to the top of the seat and removed from the vessel, the Contractor must dispose of it at his own expense.

#### 13.1.C.16.3 Uncoupling of engines/alternators

- a) Uncoupling of the engines/alternators of the DA nos 1 and 3 will be performed by the ship service generator manufacturer's representative before transporting the existing alternators to the flight deck. A period of 12 working days must be granted by the Contractor on his schedule for uncoupling.

#### 13.1.C.16.4 Handling of Existing Alternators

- a) The Contractor must transport the 2 existing alternators from the engine room to the flight deck.

#### 13.1.C.16.5 Diesel Engine

- a) The Contractor must drain and dispose of diesel engine fluids. At the end of the work, the Contractor must fill the engines of new fluids supplied by Canada. A quantity of 230 liters of cooling liquid and 310 liters of oil are in the engine.

#### 13.1.C.16.6 Piping Connected to Ship Services Generators

- a) The following pipes connected to the engine must be drained and disassembled over a sufficient distance. Liquids removed from the pipes must be eliminated according the current regulation. This list is not exhaustive and any other connection of piping to the

engines will have to be disassembled and drained. The disconnected pipes must be temporarily plugged:

- i)Compressed air (drawing 2434-10-100);
- ii)Seawater supply and return (drawing 2434-10-101) ;
- iii)Oil supply and return (drawing 2434-10-102) ;
- iv)Supply, return and fuel leaks (drawing 2434-10-103) ;
- v)Exhaust (drawing 2434-10-104) ;
- vi)Connection Diagram of Gensets Cooling System to Fresh Water Evaporators (drawing 2434-12-105).

#### 13.1.C.16.7 Piping and Ducts to be Dismantled for Lifting Operations

- a) The following piping, ducts and supports that are not connected to the ship service generators must be drained, dismantled and temporarily plugged for the duration of the works. Liquids removed from the pipes must be eliminated according the current regulation. Some piping must be temporarily reconnected with flexible couplings in order to allow the system to function for the duration of the works. The Contractor must obtain from the Owner a list of the systems that must remain functional for the duration of the works.
  - i)The exhaust pipe supports installed on the lifting beams must be cut and reinstalled once the works are completed;
  - ii)Expansion tank piping;
  - iii)Supply and return lines of heater units (4 lines);
  - iv)Lubrication oil pipe;
  - v)Four condensate pipes;
  - vi)Three seawater pipes;
  - vii)Three steam pipes;
  - viii)A carter vent pipe of a propulsion generator;
  - ix)A starting air pipe (for DA 3 lifting);
  - x)Three domestic water pipes ;
  - xi)The sewage treatment unit vent pipe (for DA1 lifting) ;
  - xii)A purifier vent pipe (for DA3 lifting) ;
  - xiii)Two heat recovery pipes;
  - xiv)An oily water drain pipe;
  - xv)An unused pipe under the platform at 17'(DA3).
- b) The Contractor must dispose of liquids removed from the piping to be replaced, particularly fresh cooling water, lubricating and fuel oils.

#### 13.1.C.16.8 Ventilation

- a) The ventilation ducts located in the works zone in the engine rooms must be disassembled and stored.

#### 13.1.C.16.9 Lighting

- a) All lighting fixtures located in the works zone and that may affect the lifting operations must be disassembled and stored. A temporary lighting system must be provided and installed by the Contractor in the engine rooms for the duration of the works.

#### 13.1.C.16.10 Electric Cables, Wires and Bus Bars

- a) All electric cables and wires supplying lighting fixtures or other equipment in the engine rooms must be powered off, secured and rolled until they are out of the works zone to be reused at the end of the works.
- b) All supply and control cables for the ship service generators must be powered off and rolled out of the works zone by the ship service generator manufacturer's representative before removing the existing alternators.
- c) The Contractor must disconnect the auxiliary systems on the base, no wires must be disconnected from the control panel. The Contractor will be responsible to securely store the control boxes with attached wires during the works.
- d) Existing bus bars must be disassembled from both existing alternators and stored to be reinstalled in the new alternators.

#### 13.1.C.16.11 Insulation

- a) Insulation on the main deck structure in way of structures used for lifting and on bulkhead stiffeners used to secure the loads must be removed on a distance of 20 cm around the lugs to be installed.

#### 13.1.C.16.12 Monorail Traveling Hoist

- a) The monorail overhead Traveling Hoist located above (towards the outside of the ship) generating sets DA1 and DA3 must be dismantled.

#### 13.1.C.16.13 Floors

- a) Engine rooms floor sections and their supports may need to be disassembled to allow the installation of component's temporary supports.

#### 13.1.C.16.14 Ship Service Generators Bases

- a) All equipment installed on the ship service generators bases that are identified by the TA and the Contractor as being removable must be identified, removed and properly stored

near generator in order to be reinstalled. The Contractor must empty the liquids and the surfaces and tanks must be cleaned to perform the hot work required on the bases.

- b) The piping removed from the bases must clearly be identified to be reinstalled once the works are completed.

#### 13.1.C.16.15 Railings

- a) Sections of the 17' FLAT railing must be dismantled in the forward engine room to move the engines of the ship service generators. Temporary railings must be installed to ensure the safety of the workers during the works.

#### 13.1.C.16.16 Tanks (refer to items 11.6 and 11.7)

- a) The ship service generator's expansion tanks and their seats must be disassembled for lifting (DA1 and DA3).
- b) The oil tank located above the 17' FLAT deck in the aft engine room, and the one in the forward engine room on port side, must be emptied for temporary lifting and storage operations.
- c) The sewage unit located on the 17' FLAT starboard deck must be emptied for temporary lifting and storage operations. The Contractor must dispose of the sewage contained in the sewage unit according to the applicable rules.
- d) Oils removed from tanks must be stored by the Contractor for the duration of the works.

#### 13.1.C.16.17 Other Equipment

- a) Removable platforms located above the ship service generator's alternators must be disassembled.
- b) Toolboxes and a workbench must be moved for temporary storage of the equipment.
- c) The lugs located on the longitudinal structure of the 17' FLAT deck must be removed, Photo 3 and Photo 7.
- d) The alternator power cable supports must be dismantled and reinstalled once the works are complete.
- e) Generator control panel supports must be removed and reinstalled once the works are complete.

#### 13.1.C.17 **Installation**

##### 13.1.C.17.1 General

- a) The Contractor must reinstall all disassembled equipment if its condition allows it according to the IA and the TA. Items to be replaced must be of a type approved by TCSM / ABS and the TA.

#### 13.1.C.17.2 Handling of New Alternators

- a) The Contractor must transport the 3 new alternators of the flight deck to the engine room.

#### 13.1.C.17.3 Seats

- a) The seats of the ship service generators must be modified as specified on drawing 2740-18-500.

#### 13.1.C.17.4 Ship Service Generators

- a) The ship service generators must be installed on the new seats same or equivalent to the existing rigid self leveling VIBRACON type mounts. In the event that the Contractor would like to propose components equivalent to VIBRACON products, engineering studies of equivalence for the proposed equivalence and a calculation file must be provided by the Contractor to the Consultant for verification. The costs of the engineering studies and those of the Consultant must be assumed entirely by the Contractor. The Contractor must comply with the installation procedure of the adjustable rigid mounts and generators' manufacturer.
- b) VIBRACON type or equivalent mounts must be supplied by the Contractor including all optional bolts, washers and nuts required.

#### 13.1.C.17.5 Piping

- a) All dismantled piping, including those for lifting operations, must be reinstalled and tested prior to restarting the systems. The pipes insulation will be replaced by a material equivalent to the existing one if its condition is not considered acceptable by the Owner. All seals and bolts will be new and supplied by the Contractor.
- b) All liquids removed from equipment and systems will be replaced by new liquids corresponding to the original fluids and will be filled at operational levels.
- c) The pipe supports will comply with ASTM F708-92 Regulations titled Standard Practices for Design and Installation of Rigid Pipe Hangers.

#### 13.1.C.17.6 Ventilation

- a) All disassembled ventilation ducts will be reinstalled.

#### 13.1.C.17.7 Lighting

- a) All fixtures removed will be reinstalled to their original position.

#### 13.1.C.17.8 Electric Cables, Wires and Bus Bars

- a) If electric cables are to be replaced, they must meet the requirements of TCMS/ABS for the marine environment, as described in standard American Bureau of Shipping (ABS). The allowable voltage and power on each electrical cable must not be less than the nominal voltage and power of the circuit on which it is used. The replacement will be handled through a negotiation on a PWGSC 1379 form.
- b) The Contractor must reinstall the ship service generators' control panel and connect previously disconnected systems.
- c) Previously stored existing bus bars must be reinstalled with the new alternators.

#### 13.1.C.17.9 Insulation

- a) The dismantled insulation must be replaced by a material equivalent to the existing one to be supplied by the Contractor.
- b) If the insulating covers for the exhaust pipes are found unrecoverable by the Owner, they must be replaced. The replacement will be negotiated by the PWGSC 1379 form. The new covers must be able to resist temperatures of 1200°F and must not contain asbestos or refractory ceramic fibers.

#### 13.1.C.17.10 Monorail Traveling Hoist

- a) If modifications to the monorail bridge cranes and/or their supports are required, the Contractor must submit a drawing of modifications sealed by a member in good standing of the association of professional engineers of the province where the work is carried out. Modifications must be handled through a PWGSC 1379 form.
- b) Ultrasonic welding tests and a static loading test must be performed in accordance with applicable standards.

#### 13.1.C.17.11 Ship Service Generators' Bases

- a) All disassembled equipment and components of the bases must be reinstalled. The piping must also be reinstalled on each of the bases. Steel shims must be installed under the mounts of certain equipment in order to compensate the height change on the base and to allow the connection of the piping to the equipment, in particular for the Alfa-Laval heat exchangers of the ship service generators.
- b) Generator base mounting holes must be drilled in place.

#### 13.1.C.17.12 Equipment and Material to be Installed

- a) The new resilient mounts for the engines and the ship service generators' alternators must be installed by the Contractor according to the manufacturer's recommendations.

#### 13.1.C.18 **Surfaces Preparation Prior to Painting**

- 13.1.C.18.1 All surfaces to be painted must be clean and degreased. All the new structural parts must be shot blasted, the edges must be rounded by grinding, all according to the painting system supplier's recommendations.

#### 13.1.C.19 **Paint**

##### 13.1.C.19.1 General

- a) All the zones affected by the works must be painted as follows: one (1) primer coat will be applied, followed by two (2) finish coats of a thickness according to the recommendations of the manufacturer of the products used. One (1) strip coat must be applied to all welds, edges, access holes, etc. before the application of the primer, as well as before the application of the first finish coat.
- b) All paint applications will be performed according to the technical specifications of the paint manufacturer.
- c) All piping must be painted with two (2) coats of paint in a color according to the international color code and the Owner's standards.

##### 13.1.C.19.2 Ship Service Generators Seats and Ship Structure

- a) The modified seats of the ship service generators as well as the ship's structural elements affected by the works must be painted according to the Owner's standards.

##### 13.1.C.19.3 Ship Service Generators Bases

- a) The paint to be applied for the bases must be equivalent compatible with the existing paint: PPG Delfleet Polyurathane (low VOC) color RAL7001.

##### 13.1.C.19.4 Ship Service Generators

- a) If necessary, touch-up to the engines must be done with equivalent compatible with the existing paint: PPG Delfleet Polyurathane (low VOC) color RAL7001.

#### 13.1.D **Proof of Performance**

##### 13.1.D.1 **Inspection Points**

- 13.1.D.1.1 All work must be inspected by IA and ABS.

##### 13.1.D.2 **Testing/Trials**

- 13.1.D.2.1 All the equipment reinstalled in the ship such as the ship service generators, fixtures and the ventilation ducts must be tested. All systems affected by the works must also be tested. The Contractor must provide a list of the equipment removed and reinstalled that will be tested and have that list approved by the Owner.
- 13.1.D.2.2 A trial procedure must be jointly established with the ship service generator manufacturer's representative and the marine authorities to evaluate the performance and vibration of the modified ship service generators.
- 13.1.D.2.3 All trials must be performed in the presence of the Owner and his representatives.
- 13.1.D.2.4 The ship service generators must be subjected to vibration tests, with and without charge, which must be performed by the ship service generator manufacturer's representative.
- 13.1.D.2.5 Before the end of the works, the ship service generator manufacturer's representative must provide to the Owner's representative, in PDF format, a report detailing the procedure and data of the alignment and balancing performed after the coupling of the three (3) ship service generators.
- 13.1.D.3 **Certification**
- 13.1.D.3.1 The Contractor must provide the steel certificates.
- 13.1.D.4 **Documentation**
- 13.1.D.4.1 « As Built » Drawings
- 13.1.D.4.2 The Contractor must make all the necessary take-offs and provide an "as built" version of all the drawings listed below in four (4) hard copies and in an electronic CAD version.

2740-18-500	Seat Modification-Ship Service Generator
2740-18-501	Lifting Supports and Lugs Positioning
2740-18-502	Bases Modification-Ship Service Generator

- 13.1.D.4.3 The table below identifies the minimum deliverables required during the works, which must be prepared and provided by the Contractor:

**Table 6: Deliverables**

DELIVERABLES	REF. SPEC.	FIRST EMISSION DEADLINE	FREQUENCY	FORMAT (PAPER COPY)
List of tanks to be degassed	13.1.C.12	2 Weeks Before Work	1	PDF
List of non-recoverable items	13.1.C.16.1	2 Weeks Before Work	1	PDF



Machining compliance report of the contact points of engine's resilient mounts	13.1.C.9	1 Week After Test	1	PDF
Drawing and procedure for installing DA (self-leveling rigid mounts)	13.1.C.17.4	2 Weeks Before Work	1	PDF
Drawing «as built»	13.1.D.4.1	2 Week After Delivery	1	(1) CAD
Test report of equipment other than DA	13.1.D	According to schedule	1	(2) PDF
Steel certificate	13.1.C.13	2 Weeks Before Work	1	PDF
Lifting procedures	13.1.C.15	2 Weeks Before Work	1	PDF
Detailed work schedule	13.1.C.8	1 Month Before Work	1	PDF
Plan and certificate of lifting and handling equipment	13.1.C.15	2 Weeks Before Work	1	PDF
Inspection plan	13.1.C.8	2 Weeks Before Work	1	PDF
Plan of temporary ship internal supports	13.1.C.9	2 Weeks Before Work	1	PDF
Welding inspection report	13.1.C.14	1 Week After Test	1	PDF

#### 13.1.D.5 **Training – [Not Used]**

**Annex 1: FWD Engine Room****Photo 1 - DA1 – Heat exchanger support****Photo 2 - DA1 – Control panel support****Photo 3 - Expansion tank, its support, piping and eyelets on longitudinal structure**



**Photo 4 - DA1 – Ventilation ducts and exhaust pipe**



**Photo 5 - DA1 – Power cable supports and platform**



**Photo 6 - DA1 – Collision stoppers**



**Photo 8 - DA3 – Cable tray under the platform 17' FLAT**



**Photo 7 - DA3 – Lugs, expansion tank, exhaust pipe and supports**



**Photo 9 - DA3 – Ventilation duct and exhaust pipe**





**Photo 10 - DA3 – Power cable supports and lighting**

## 14.0 **ELECTRICAL POWER DISTRIBUTION**

### 14.1 **RECONDITIONNING OF 5 MAIN CIRCUIT BREAKERS (OPTIONAL)**

#### 14.1.A **Identification**

14.1.A.1 The objective of this item is to perform a complete upgrade and reconditioning of five (5) circuit breakers currently in operation on the vessel CCGS Amundsen, as set out in Section 14.1.B.1 below.

#### 14.1.B **References**

##### 14.1.B.1 **Equipment Data**

##### 14.1.B.1.1 CIRCUIT BREAKER # 1 : 52-ET EMERGENCY TIE-IN BRAKER

MANUFACTURER :	WESTINGHOUSE
TYPE :	DSL-208
TRIP UNIT RELAY :	AMPTECTOR model LS
LOCATION :	CONTROL ROOM MSWBD (Cubicle #5)
IDENTIFICATION :	52-ET EMG. TIE-IN
SERIAL NO. :	J2B47266-1A
SENSOR RATING (Amps) :	600/5
BKR RATING (Amps) :	800
FUSES (Amps) :	1600
CONTROL & CLOSING CCT :	120 Vac
UNDERVOLTAGE RELAY :	480 Vac

##### 14.1.B.1.2 CIRCUIT BREAKER # 2 : 52-PR PREFERENTIAL (NON-ESS.)

MANUFACTURER :	WESTINGHOUSE
TYPE :	DSL-416
TRIP UNIT RELAY :	AMPTECTOR model LS

LOCATION :	CONTROL ROOM MSWBD (Cubicle #9)
IDENTIFICATION :	52-PR PRÉFÉRENTIAL (NON-ESS)
SERIAL NO. :	J2B47263-1A
SENSOR RATING (Amps) :	1600/5
BKR RATING (Amps) :	1600
FUSES (Amps) :	2500
CONTROL & CLOSING CCT :	120 Vac
UNDERVOLTAGE RELAY :	480 Vac

#### 14.1.B.1.3 CIRCUIT BREAKER # 3 : 52-EG EMERGENCY GENERATOR

MANUFACTURER :	WESTINGHOUSE
TYPE :	DSL-208
TRIP UNIT RELAY :	AMPTECTOR model LS
LOCATION :	EMERGENCY GEN. COMP'T
IDENTIFICATION :	52-EG EMERGENCY GENERATOR.
SERIAL NO. :	CPJ2B46856-1A
SENSOR RATING (Amps) :	600/5
BKR RATING (Amps) :	600
FUSES (Amps) :	1200
CONTROL & CLOSING CCT :	120 Vac
UNDERVOLTAGE RELAY :	480 Vac

#### 14.1.B.1.4 CIRCUIT BREAKER # 4 : 52-T TIE-IN BREAKER

MANUFACTURER :	WESTINGHOUSE
TYPE :	DSL-208
TRIP UNIT RELAY :	AMPTECTOR model LS

LOCATION :	EMERGENCY GEN. COMP'T
IDENTIFICATION :	52-T TIE-IN (TO MSWBD)
SERIAL NO. :	CPJ2B46860-1A
SENSOR RATING (Amps) :	800/5
BKR RATING (Amps) :	600
FUSES (Amps) :	1600
CONTROL & CLOSING CCT :	120 Vac
UNDERVOLTAGE RELAY :	480 Vac

**14.1.B.1.5 CIRCUIT BREAKER # 5 : 52-FB FEEDBACK BREAKER**

MANUFACTURER :	WESTINGHOUSE
TYPE :	DSL-208
TRIP UNIT RELAY :	AMPECTOR model LS
LOCATION :	EMERGENCY GEN. COMP'T
IDENTIFICATION :	52-FB FEEDBACK
SERIAL NO. :	CPJ2B46859-1A
SENSOR RATING (Amps) :	400/5
BKR RATING (Amps) :	600
FUSES (Amps) :	1200
CONTROL & CLOSING CCT :	120 Vac
UNDERVOLTAGE RELAY :	480 Vac



## 14.1.B.1.6 Photos of a typical DSL circuit breaker:

14.1.B.2 **Drawings and Documents**

14.1.B.2.1 All Drawings are listed in the General Notes. The following drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Drawing Number	Drawing / Document Title	Number of Sheets
	AMD Options DSL refit	2
182D586-595	Assy and wiring dwg for Main and Emergency SWBD	10
222-900-8_02-03-04	Main and Emergency SWBD 440 V and 120 V Essential and Non-essential section	3

14.1.B.3 **Regulations and Standards**

14.1.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

FSSM Procedures	Title	Included Yes/No
<b>Publications</b>		
<b>Standards</b>		
<b>Regulations</b>		
ABS	American Bureau of Shipping (ABS)	<a href="https://ww2.eagle.org/">https://ww2.eagle.org/</a>

IEEE-45	“IEEE Recommended Practice for Electrical Installations on Shipboard (2002)”	ieeexplore.ieee.org ISBN: 0-7381-3381-7
CSA C22.1-12	“Canadian electrical code, part I (22nd edition), safety standard for electrical installations”	Shop.csa.ca
CSA C22.2 NO. 0-10	“General requirements - Canadian electrical code, part II”	Shop.csa.ca
SOR-90-264	“Marine Machinery Regulation (2014)”	lois-laws.justice.gc.ca

#### 14.1.C **Statement of Work**

##### 14.1.C.1 **General**

- 14.1.C.1.1 The Contractor must subcontract a specialized company which is authorized and certified for performing a complete surveye and reconditioning of five (5) circuit breakers Westinghouse DSL-416 / DSL-208 currently in operation on the vessel.
- 14.1.C.1.2 The Contractor is responsible for transporting the circuit breakers between the Ship's switchboards and specialized subcontractor workshop, both ways, this including manipulation from the Switchboards and his transportation vehicle. The Contractor must provide, for this purpose, wooden boxes to put each breaker to transport them both ways.
- 14.1.C.1.3 The Contractor must remove the breakers from the cabinets and put them back in place after the work is done.
- 14.1.C.1.4 The Contractor must then verify each breaker after putting it back in place in the Switchboard and produce a report accordingly.
- 14.1.C.1.5 The Contractor must keep the Emergency Bus in operation to supply power to the various electrical systems of the vessel connected to it while the circuit breakers are being verified in connection with it. Regardless of the method used by the Contractor, he must inform the TA of his solution before proceeding with the work.

14.1.C.2 **The work must include at least the following items for each circuit breaker (Sections 14.1.C.2.1 to 14.1.C.2.5 including Testing/Trials):**

14.1.C.2.1 Replacement of the protection unit:

- a) The Contractor must replace the existing protection unit (LS) with a new model WESTRIP RMS-2012AF, that provides the same level of protection;
- b) The Contractor must program and adjust the new protection module based on the settings found on the existing LS modules and to be operational as per required values.

14.1.C.2.2 Maintenance of the mechanism and frame

- a) The Contractor must completely disassemble the mechanism;
- b) Inspect and clean each part;
- c) Replate all of the mechanism's parts with zinc;
- d) Clean the frame using glass beads;
- e) Repaint the front plate;
- f) Replace damaged bolts;
- g) Lubricate the mechanism in accordance with the manufacturer's recommendations;
- h) Reassemble and test the mechanism assembly.

14.1.C.2.3 Maintenance of electrical components

- a) The Contractor must clean the main and arc-chute contacts;
- b) Replate all conductive parts with silver (Main contacts);
- c) Check the pressure of the main contacts and make adjustments if required;
- d) Add blue Locktite on the adjustment nuts of each pole (Main contacts)
- e) Clean and reinsulate the moulded plastic parts around the main contacts;
- f) Clean and reinsulate the arcing chambers;
- g) Clean and reinsulate all insulators;
- h) Test and clean all auxiliary contacts, replacing them if required;
- i) Clean and lubricate the electrical connection points at the rear of the circuit breaker;

- j) Check and replace the spring loading motor brushes if necessary;
- k) Check the general condition of internal wiring and replace attachments if necessary;

#### 14.1.C.2.4 Replacement of parts

- a) If any parts are defective or damaged and must be replaced, the Contractor must provide a list of such parts with an assessment of replacement cost and associated delivery times. No parts can be replaced by the Contractor before receiving written authorization from the CA involved in the project. Cost of parts will be addressed using PWGSC 1379 form.
- b) The Coast Guard already has several spare parts for this type of circuit breaker that can be used for the repairs with the approval of the TA.

#### 14.1.C.2.5 Report on the work

- a) The Contractor must produce a complete report for all work and tests done on each circuit breakers.

### **14.1.D Proof of Performance**

#### 14.1.D.1 **Inspection Points**

- 14.1.D.1.1 An initial complete survey must be provided to IA and TA for approbation prior engaging corrective works. A final reports including list of corrective works, pictures after work completed, tests descriptions and results must be provided prior to returning breakers to TA.

#### 14.1.D.2 **Testing/Trials**

##### 14.1.D.2.1 Electrical tests:

- a) The Contractor must check the operation of the new protection unit;
- b) Check the operation and adjustment of the SHUNT trip;
- c) Measure the resistance of the main contacts;
- d) Measure the insulation level of the electrical circuits;
- e) Check the operation of the spring loading motor;
- f) Check the operation of the low voltage trip relay (if applicable);
- g) Check operation of the anti-hunting relay (If applicable);
- h) Carry out a primary injection trip test, in the Contractor's workshop, in the presence of the ABS classification society inspector, according to his availability.

**14.1.D.3     Certification**

- 14.1.D.3.1     ABS certification required following successful primary injection trip tests with presence of ABS surveyor at specialized company's workshop.

**14.1.D.4     Documentation**

- 14.1.D.4.1     A paper copy and PDF electronic file must be provided to IA and TA for Initial Survey and Final Report.

- 14.1.D.4.2     A PDF version of the ABS approval certificate (if any) must be provided to TA.

**14.1.D.5     Training – [Not Used]**

## 15.0 AUXILIARY SYSTEMS

### 15.1 REPLACEMENT OF SPRINKLERS TANK

#### 15.1.A Identification

15.1.A.1 The objective of this item is to replace the Sprinkler Tank on the icebreaker vessel CCGS Amundsen.

#### 15.1.B References

##### 15.1.B.1 Equipment Data

15.1.B.1.1 See **Annex 1** for some pictures of the equipment, piping and vents surrounding the tank to be replaced.

15.1.B.1.2 Additional info on the tank:

SPRINKLER TANK TO BE DISMANTLED	
Length	120 in.
Diameter	45 in.
Height, Overall	57 in.
Weight	2000 lb.

##### 15.1.B.2 Drawings and Documents

15.1.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Drawing Number	DRAWING TITLE	Number of Sheets
222-H-101-T (page 6)	General Arrangement	6
9995 –M-006	Sir John Franklin Sprinkler Tank	1
9995 –M-007	Sir John Franklin Sprinkler Tank Welding Details	1
171-09529-67_NGCC_Amundsen_HazMat2020_20200731_signe.pdf	Annual report of hazardous material management	50

### 15.1.B.3 **Regulations and Standards**

- 15.1.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

	<b>Title</b>	<b>Included Yes/No</b>
<b>FSSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>		
	Canada Shipping Act, Marine Machinery Regulations, SOR/90-264,	No
	American Bureau of Shipping (ABS)	No
	IAC no. 47 Shipbuilding and Repair Quality Standard	No
	ASTM Standards, Section one Iron and Steel Products, volume 01.07 Ship and Marine Technology	No
	Mechanic-welding standards and procedures of CWB (or equivalent)	No
	Procedure for Determining Conformance to Dry Coating Thickness Requirements, SSPC-PA 2 (November 1982), Paint Application Specification no.2	No
	CSA Z432-04, Safeguarding of Machinery	No
	CSA Z460-05, Control of Hazardous Energy – Lockout and Other Methods	No
	CSA Z259 applicables regulations (work at height),	No
	Safety Code for the Construction Industry, Section 3.21 Work in Restricted Area,	No
	CSA regulation for identification in workplace	No
	ASTM F708-92 regulation, <i>Standard Practice for Design and Installation of Rigid Pipe Hangers</i> , 1992 (Reapproved 2008)	No
<b>Regulations</b>		

### 15.1.C **Statement of Work**

#### 15.1.C.1 **General**

- 15.1.C.1.1 The Contractor must supply and replace the existing Sprinkler Tank.

- 15.1.C.1.2 The existing tank must be dismantled and taken off the ship by the Contractor, by the way of the opening performed on the Aft Retractable Thruster when removed. (ref. item 12.9)
- 15.1.C.1.3 The Contractor must proceed with the moving and installation of the Sprinkler System tank on a schedule not to interfere with the installation of Aft Retractable Thruster.
- 15.1.C.1.4 All dimensions, drawings, and specifications supplied to the Contractor must be verified by the Contractor onboard prior to the beginning of the works by obtaining the necessary information from the different suppliers and manufacturers. Prior to the start of works, the Contractor must compile and verify all compatibility measurements for the old and new equipment and any incompatibility found must be communicated to the TA and IA for appropriate instructions.

#### 15.1.C.2 **Works Environment**

- 15.1.C.2.1 The Contractor must take the necessary measures to maintain appropriate temperature and environmental conditions in the welding and painting zones. Temporary shelter must be installed to meet the required conditions as necessary. Watertight shelter must be provided and installed over the shell openings. The tightness of the shelter must be checked daily by the Contractor.
- 15.1.C.2.2 The Contractor must make sure that the compartments affected by the works are well ventilated throughout the work period. A special attention must be paid to ensure that fumes and smokes are well evacuated.
- 15.1.C.2.3 The Contractor must isolate the work area in such a way to eliminate the possibility of any dust from contaminating other areas.
- 15.1.C.2.4 The Contractor must cover and protect from dust all equipment, motors, pumps, compressors, air conditioning systems, control panels, etc in the work area.
- 15.1.C.2.5 The Contractor must, upon the completion of all welding works, remove all isolation and protective materials used for isolating the area or covering the equipment.

#### 15.1.C.3 **Disassembly**

##### 15.1.C.3.1 GENERAL

- a) All the equipment located in the work zone that must be disassembled must be stored in a dry and secure place. The following elements represent the main equipment requiring the Contractor's intervention. This list is not exhaustive and all elements that might interfere with the works or might be damaged during the works must be moved or disassembled by the Contractor at his sole expense.



- b) The Contractor must note the location of each item to be disassembled and identify each of them for their future installation.

#### 15.1.C.3.2 SPRINKLER SYSTEM TANK

- a) The Contractor must complete the following works:
- b) disconnect all piping and accessories from the tank beforehand;
- c) install fireproof panels or canvas around the tank before dismantling it in order to protect all surrounding equipment, including the floor and the ceiling ;
- d) dismantle the tank in smaller pieces to facilitate its transport out of the ship;
- e) The tank must be removed from the ship and disposed by the Contractor;
- f) The Contractor must provide all the equipment and manpower to remove the loose pieces of the dismantled tank.

#### 15.1.C.3.3 PIPING

- a) The pipes that must be disassembled must also be temporarily blanked for the work period
- b) Some pipes must be temporarily reconnected with flexible hoses in order to allow some systems to stay operational throughout the work period.
- c) The Contractor must obtain from the TA a list of the systems to remain operational during the work period. The temporary reconnection of the identified systems will be treated using a PWGSC 1379 form.
- d) The Contractor must dispose of all the liquids removed from the piping disassembled, especially the fresh water cooling and lube oil. For bidding purpose, the Contractor must include disposal of 1 cu/m for each liquid type to be adjusted upward or downward on a PWGSC 1379 form upon presentation of disposal slip.

#### 15.1.C.3.4 VENTILATION

- a) **To be coordinated with work to remove Asbestos from item 12.7.**
- b) The vent ducts being in the work zone in the engine rooms must be disassembled. **It must be noted that the vent duct insulation might contain asbestos and the necessary arrangements must be taken by the Contractor to be compliant with the health and safety standards for this kind of work, if needed.** See the report 171-09529-67\_NGCC\_Amundsen\_HazMat2020\_20200731\_signe.

#### 15.1.C.3.5 TEMPERATURE CONTROL

- a) Heating units must be temporarily reinstalled or temporary electrical or other heating equipment must be installed in order to keep a proper temperature in the propulsion room for the work period.

#### 15.1.C.4 **Installation**

##### 15.1.C.4.1 GENERAL

- a) The Contractor must reinstall all equipment that was disassembled if their condition is acceptable by the IA and TA standards. The items to be replaced must be certified by a marine class society and approved by the TA.

##### 15.1.C.4.2 SPRINKLER TANK

- a) Once the new tank rests on the seats of the removed tank, the Contractor must bolt in place the tank using Contractor supplied grade 8 bolts, nuts and lock nuts.

##### 15.1.C.4.3 WATERTIGHT BULKHEAD

- a) Once the new tank will have been fitted in the Propulsion Room, the Contractor must then connect back all piping and the control system and trials must be performed in the presence of the ABS Surveyor, the TA and IA. The Contractor must correct any misalignment or other deficiencies and perform more trials at his own expense. When defects are corrected, an acceptance trial will be performed in the presence of previously mentioned personnel and the ABS Surveyor.

##### 15.1.C.4.4 PIPING

- a) The connections for the various equipment requiring piping must be made according to the rules and regulation stated above. All the piping disassembled for the installation of the temporary lifting beams, temporary supports or to perform the openings must be reinstalled and tested before the systems commissioning. The piping insulation must be replaced by an equivalent material if its condition is found unacceptable by the TA or IA. The pipe hangers must be compliant with the standard ASTM F708-92 titled Standard Practices for Design and Installation of Rigid Pipe Hangers.

##### 15.1.C.4.5 VENTILATION

- a) All disassembled vent ducts must be reinstalled.

#### 15.1.C.5 **Paint**

- 15.1.C.5.1 All the zones affected by the works must be painted. The paint to be used must be compatible and equivalent with existing Intershiel 300. One (1) coat of primer must be applied followed by two (2) coats of finishing of a thickness of 0.06 inch per coat. One (1) paint strip must be

applied on all welds, borders, access hatches, etc. before the primer application and before the application of the first coat of finishing. All the paint applications must be made according to the technical specification of the paint manufacturer.

15.1.C.5.2 All the pipes must be painted with two (2) coats of paint of a color compliant with the international color code.

15.1.C.6 **Galvanizing**

15.1.C.6.1 All the pipe spools must be hot dipped galvanised before the installation, except for the fuel piping, lube oil piping.

**15.1.D Proof of Performance**

15.1.D.1 **Inspection Points**

15.1.D.1.1 The Contractor must coordinate with IA and TA for the following:

- a) Presentation of the tank removing strategy
- b) Inspection of the new structure and painting prior to installing back the new tank
- c) Inspection of final installation of the tank with all items previously removed being reinstalled.

15.1.D.2 **Testing/Trials**

15.1.D.2.1 All the equipment that were affected by the works such as the lighting fixtures and all the ventilation ducts must be tested. The Contractor must provide a list of equipment removed and reinstalled that will be tested and have that list approved by the TA and IA.

15.1.D.2.2 All the testing must be done in presence of the IA and ABS Surveyor.

**15.1.D.3 Certification**

**15.1.D.3.1 Tank engineering and manufacturing must approved by ABS.**

15.1.D.4 **Documentation**

15.1.D.4.1 The Contractor must produce and provide to TA all updated related plans and drawings in an «as fitted» version, in PDF and in CAD electronic versions.

15.1.D.5 **Training – [Not Used]**

**ANNEX 1:**

## **15.2 REPLACEMENT OF QUICK CLOSING VALVES**

### **15.2.A Identification**

15.2.A.1 The objective of this item is to procure and replace 26 quick closing valves used to isolate fuel tanks onboard the vessel.

15.2.A.2 The work in this section must be coordinated with the work in section 11.7 *Fuel oil and Oily water tanks* of this specification package.

### **15.2.B References**

#### **15.2.B.1 Equipment Data**

15.2.B.1.1 The following valves must be replaced:

<b>NUMBER</b>	<b><u>FUEL VALVE</u></b>	<b><u>LOCATION</u></b>	<b><u>DRAWING</u></b>
1	Day Tank High Suction Stbd. 3"	Fwd E/R Upper Deck	222-695-1_02
2	Aft Deep Tank Port 4"	Motor Room	222-695-1_01
3	Fwd E/R Wing Tank Stbd 4"	Fwd E/R Lower Deck	222-695-1_01
4	Day Tank Low Suction Stbd. 3"	Fwd E/R Upper Deck	222-695-1_02
5	Boiler Tank 1 1/2"	Boiler F/O Tank	222-695-1_01
6	Fwd Lower Wing Tank Port 4"	Heeling Pump Room	222-695-1_01
7	Fwd Center Deep Tank Stbd 4"	Heeling Pump Room	222-695-1_01
8	Aft Deep Tank Stbd 4"	Motor Room	222-695-1_01
9	-	-	-
10	-	-	-
11	Fwd Lower Wing Tank Stbd. 4"	Heeling Pump Room	222-695-1_01
12	Aft E/R Wing Tank Stbd. 4"	Aft E/R	222-695-1_01
13	Lower Flume Tank Port. 6"	Heeling Pump Room	
14	Upper Flume Tank Port. 6"	Heeling Pump Room	
15	Fwd Center Deep Tank Port 4"	Heeling Pump Room	222-695-1_01
16	Aft E/R Wing Tank, Port. 4"	Aft E/R Lower Deck	222-695-1_01
17	Stbd. Settling Tank Emergency Supply To M/E & S/S 3"	Fwd E/R Lower Deck	222-695-1_02
18	Day Tank Suction & Discharge. 4"	Fwd E/R Upper Deck	222-695-1_01
19	Port Settling Tank Emergency Supply To M/E & S/S. 3"	Fwd E/R Lower Deck	222-695-1_02
20	Fwd E/R Wing Tank Port. 4"	Fwd E/R Lower Deck (behind ows)	222-695-1_01
21	Day Tank High Suction Port. 3"	Fwd E/R Upper Deck	222-695-1_02

22	Stbd. Settling Tank Crossover (purifier suction) 3"	Fwd E/R Lower Deck	222-695-1_02
23	Port Settling Tank Suction & Discharge 4"	Fwd E/R Lower Deck	222-695-1_01
24	Stbd Settling Tank Suction & Discharge Settling 4"	Fwd E/R Lower Deck	222-695-1_01
25	Port Settling Tank Crossover (purifier suction) 3"	Fwd E/R Lower Deck	222-695-1_02
26	Day Tank Low Suction, Port. 3"	Fwd E/R Upper Deck	222-695-1_02
27	Upper Wing Port Side 4"	Heeling Pump Room	
28	Upper Wing Starboard side 4"	Heeling Pump Room	

#### 15.2.B.1.2 Quantities and technical descriptions:

- a) Eight (8) Quick closing flanged globe valve, PN 25, compact design, spring-loaded, straight pattern, C/W closing, manual, hydraulic and pneumatic actuation, body and cover: 150 PSI bronze body and trim seal: Viton 75-80 ; LLOYD'S CERTIFICATION (or type approved with certificate from a recognized marine classification society), dim. ANSI B16.10: 241 mm, flange drilling acc. to ANSI 150 lbs, DN 80 (3")Face to face 9"1/2 (241mm)Flange OD 7"1/5 (191mm)PCD 6" X 4 holes (152mm).
- b) fifteen (15) Quick closing flanged globe valve, PN 25, compact design, spring-loaded, straight pattern, C/W closing, manual, hydraulic and pneumatic actuation, body and cover: 150 PSI bronze body and trim, seal: Viton 75-80 ; LLOYD'S CERTIFICATION (or type approved with certificate from a recognized marine classification society), dim. ANSI B16.10: 241 mm, flange drilling acc. to ANSI 150 lbs, DN 100 (4"),Face to face 11"1/2 (292mm),Flange OD 9" (229mm),PCD 7"1/2 X 8 holes (191mm).
- c) Two (2) Quick closing flanged globe valve, PN 25, compact design, spring-loaded, straight pattern, C/W closing, manual, hydraulic and pneumatic actuation, body and cover: 150 PSI bronze body and trim, seal: Viton 75-80 ; LLOYD'S CERTIFICATION (or type approved with certificate from a recognized marine classification society), dim. ANSI B16.10: 241 mm, flange drilling acc. to ANSI 150 lbs, DN 150 (6"),Face to face 13"1/2 (343mm),Flange OD 11" (279mm),PCD 9"1/2 X 8 holes (241mm).
- d) One (1) Quick closing flanged globe valve, PN 25, compact design, spring-loaded, straight pattern, C/W closing, manual, hydraulic and pneumatic actuation, body and cover: 150 PSI bronze body and trim, seal: Viton 75-80 ; LLOYD'S CERTIFICATION (or type approved with certificate from a recognized marine classification society), dim. ANSI B16.10: 241 mm, flange drilling acc. to ANSI 150 lbs, DN 40 (1 1/2"),Face to face 6 1/8" (174mm),Flange OD 5" (142mm),PCD 3 3/4" X 4 holes (106,5mm).

### 15.2.B.2 **Drawings and Documents**

- 15.2.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Drawing Number	DRAWING TITLE	Number of Sheets
<b>222-695-1_01</b>	F.O. Filling and Transfer System Diagram	1
<b>222-695-1_02</b>	F.O. Service Diagram	1

### 15.2.B.3 **Regulations and Standards**

- 15.2.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

	Titre	Inclus – Oui/Non
<b>Procédures du MSF</b>		
<b>Publications</b>		
[sans objet]		
<b>Normes</b>		
<b>Règlements</b>		

### 15.2.C **Statement of Work**

#### 15.2.C.1 **General**

- 15.2.C.1.1 The Contractor must supply all materials, equipment, tools and manpower required to carry out the work described below.
- 15.2.C.1.2 The Contractor must provide and replace the 26 valves listed above.
- 15.2.C.1.3 The Contractor must disconnect each valve from its hydraulic remote control line. The Contractor must prevent hydraulic oil drips. These hydraulic lines must identified and be protected from damage during the work.
- 15.2.C.1.4 The Contractor must remove each valve and remove any residual fuel in the piping. All bilge areas must be kept clean throughout the duration of the work period.

- 15.2.C.1.5 The Contractor must hold onto store the existing valves until this work has been completed and accepted by the IA. The existing valves must be protected from damage until their disposal.
- 15.2.C.1.6 The Contractor must ensure the locking levers from the new valves are functional. The locking levers from the existing valves must be given to the IA (see photo below).
- 15.2.C.1.7 The Contractor must install new nameplates on the new valves.
- 15.2.C.1.8 The Contractor must install each valve using new gaskets and fasteners. The gasket material used must be compatible for use with diesel fuel oil. Prior to the installation of the valves, the Contractor must verify that piping on each side of the valve is free of debris and rags.
- 15.2.C.1.9 The Contractor must reconnect the hydraulic lines using new connectors of the same type as the existing. These connectors must be Contractor supplied.

#### **15.2.D Proof of Performance**

##### **15.2.D.1 Inspection Points**

- 15.2.D.1.1 The Contractor must demonstrate the proper installation of each of the valves, including the hydraulic lines for remote closing and name plates.
- 15.2.D.1.2 The Contractor must demonstrate fuel tightness of each valve installation to the IA. Any leaks must be repaired at the Contractor's expense.

##### **15.2.D.2 Testing/Trials**

- 15.2.D.2.1 The Contractor must do a functional test, both locally and remotely, of each of the valves in the presence of the IA and the ABS surveyor.

##### **15.2.D.3 Certification**

- 15.2.D.3.1 The Contractor must provide the original approbation certificate from LLOYD'S (or type approved with certificate from a recognized marine classification society).

##### **15.2.D.4 Documentation**

- 15.2.D.4.1 The Contractor must provide a report detailing all work carried out, all parts replaced, all corrective measures taken and the materials used.
- 15.2.D.4.2 Supply 3 Paper copies and an electronic pdf format of the operation and maintenance manual.

##### **15.2.D.5 Training – [Not Used]**



**Annex 1 (typical valve):**

### **15.3 REPLACEMENT OF CABIN HEATING UNITS (OPTIONAL)**

#### **15.3.A Identification**

15.3.A.1 The objective of this item is to replace heating unit in cabins and common rooms.

#### **15.3.B References**

##### **15.3.B.1 Equipment Data – [not used]**

##### **15.3.B.2 Drawings and Documents**

15.3.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>DRAWING TITLE</b>	<b>Number of Sheets</b>
222-900-7_01	A/C Ventilation & Heating System Deck Plan	1
222-900-7_02	A/C Ventilation & Heating System Deck Plan	1
222-900-8_03	Amundsen Main Switchboard 440 & 120 V non-essential sect.	1
222-900-8_15	Amundsen Accommodation Ventilation MCC #11	1
222-900-8_21	Essential Service Dist. Panel Accom'n heating Panel	1
222-900-8_29	A/C Vent'n & Accom'n Heating System Plan #2 E.W.D.	1
222-900-8_30	A/C Vent'n & Accom'n Heating System Plan #3 E.W.D.	1
222-900-8_31	A/C Vent'n & Accom'n Heating System Plan #4 E.W.D.	1
222-900-8_32	A/C Vent'n & Accom'n Heating System Plan #5 E.W.D.	1
C1129_01	HVAC Ducting Layout Navigating bridge deck, Wheelhouse	1
C1129_02	HVAC Ducting Layout Officer's deck	1
C1129_03	HVAC Ducting Layout Flight & Boat deck	1
C1129_04	HVAC Ducting Layout Upper deck	1
C1129_05	HVAC Ducting Layout Main deck	1
AMD Chauffage Boitier 13 & 15 in. Heating boxes	New air diffusers drawing 13" et 15" (as exemple)	11
AMD Plans Safety Control Panels	HVAC2, 3, 4, 5 Safety Panels Dwgs	5
AMD HVAC 2-3-4-5 Transfos Location	HVAC #2, 3, 4, 5 Dwg & photos of new transformers locations	4
AMD Rex Transfos Informations	Installation, hook-up & dimensions of new transfos (as example)	8

AMD List(e) Heating ccts chauffage	Lists of new air diffusers & convectors locations, where to install and equipment required	42
Photo installation chambre-room # 622	Picture, as example, of a suitable air diffuser/convector arrangement	1

### 15.3.B.3 **Regulations and Standards**

- 15.3.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

FSSM Procedures	Title	Included Yes/No
<b>Publications</b>		
ABS	American Bureau of Shipping (ABS)	No
IEEE-45	“IEEE Recommended Practice for Electrical Installations on Shipboard (2017)” Ieeexplore.ieee.org	No
IACS UR E	“Unified Requirements Concerning Electrical Installations (2018)” www.iacs.org.uk	No
<b>Standards</b>		
<b>Regulations</b>		

### 15.3.C **Statement of Work**

#### 15.3.C.1 **General**

- 15.3.C.1.1 The Contractor must provide all equipment, cables, accessories required for the project, as well as all labor and tools required to perform the installation in order to achieve a final and functional product.
- 15.3.C.1.2 The Contractor must replace existing heating boxes with new air diffusers in cabins and common rooms, according to the plans, photos and lists provided. If the work is done in winter, the contractor will have to agree with the TA and/or the chief engineer to do it section by section in order to avoid a complete shutdown of the heating on board the vessel.

- 15.3.C.1.3 The Contractor must replace reheat box space heaters and baseboard heaters with convectors in conjunction with air diffusers or baseboard heaters where indicated on the plans and lists provided. The convector models considered are of the plug-in type, with an independent base that is fixed to the wall and then the convector is plugged in. Then we tighten a retaining screw, from above, which then holds it in place. The convectors will be of power varying from 0500 to 1500 Watts, depending of location. The contractor shall also supply the programmable or non-programmable electronic thermostat of sufficient power adapted to the model of convector and/or electric baseboard heater, when applicable. With the exception of the RHF-3 and RHF-4 circuits, the office and the chief engineer's room, where the contractor shall install only two (2) new electronic thermostats, as the existing baseboard heaters will remain in place, but connected in parallel.
- 15.3.C.1.4 The CCG recommends the use of convector and thermostat models from the same company, whenever possible, to minimize the inventory of spare parts. In addition, the contractor must have the models of convectors and thermostats approved by the Technical Authority before any purchase.
- a) The contractor must tour the cabins/bedrooms and common rooms to take appropriate measurements to ensure that new air diffuser and convector boxes can be installed according to the lists and drawings. The contractor must produce a production plan of the diffusers and have it approved by the TA before proceeding with the manufacturing process. If it is impossible to install a convector/diffuser assembly according to the list and plans provided by the CCG, for reasons of space or otherwise, the contractor must propose an alternative that will be approved by the T.A.
  - b) The contractor must take into account that there are 4-inch and 6-inch air supply connections with air intake either from below or from behind. The contractor must manufacture the units accordingly. To do this, a sample plan is provided by the C.C.G. to show them what is required, i.e. 2 models; a 15" high model for diffusers with 6" pipe with rear inlet and a 13" high model for other diffusers, i.e. 4" with rear inlet and 4" and 6" with bottom inlet. The existing adapters must be kept at the end of the air supply pipes to be fixed under the new dampers in the new housings.
  - c) The contractor must fabricate the new diffuser 18 gauge sheet steel and paint the exterior of the new air diffusers in the color chosen by the TA then attach the 2 aluminum-colored aluminum air outlet grilles and 1/2" thick acoustic/insulating insulation, where space permits. The grilles are 15" X 3" with a 0° air deflection angle, for the top of the diffusers and 15" X 3" with a 30° air deflection angle, for the front of the diffuser. The grids are made of aluminum and aluminum in colour. The diffusers are also equipped with a manually adjustable, opposed blade air control damper, whose actual size is 6 3/4" x 7" x 2 3/8". If the contractor cannot find a replacement, they will have to be retained from the old reheat box and reinstalled in the new diffusers. These existing dampers are welded,

so special care must be taken to recover them. These dampers are installed in the center of the plate, above the 6" hole, below which is screwed the air supply pipe adapter. The diffusers have a removable screwed access panel to fix in the air supply pipe and its adapter and to adjust the regulating damper. It is also used as an access panel for housing maintenance. The top rear panel of the diffuser must be bent forward enough along its entire length so that the front panel can be slid effortlessly into it when it is screwed onto the housing. The same applies to the removable panel, the top part of which must be folded over its entire length to slide it behind the bottom of the housing. See drawings, lists and instructions provided by the CCG.

- d) The contractor must remove the existing housings, taking care to keep the air supply hose adapter under the cabinet, by loosening the 4 screws holding it, in order to attach it to the new housing/diffuser. The old casings are then disposed of.
- e) The Contractor must install the air diffusers so that the vibration is minimized during the vessel's operations and repair any damage to, the finishing works around them caused by the Contractor.
- f) The convector must be installed at a distance of 2" above the diffuser once the diffuser is installed and fixed to the wall.
- g) When there is no diffuser, the convector must be installed either above where the electric baseboard was located, depending on where the aeroconvector was located, or at the location indicated on the list. In case of uncertainty, the T.A. and/or the Chief Engineer will confirm the location of the convector in question.
- h) The contractor must take the insulation reading of each convector and record the value on a list for this purpose. (See Proof of Performance section).
- i) The existing thermostat must be replaced by a compatible electronic model, programmable or not, depending on the power of the convector or baseboard heaters to be controlled and connected using the existing cable, 2C#14. It is recommended to use the same type of thermostat, for the whole system/project, from the same company and ideally from the one of the convectors supplied.
- j) For the RHM-6 and 7 circuits in the officers' dining room, the contractor must install only one thermostat for both convectors.
- k) For RHD-2 and 3, the contractor must install only one thermostat for both convectors.
- l) For the existing baseboards on RHF-3 and 4 the contractor must install one new thermostat on each circuit.
- m) Once the connections have been completed, the convector and its thermostat must be checked and the result recorded on a list for this purpose. (See Proof of Performance section).

- n) The power supply circuit of the convector must be identified by a black on white p-touch in the upper right corner of the unit and must be identical to the existing circuit.

15.3.C.1.5 The Contractor must install and connect four (4) new transformers, one in each HVAC compartment #2, #3, #4, #5, according to the plans and location determined by the C.C.G. The transformers have a capacity of 30 KVA for HVAC #2, 3, 4 and 15 KVA for HVAC #5. Also these transformers must be ABS self-certified so don't require special approval being already certified by the manufacturer. In addition to having a NEMA 3R enclosure, the transformers must have a copper winding and respect the following dimensions: For the 30 KVA; 20.5" W x 20.75" D x 30" H ( $\pm 52.07\text{cm}$  W x  $\pm 57.7\text{cm}$  D x  $\pm 76.2\text{cm}$  H). For the 15 KVA; 20.5" W x 16" D x 25" H ( $\pm 52.07\text{cm}$  W x  $\pm 40.64\text{cm}$  D x  $\pm 63.5\text{cm}$  H). Transformers must meet the Canadian NRCan 2019 standard for efficiency and noise level of 45dB or less. The models of transformers suggested in the list are for reference only and are suitable for the locations where they are to be installed.

- a) The contractor must weld angle iron bar to the floor of the compartment, according to the manufacturer's installation diagram, in order to secure the transformers permanently with bolts and nuts.
- b) The contractor must run the new cables between the Safety Panel and the transformers according to the gauge indicated on the plans for each.
- c) The contractor then connects the transformers and provides the appropriate cable glands for this purpose. The contractor must use marine cable without armoring of type MPRX or equivalent and of the appropriate gauge.

15.3.C.1.6 Modification of the "Safety Control Panel".

- a) The contractor must connect the new transformer cables to the "Safety Control Panel". The contractor must provide the necessary cable glands at both locations.
- b) The contractor must replace all existing terminal blocks with new ones and add new terminal blocks, in sufficient number and capacity, to connect the new transformer cables to the panel.
- c) The contractor must replace some of the circuit breakers, according to the drawing and list provided. The circuit breakers are Eaton Cuttler-Hammer and model FD3020, FD3025 or FD3035 as applicable. These circuit breakers must be of the requested model for compatibility with existing distribution panels.
- d) The contractor must replace the contactors, C1 to C10, in the panels according to the drawing and list provided. The contactors are of the type for heating, of a definite purpose for: 575V,  $\pm 15$  to 20 HP, 3 poles, 30A, coil at 120Vac. The contractor will take the details on the name plate of the existing contactors and replace with an identical or equivalent one.

- e) The contractor must install (3) 240Vac, 50-60 Hz, ground fault LED lights on the front of the four (4) panels and connect them as shown on the drawing provided. The lamps (12 in total) are 22mm diameter fixtures, preferably with metal collar, round head, white color. For reasons of standardization and spare parts, we favor the Schneider Electric model no. XB4 or XB5, but any equivalent with similar characteristics will be accepted, under the authorization of the A.T.
- f) The contractor must replace the control transformers, (4), of each Safety Panel, with an open type, 500 VA, prim. 240/480V, sec. 120/240V and dimensions; 5.25" (133.4mm) W x 4.38" (111.3) H. x 5.20" (125.7mm) D.
- g) The contractor must reconnect the interlock cable between the fan and the HVAC Safety Panels #2, 3, 4, 5, to turn off the heat in the event the fan shuts off. (This is a requirement of the Fire Fighting Manual).
- h) The contractor must replace the fuses (8) on the new 240V primary side control transformers with 4 amp, class J, time delay fuses, size: 2.25" (57mm) L x .81" (21mm) diam. and add new class J, modular type, double drawer (2-pole) DIN rail mount fuse holders (4) for insertion;
- i) The contractor must add modular-type fuse holders (4) with single drawer (1 pole), for DIN rail mounting, on the secondary 120V side of the new control transformers and add 10 amps/600Vac J-class, time delay fuses, dimensions: 2.25" (57mm) L x .81" (21mm) diam. to replace old ones.
- j) The contractor must replace the P431-3-3, 3C#12 cable with a new 3C#10 cable between the Safety Panel HVAC#3 and the RHF distribution panel in this compartment. Identify the new cable with a metallic marker. The cable is MPRX marine type, non-armored 3 Cond. 6mm for 36A capacity.

#### 15.3.C.1.7 Modify Dist. Panels RH-A, B, C, D, E, F, G, J, K, M, :

- a) The contractor must move certain circuits, according to a list provided by CCG, in each of the RH distribution panels to better balance loads. See list of circuits.
- b) The contractor must replace the circuit breakers in the RH-x panels, according to the list provided. The current circuit breakers are Eaton and model no. FAZ-B8/2, FAZ-B10/2 and FAZ-B12/2, as applicable. However, they can be replaced by an equivalent model if they have identical characteristics, i.e. a miniature MCB type circuit breaker, 2 poles, for DIN rail mounting, UL489 approved and having the B trip curve. Dimensions :  $\pm 35$ mm W x 80mm H x 73.5mm D.
- c) The contractor must disconnect the cable from the RHA-12 circuit, 4KW Air Heater (Diffusiometer Laboratory), and move it to a 460V circuit of the CCM-11, from the same room, i.e. the cct. P433-4. If the cable is not long enough, a joint box must be provided to

return it to MCC #11. The contractor must provide a circuit breaker to be installed in the MCC#11, Eaton brand and model no. FD3015, 3-pole, 15A, 480Vac. This circuit breaker must be of the requested model for compatibility with existing distribution panels.

15.3.C.2 **Equipment**

15.3.C.2.1 All equipment and accessories must be supplied by the Contractor.

15.3.C.3 **Location**

15.3.C.3.1 Refer to the list of documents/drawings at section 15.3.B.2.1 above.

15.3.D **Proof of Performance**

15.3.D.1 **Inspection Points**

15.3.D.1.1 The Contractor must coordinate the final verification of each installation by the IA.

15.3.D.1.2 A final verification must be made in the presence of the T.A. with respect to the following items :

- a) General quality of the work
- b) Strength of the installations
- c) Vibration resistance of the installations
- d) Esthetics of the finish

15.3.D.2 **Testing/Trials**

15.3.D.2.1 The contractor must produce and provide reports to the IA at least 3 weeks prior to ship's departure with the following information enclosed:

- a) An electrical insulation report (Megger) of all newly installed circuits.
- b) An electrical insulation report (Megger) of all newly installed convectors.
- c) An electrical insulation report (Megger) of all newly installed transformers.
- d) A current reading of each circuit to verify that the devices are within the manufacturer's standards.
- e) A main current reading of each phase of each of the 10 panels, RH-A to M, when all convectors are operating at full capacity to see if the loads are properly balanced and to see if all cables are of the proper capacity.



**15.3.D.3     Certification**

- 15.3.D.3.1     The contractor must provide all marine certificates for all material used to complete the works.

**15.3.D.4     Documentation**

- 15.3.D.4.1     The contractor must produce and provide .DWG and .PDF copies to IA and TA at least 2 weeks prior of ship's departure.

**15.3.D.5     Training- [Not Used]**

## 16.0 **DOMESTIC SYSTEMS**

### 16.1 **POTABLE WATER TANKS**

#### 16.1.A **Identification**

- 16.1.A.1 The objective of this item is to perform the 5 year inspection, certification and maintenance of Port side potable water tank and perform a complete renewal of the starboard side potable water tank coating.
- 16.1.A.2 The purpose of the work is also to supply and replace the two pressurizing pumps on the drinking water system.

#### 16.1.B **References**

##### 16.1.B.1 **Equipment Data**

TANK	FRAME	CAPACITY (m <sup>3</sup> )	AREA (m <sup>2</sup> )
Fresh Water Tank Port	13 - 27	68.8	218
Fresh Water Tank Starboard	13 - 27	68.8	218

##### 16.1.B.2 **Drawings and Documents**

- 16.1.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Drawing Number	Drawing / Document Title	Number of Sheets
NT-2532-14-CA001A	Tank and compartment surface calculation	98
222-H-146	Capacity Plan	1
221-H-45	Tank Testing Plan	1
	1200 Icebreaker Coating scheme V5	1
	Specification for the Application of Astek Marinecoat Potable Water Tank Lining System on Steel Surfaces	6
	Marinecoat Tech Data	2
	20210503_144001_resized	1
	20210503_143943_resized	1
	20210503_143931_resized	1
	20210503_143923_resized	1
	20210503_143019_resized	1

	20210503_143009_resized	1
	20210503_142954_resized	1
	Sterling pump tech data #1	1
	Sterling pump tech data #2	1

### 16.1.B.3 **Regulations and Standards**

- 16.1.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
<b>FSM Procedures</b>		
7.A.12	Potable Water Quality	Yes
<b>Publications</b>		
2015-01	Potable Water Technical Bulletin	Yes
<b>Standards</b>		
NSF 61/ANSI 61 -2020	Drinking water system components	No
NACE 6G186-2010-SG	Surface Preparation of Soluble Salt Contaminated Steel Substrates Prior to Coating	No
SA-2½ SSPC SP10	Near White metal blast cleaning	No
SSPC-SP-1	Solvent Cleaning	No
SSPC Guide 15	Methods for Extraction and Analysis of Soluble Salts on Steel and other Nonporous Substrates	No
<b>Regulations</b>		

### 16.1.C **Statement of Work**

#### 16.1.C.1 **General**

- 16.1.C.1.1 The Contractor must supply all materials and equipment to conduct the work.
- 16.1.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.
- 16.1.C.1.3 The Contractor must certify safe access to each potable water tank, in accordance with Fleet Safety and Security Manual requirements and recommendations. Potable water tanks are enclosed spaces.

- 16.1.C.1.4 The preparation and coating work of the potable water tanks must start as early in the work period to allow sufficient curing time. Once the vessel has been safely docked, the Contractor must be responsible for the immediate draining of their contents.
- 16.1.C.1.5 The Contractor must provide all materials, equipment, parts and tools required to carry out the work.
- 16.1.C.1.6 During the work, workers must wear disposable coveralls and shoe covers over their work clothing to avoid contaminating the tank. New protective clothing must be worn each time the tank is entered.
- 16.1.C.1.7 All products or materials (e.g.: lubricant, anti-seize products, gaskets, caulking, o-rings etc.) used when working must be certified for use in a potable water system according to the NSF 61 standard. The Contractor must provide the TA and IA with justifying documents.
- 16.1.C.1.8 The Contractor must obtain the services of an FSR from the paint manufacturer to supervise the surface preparation and the paint application processes. The FSR must also verify the environmental conditions, in which he or she must record in accordance with the manufacturer's instructions for the product. The FSR must submit a report when the work is completed. The Contractor must include a firm price in its bid for the services of the FSR. This price must include all travel expenses, labor and materials required to carry out the work.
- 16.1.C.1.9 The Contractor must note that the coating currently used in the Starboard tank is Marine Coat (Astek Composites) and in Port tank is Interline 925P.
- 16.1.C.1.10 All work must be in accordance with the paint manufacturer's guidelines for preparing and applying their product to potable water tanks.
- 16.1.C.1.11 Important: No solvent or thinner must be used in the work.
- 16.1.C.1.12 The Contractor must use all new equipment for the application of the coating including pumps, hoses, spray guns, brushes, etc. This is important to ensure that thinners or solvents are not inadvertently introduced by equipment previously used and then cleaned and contaminated with thinners or solvents. The re-use of pumps but not hoses may be permitted provided that the Contractor demonstrates draining plus sufficient flushing of the equipment with a product NSF 61 certified for use in potable water tanks and absent of any solvents. The Contractor must not use the product used for flushing on potable water tanks.
- 16.1.C.2 **Initial Preparation and Cleaning**
- 16.1.C.2.1 The Contractor must remove the manhole covers, finish emptying the tanks with portable pumps then ventilate the tanks. A certified chemist must post a certificate attesting that each tank is gas free and safe to work inside.

- 16.1.C.2.2 The tanks must be washed and cleaned of any contaminant or debris and then wiped dry. For bidding purposes, the Contractor must remove and dispose of approximately two hundred (200) litres of water and debris.
- 16.1.C.2.3 The Contractor must carry out an initial inspection with the AI and the paint manufacturer FSR to determine the quantity of coating work that needs to be done.
- 16.1.C.3 **Initial Preparation and Cleaning Prior to Painting**
- 16.1.C.3.1 The Contractor must bid on the preparation of 10% of the total tank surface area for Port side potable water tank. This surface must be prepared to obtain a surface profile of SA2 ½ of the SSPC standard.
- 16.1.C.3.2 The Contractor must bid on the preparation of 100% of the total tank surface area for STBD side potable water tank. This surface must be prepared to obtain a surface profile of SA2 ½ SSPC SP10 standard.
- 16.1.C.3.3 **Important:** The Contractor must strictly follow CCG Technical Bulletin 2015-01 as well as all the parameters identified in paragraph 3.9 and section 7.A.12 of the Fleet Safety Manual.
- 16.1.C.3.4 As the manholes for these tanks are located within the vessel's machinery space the Contractor must take every precaution to prevent ingress of sand into the machinery areas, ventilation systems and accommodations. The Contractor must erect an enclosure around the access of each tank. These enclosures must be under negative pressure to eliminate the possibility of blasting media entering into the machinery spaces. (i.e. the air pressure on the outside of the enclosure must be higher than the air pressure on the inside (tank side) of the enclosure). All ventilation exhaust must be exhausted outside, overboard and away from any of the vessel's ventilation intake fans.
- 16.1.C.3.5 Prior to commencing sandblasting, all above water hull mounted equipment and openings are to be fully protected and all ship openings and ventilation ducts are to be covered with a polyethylene material to prevent sand/grit from entering the ship accommodations and the engine room. All protective coverings must be removed upon completion of work. Any damage resulting from inadequate protection must be repaired by the Contractor at his expense.
- 16.1.C.3.6 After the surface preparation work, the Contractor must thoroughly clean each tank of all residues (accordance with SSPC-SP-1) and other foreign materials. This cleaning must also remove the chloride ions from the tank surfaces. The Contractor must carry out chloride ion testing as described below. If the Chloride ion tests are above the maximum acceptable value, remedial work will have to be carried out by the Contractor to reduce the chloride ion to an acceptable level. This remedial work will be at the Contractor's expense. The

Contractor must dispose of these residues respecting federal, provincial and municipal codes in effect. The Contractor must provide the TA with a disposal certificate.

- 16.1.C.3.7 After the tanks are cleaned of all residue, they must be inspected by the IA, the NACE inspector and the ABS surveyor. This inspection is to ensure that the suction valves and sounding pipes are free of obstruction and that limber holes in the floors, stringers and web frames are free. The Contractor must advise the NACE inspector when the tanks in question are ready for inspection.
- 16.1.C.3.8 Any structural defects discovered during these inspections will be dealt with using PWGSC 1379 form.
- 16.1.C.3.9 Once the tanks have been cleaned from all blasting residue and contaminants, and prior to painting, the Contractor must conduct chloride ion testing on the bare metal surfaces to be coated. This test must be conducted in the presence of the IA, the NACE inspector and must be in accordance with SSPC Guide 15, Methods for Extraction and Analysis of Soluble Salts on Steel and other Nonporous Substrates. The Contractor must supply and use Chloride ion tests (ex: CHLOR\*TEST "CSN SALTS" Test kit) conforming to NACE 6G186, SSPC Guide 15 or SSPC-TU-4. The maximum amount of chloride ion on the surfaces must be 5 µg/cm<sup>2</sup> or less. The Contractor must record the results of the testing and provide them to the TA and the IA prior to commencing any coating work. If the Chloride ion tests show results above the maximum permissible, additional remedial work must be conducted by the Contractor to reduce the chloride ion count to below the maximum permissible.
- 16.1.C.3.10 To determine the number of tests required, the Contractor must refer to the table below:

<b>(A) Total Recoated Area</b>	<b>(B) Recoated Area per Test</b>
Less Than 50 m <sup>2</sup> (539 ft <sup>2</sup> )	10 m <sup>2</sup> (107 ft <sup>2</sup> )
50 m <sup>2</sup> (539 ft <sup>2</sup> ) to 200 m <sup>2</sup> (2153 ft <sup>2</sup> )	20 m <sup>2</sup> (215 ft <sup>2</sup> )
200 m <sup>2</sup> (2153 ft <sup>2</sup> ) to 500 m <sup>2</sup> (5382 ft <sup>2</sup> )	40 m <sup>2</sup> (431 ft <sup>2</sup> )
500 m <sup>2</sup> (5382 ft <sup>2</sup> ) to 1000 m <sup>2</sup> (10764 ft <sup>2</sup> )	60 m <sup>2</sup> (646 ft <sup>2</sup> )

- Locate the entry in column (A) for the approximate tank area to be recoated and divide that value by the value in column (B) of the same row.
  - When only portions of the tank are to be recoated, the total area that is to be recoated per location (and not the total recoat area of the tank) is used in the calculation listed above.
- 16.1.C.3.11 Chloride ion tests must be uniformly distributed over the tank area to be recoated.
- 16.1.C.3.12 The Contractor must provide a price for carrying out testing of 100% of the surface area of each tank.

16.1.C.3.13 The Contractor must also provide a price per lot of 10 tests.

16.1.C.4 **Application of Coating (paint)**

16.1.C.4.1 The Contractor must provide a complete schedule of painting work, including the application. The Contractor must ensure that the paint used meets the following criteria :

- a) 100% solid epoxy coating that is volatile organic compound (VOC) free.
- b) Certified "protective barrier material" for use on potable water tanks, as stipulated in the National Sanitation Foundation's "Drinking Water System Components Program – Standard 61."
- c) Compatible with the existing coating allowing for NSF 61 certification.

16.1.C.4.2 The Contractor must use a suitable solid epoxy-based paint that meets the CA 013 000 ES TE 003 Paints and Coating Standard for potable water tanks found aboard a ship.

16.1.C.4.3 The Contractor must indicate a price for recoating approximately 10% of 215 m<sup>2</sup> of the Port Potable Water tank area.

16.1.C.4.4 The Contractor must provide a price for the complete blasting and recoating of STBD Potable Water tank.

16.1.C.4.5 The Contractor must apply a strip coat (as recommended by the paint manufacturer) to all edges and corners at right angles before the first coat of paint is applied.

16.1.C.4.6 Before contract award, the Contractor must provide the PWGSC Contracting Authority with the following:

- a) The paint coating that has been bid and that will be applied;
- b) The manufacturer of the coating;
- c) Proof that the paint meets the NSF 61 Standard and that it is compatible with Interline 925 (current Port side tank coating). The Contractor must also demonstrate that the two products, when applied one over the other, are NSF 61 approved;
- d) Manufacturer's application procedures;
- e) WHMIS Material Safety Data Sheets and product data sheets.

16.1.C.4.7 The Contractor must ensure that the paint manufacturer's application procedures for the paint are strictly adhered to, in particular, with respect to:

- a) Preparation of surfaces
- b) Drying and curing conditions (including temperature, humidity, dew-point, ventilation, cure time)
- c) Shelf life of paint

d) Compatibility with tank materials

- 16.1.C.4.8 On completion of the surface preparation and prior to the first application of the paint schedule, the Contractor's Quality Assurance representative must provide a written statement certifying that the surface preparation has been completed in accordance with the manufacturer's instructions. Any deviations from those instructions must be noted in the certified statement.
- 16.1.C.4.9 The Contractor must monitor the following parameters during paint application and curing:
- a) The temperature of the ambient air in each tank must be constantly monitored during the application and curing period of the paint schedule, using an electronic data recorder. Temperatures must be recorded hourly and printouts submitted as contract deliverables;
  - b) Space temperature and relative humidity level in the tank - before work is started and then then during the curing process;
  - c) Wet-bulb temperatures of the tank and temperatures of the surfaces being painted - this is to be taken and recorded every four hours during the coating process as well as during the paint curing process.
- 16.1.C.4.10 The Contractor must note that the paint application must not take place when the surface temperature of the tanks is less than three (3) degrees Celsius above the dew point.
- 16.1.C.4.11 On completion and acceptance of all painting, the Contractor must dismantle and dispose of the temporary enclosure ashore.
- 16.1.C.5 **Commissioning of the Potable Water Tanks**
- 16.1.C.5.1 The Contractor must leave the potable water tanks open and ventilated until the paint coating is fully cured. The curing period must be determined based on the ambient air temperature in the tanks as well as the substrate temperature. The Contractor must afford the IA, TA and the 3rd party NACE inspector the opportunity to inspect the cured paint coating before the tanks are closed for commissioning.
- 16.1.C.5.2 The Contractor must close the manhole covers with new Contractor supplied fibre reinforced neoprene gaskets (certified NSF 61) for the manhole covers.
- 16.1.C.5.3 The Contractor must disinfect each tank in accordance with the CCG Fleet Safety Manual (FSM) Potable Water Quality Guidelines contained in section 7.A.12 prior to filling for testing. The water used for disinfection must be disposed of in accordance with regulations in effect and the Contractor must supply the IA and TA with a disposal certificate.
- 16.1.C.5.4 The Contractor must measure and record the chlorine levels during super chlorination of the tanks. These reading must be provided to the IA and TA.



- 16.1.C.5.5 The Contractor must hydrostatically test each potable water tank to a head of 2.44m. This hydrostatic test must be witnessed by the IA and the ABS surveyor. This test may be carried out concurrently with the chlorination treatment specified in the FSM.
- 16.1.C.5.6 The Contractor must supply all required chemicals and equipment for the super chlorination, de-chlorination and disposal of all water used to treat the fresh water tanks in accordance with paragraphs 3.6 of the CCG Fleet Safety manual (FSM) “Potable Water Quality”, contained in section 7.A.12.
- 16.1.C.5.7 On completion of flushing of the water tanks the Contractor must arrange for water samples to be provided to an accredited laboratory for analysis and to obtain a potable water inspection certificate.
- 16.1.C.5.8 The Contractor must perform the following to obtain these samples:
- a) Each tank must be filled with potable water to half its normal capacity;
  - b) Each tank must then sit undisturbed forty-eight (48) hours before samples are taken;
  - c) One (1) water sample must be taken from the fresh water supply line used to fill the tanks;
  - d) Two (2) samples must be taken from the water inside each tank;
  - e) The samples must be taken in the presence of the IA and the TA;
- 16.1.C.5.9 The Contractor must ship the water samples listed above to an independent, accredited laboratory for water quality testing. The Contractor must ensure that the water samples are kept at the correct temperature and shipped in such a way that the laboratory can perform the water quality analysis. Failure to meet this requirement will require re-sampling of the potable water tanks at Contractor expenses. The Contractor must have the water samples tested using the 29 parameters described in the Fleet Safety Manual, paragraph 3.6F of the section 7.A.12 – POTABLE WATER QUALITY, as well as other identified chemicals of concern based on the Coating manufacturer MSDS sheets.
- 16.1.C.5.10 The Contractor must take an additional 2 water samples after 72 hours from the time the first samples were taken from the tanks and ship them for analysis and testing as specified in 16.1.C.5.9.
- 16.1.C.5.11 All potable water test results must meet the parameters specified. Where potable water results are higher than those specified will require the Contractor to perform remedial work at his expense to rectify the situation.
- 16.1.C.6 **Drinking water pressurizing pumps replacement**
- 16.1.C.6.1 The Contractor must provide the following pump or the equivalent:

Item	Qty.	P/N	Catalogue No. / Description
1	2	AKHY 5101 BN 135 35 0	<b>Sterling Sihi Pump</b>  <b>(Replacement Pumps For AKHK 5101 BN 081.35.0)</b>

16.1.C.6.2 The criterias for the replacement pump are the following:

- a) Capable of delivery 50 I.G.P.M. @ 65 psig
- b) Component with high salt water corrosion resistance:
  - i) Stainless steel 316 shaft
  - ii) Bronze or stainless steel casing and intermediate parts
  - iii) Bronze or stainless steel impeller
- c) Self-priming pump
- d) Shaft with mechanical seals
- e) NSF61 Certified

16.1.C.6.3 The two (2) existing pumps on the drinking water pressurization must be removed and stored onboard. The TA will indicate a location where to store them.

16.1.C.6.4 The existing electric motors driving the pumps must be reused. (Laurence Scott electric motor rated for 10 BHP @ 1700 rpm. Coupling - 8J)

16.1.C.6.5 The Contractor must ensure that the pump supplied have enough pumping capacity for both systems.

16.1.C.6.6 The Contractor must provide all material, equipment, tooling and parts required to do the work.

16.1.C.6.7 The existing pumps must be electrically isolated on the MCCs located in the control room. The circuit breakers must be isolated and locked.

16.1.C.6.8 The two new pumps must be bolted on their respective original bases, piping and couplings.

16.1.C.6.9 The Contractor must connect the piping to the new pumps with new seals.

16.1.C.6.10 The Contractor must assume that some paint touch-ups will be required on the bases and some piping adjustments will be required.

16.1.C.6.11 The Contractor must align the pumps with electrical motors using a modern and accurate method.

16.1.C.6.12 Installation must be done with new bolts, washers and nuts.

16.1.D **Proof of Performance**

16.1.D.1 **Inspection Points**

16.1.D.1.1 The Contractor's quality assurance representative, the IA, TA and the NACE inspector must perform the following tasks:

- a) Inspect each water tank after the surfaces have been cleaned and prepared;
- b) Monitor ambient temperatures and dew points;
- c) Monitor surface temperatures;
- d) Monitor the relative humidity;
- e) Final inspection of all tanks prior to being "closed-up".

16.1.D.1.2 The Contractor must provide the results of the Chloride ion testing prior to commencing any coating work.

16.1.D.1.3 The Contractor must schedule inspection after removal and after installation of the pumps

16.1.D.2 **Testing/Trials**

16.1.D.2.1 With the ABS inspector present, the tanks must be subjected to a hydrostatic test.

16.1.D.2.2 Perform start-up and testing of the new pumps in the presence of the IA.

16.1.D.2.3 The pumps must be operated for at least 1 hour during the tests.

16.1.D.3 **Certification**

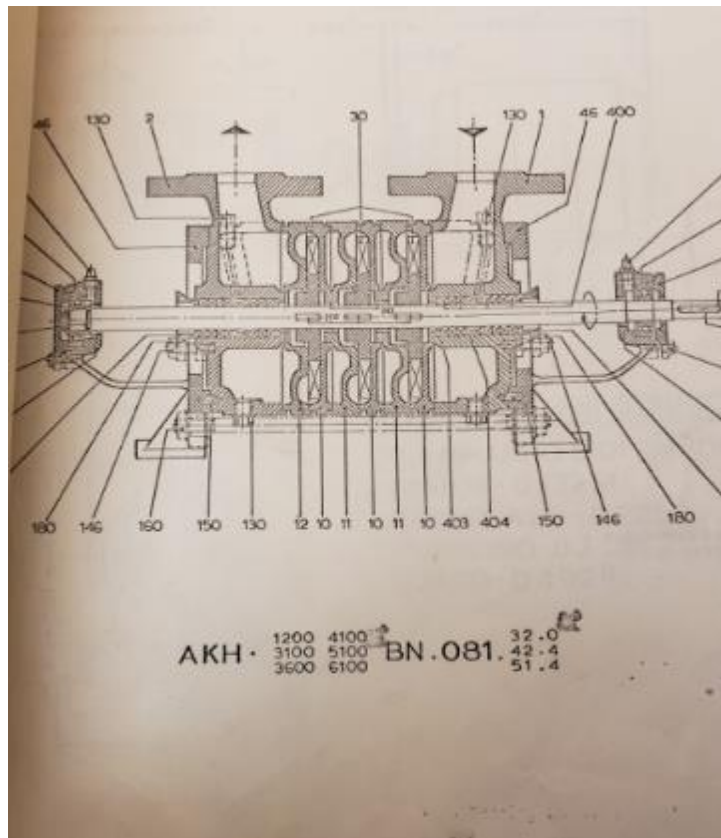
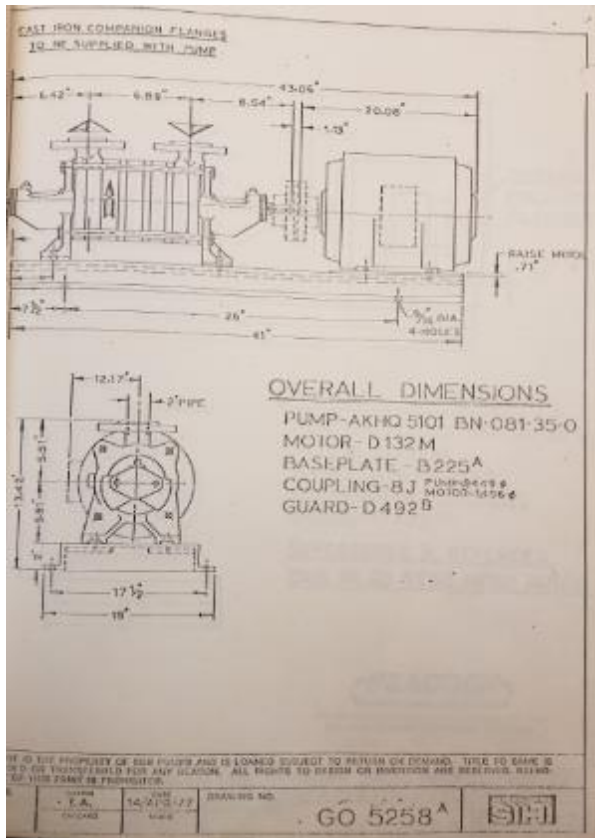
16.1.D.3.1 The Contractor must provide a copy of the laboratory water analysis results certifying each tank is suitable for potable water use.

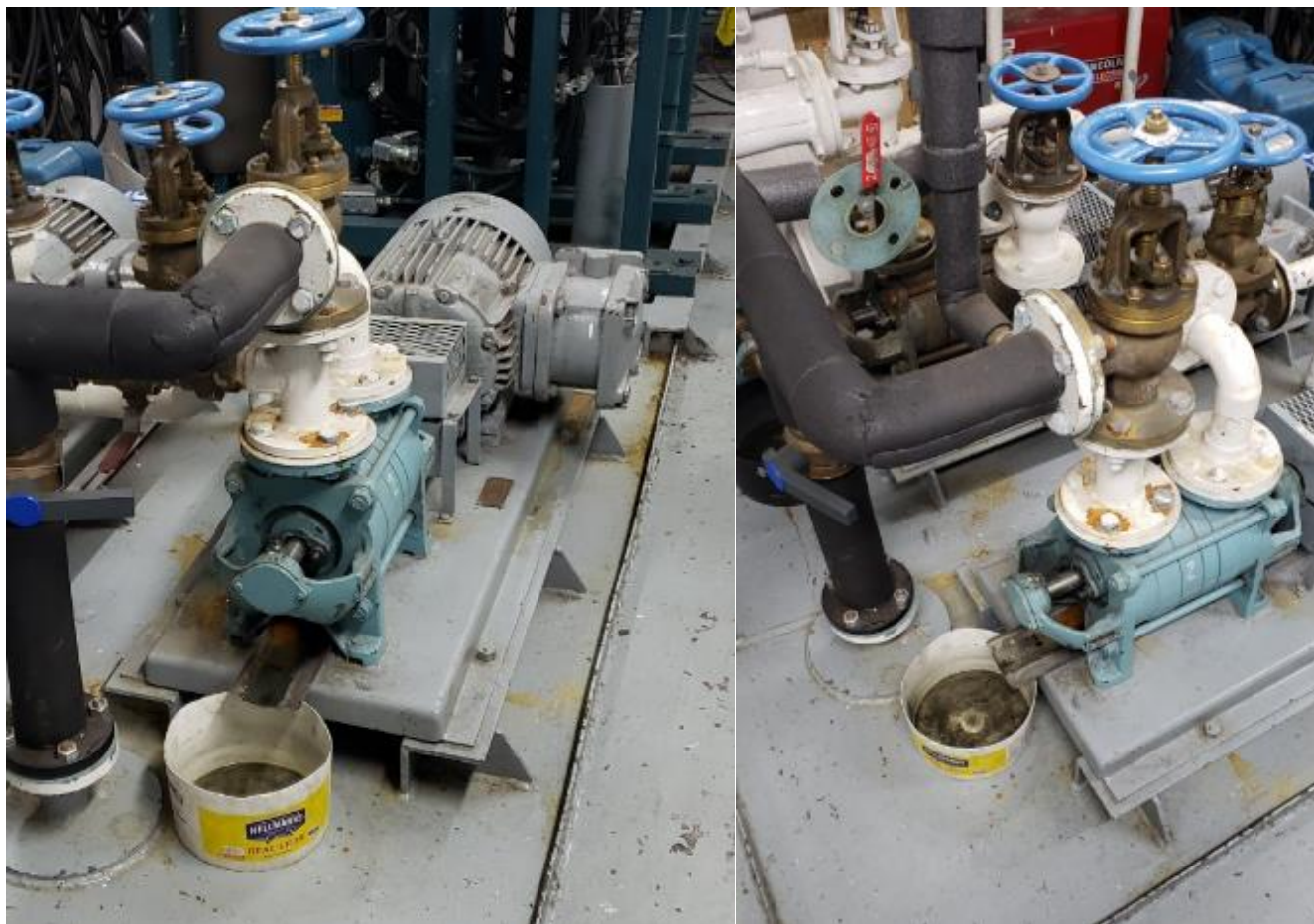
16.1.D.3.2 The Contractor must provide certificate that proves that the pumps selected are NSF61 certified prior to procurement.

16.1.D.4 **Documentation**

16.1.D.4.1 The Contractor must provide the IA and TA with the report detailing the work done, defects, repairs performed, measurements and readings taken.

- 16.1.D.4.2 The Contractor must provide the NACE report to the IA and the TA. The report must indicate any non-compliance with the manufacturer's instruction in performing the work. This must also include the results of the Chloride ion testing.
- 16.1.D.4.3 The Contractor must provide the reports from the independent, accredited laboratory for water quality testing to the IA and TA and the vessel as soon as they are available but no longer than 1 week after the samples were taken.
- 16.1.D.4.4 The Contractor must provide a complete operations and maintenance manual for the pumps in two (2) hard copies and one PDF file of the manual in French and English.
- 16.1.D.4.5 The maintenance manual must contain the following:
- a) A detailed description of the pumps
  - b) Installation instructions
  - c) Detailed maintenance program
  - d) Detailed list of spare parts
  - e) Drawings associated with the pumps
  - f) Troubleshooting guide
- 16.1.D.5 **Training - [Not Used]**

**Annex 1 (existing pumps photos):**



## **16.2 ENGINE ROOM FANS REFURBISHMENT (OPTIONAL)**

### **16.2.A Identification**

- 16.2.A.1 The objective of this item is to perform an inspection and refurbishment of the 12 fans for the ventilation of the FWD engine room, Aft engine room and propulsion motor room.

### **16.2.B References**

#### **16.2.B.1 Equipment Data – [Not Used]**

#### **16.2.B.2 Drawings and Documents**

- 16.2.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>Drawing / Document Title</b>	<b>Number of Sheets</b>
Fans Data Sheets	Fans Data Sheets	18
Fans Service Manual	Fans Service Manual	20
221-625-2_01	Ventilation Arrangement in machinery space (forward engine room)	1
221-625-2_02	Ventilation Arrangement in machinery space (Aft engine room)	1
221-625-2_03	Ventilation Arrangement in machinery space (Propulsion Motor room)	1

#### **16.2.B.3 Regulations and Standards**

- 16.2.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
FSM Procedures		
Publications		
	[Not Used]	
Standards		
Regulations		

**16.2.C Statement of Work****16.2.C.1 General**

- 16.2.C.1.1 The Contractor must supply all labour, materials, tools, lifting equipment, scaffolding to remove and install all 12 fans for the FWD Engine Room, Aft Engine Room and Propulsion Motor Room.
- 16.2.C.1.2 Before removing the fans, the Contractor must properly identify them, their location, their position and provide a megger test report to the IA.
- 16.2.C.1.3 The Contractor must send the 12 fans to a specialized firm to be dismantled, cleaned and inspected. An inspection report must be sent to the IA and TA for review. All required repairs will have their costs negotiated and covered in a PWGSC 1379 form. Any replacement components for the fans refurbishment must be first quality components.
- 16.2.C.1.4 The Contractor must provide a second complete inspection report detailing the work performed, the modifications completed, the parts used, vibration test and megger test to IA and TA for approval prior to reinstalling the fans.
- 16.2.C.1.5 The Contractor must include all handling and transportation costs.

**16.2.D Proof of Performance****16.2.D.1 Inspection Points**

- 16.2.D.1.1 The Contractor must coordinate inspections with the IA and TA.
- 16.2.D.1.2 The Contractor must provide the first inspection report and second detailed works completed report in due time to IA and TA.
- 16.2.D.1.3 All work must be completed, presented and accepted by the IA.

**16.2.D.2 Testing/Trials**

- 16.2.D.2.1 Tests must be conducted in the presence of the IA. The Contractor must demonstrate to the IA the proper functioning of fans from every control locations.

**16.2.D.3 Certification – [Not Used]****16.2.D.4 Documentation**

- 16.2.D.4.1 The Contractor must provide a first complete inspection report detailing the work performed, the cause of the failures (if any), the modifications required and the parts to be replaced.



- 16.2.D.4.2 The Contractor must provide a second complete inspection report detailing the work performed, the modifications completed, the parts used, vibration test and megger test.
- 16.2.D.4.3 The Contractor must provide an electronic copy in PDF format of the reports to the TA.
- 16.2.D.5 **Training - [Not Used]**

## **16.3 GALLEY RENEWAL**

### **16.3.A Identification**

- 16.3.A.1 The objective of this item is to renew the vessel's kitchen following the supplied new kitchen design engineering documents and replace the refrigerator safety alarm system.

### **16.3.B References**

#### **16.3.B.1 Equipment Data – [Not Used]**

#### **16.3.B.2 Drawings and Documents**

- 16.3.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Drawing Number</b>	<b>DRAWING TITLE</b>	<b>Number of Sheets</b>
P4134	AMUNDSEN_SPEC_GALLEY	50
P4134	Amundsen Galley and Pantry – Plan and Elevation	12
222-910-15_8	Refrigeration Alarms	1
222-900-8 (page 58)	Galley fire protection and cleaning station	1
222-H-101	General Arrangement	3
P4134	Spec Pantry	10

#### **16.3.B.3 Regulations and Standards**

- 16.3.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

	<b>Title</b>	<b>Included Yes/No</b>
<b>FSSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>		
	Coast Guard Welding Specification	
	Coast Guard ISM Hotwork procedures	
<b>Regulations</b>		
	Fleet Safety and Security Manual (DFO/5737)	
	IACS No. 47 - Shipbuilding and Repair Quality Standard	

	CSA W59-08 (R2008) - Welded Steel Construction	
	CSA W47.1-09 - Certification of Companies for Fusion Welding of Steel	
	Society for Protective Coatings (SSPC) Standards	
	American Bureau of Shipping (ABS)	

### **16.3.C Statement of Work**

#### **16.3.C.1 General**

- 16.3.C.1.1 The Contractor must supply all labor, materials, equipment, lifting equipment, and parts required to perform the specified works.
- 16.3.C.1.2 The Contractor must take all precautions to prevent waste, cuttings and dust from leaving the work areas.
- 16.3.C.1.3 The Contractor must integrate floor drains, tank sounding plugs, piping, grommets and any other penetrations in the floor, if any. The Contractor must supply, manufacture and install special adapters if they are required for these items.
- 16.3.C.1.4 All products used for floor repairs must be applied/installed according to the recommendations and instructions from the product's manufacturer.
- 16.3.C.1.5 Temperature of areas where work is taking place must be controlled and maintained within tolerance of glue/concrete manufacturers recommendation to ensure a quality and durable results once dried.
- 16.3.C.1.6 The Contractor is responsible for collecting, removing from the ship and disposal of the waste.
- 16.3.C.1.7 When the work is completed, the passageways, cafeteria and galley entrances and stairways must be cleaned to return the vessel to the same state of cleanliness as before the work.

#### **16.3.C.2 Removal**

- 16.3.C.2.1 All sources of power, hot and cold potable water and drainage must be locked by the Contractor with his own locks. The IA, TA and other CCG personnel allowed onboard must examine the location of the locks. The Contractor must complete and maintain proper lock and tag forms.

- 16.3.C.2.2 A fire equipment specialist must unplug and remove all fire equipment from the kitchen. Detection equipment must also be isolated and dismantled. The equipment must be stored for reinstallation during the reassembly of the kitchen equipment.
- 16.3.C.2.3 The Contractor must coordinate with IA to take digital photos of the entire space to locate all equipment for reassembly. A copy of the digital images must be provided to IA and TA before work begins.
- 16.3.C.2.4 All equipment removed from Galley that is planned to be kept must be stored in the cafeteria. In order to be able to transfer the equipment, the Contractor must remove the door 632, its frame and a section of wall panelling to create an opening of 83 inches high by 40 inches wide. (See **Annex 1** for pictures of the door). The door, its frame and the wall panelling on the cafeteria side must be kept
- 16.3.C.2.5 Once the equipment has been electrically isolated, the Contractor must dismount the equipment from their seating, and proceed with storage for those who will be relocated or disposed for those to be replaced, according to the new guidance drawings *Amundsen Cuisine and Pantry – Plan et Elevation*.
- 16.3.C.2.6 The Contractor must remove all stainless steel cabinets to allow the removal of existing flooring and ceiling panels. The Contractor must also remove all stainless steel countertops and articles mounted on stainless steel bulkheads, ie. clocks, spice racks, bookcases, lockers, paper towel racks, plate warmers, dishes, etc. Cabinets, counters and items found indoors must be either for disposal or stored in the cafeteria for future re-installation. The Contractor must assign a number to each cabinet / closets and properly label all the contents in the appropriate cabinet / closets for subsequent placement in the appropriate location once the work is completed. The Contractor must wear clean, never worn and disposable coveralls and gloves when handling items in cabinets / closets. The Contractor must keep all loose items in new, never used, properly protected packaging boxes with bubble / paper / foam packaging. The Contractor must take care not to damage and must note any anomalies detected before the move. The Contractor is responsible for replacing or repairing any damaged items, at its own expense.
- 16.3.C.2.7 The Contractor must remove all ceiling panels and supports for disposal.
- 16.3.C.2.8 The Contractor must remove all panels from the inner wall panels and their fastening systems. The Contractor must include in its bid the removal for storage of interference elements (ie, insulation below, wiring, piping work, etc.) and reinstallation after work is completed.
- 16.3.C.2.9 The galley range hood must be removed and disposed and ducting must be degreased and cleaned up to the hood before the work. The duct for a 12" x 32" rectangular section includes

a 36' horizontal segment, a 90-degree elbow and a 27' vertical segment. An access panel is installed in the cleaning product storage room and another in the passageway in front of the helicopter hangar and two in the section in the galley ceiling. The Contractor must open and close the access panels for cleaning purposes.

16.3.C.2.10 The Contractor must completely remove the ceramic tiles, as well as leveling underlayment of ½" thick. The Galley has a flooring area of approximately 50 m<sup>2</sup>/540 ft<sup>2</sup>. The thickness of the marine concrete under the flooring and the leveling underlayment is between 2" to 3/8".

16.3.C.2.11 For bidding purpose, the Contractor must estimate that 50% of the Galley concrete floor area will be removed down to the deck steel in order to prepare for removal and installation of new counter bases. As per guidance drawings, the Contractor must fabricate and install new foundations for all new equipment, after removal of the old foundations. The Contractor must get services from a qualified technician to take 100 deck steel thickness readings (see details in following section below).

16.3.C.3 **NDT Thickness readings and Steel Repair (if any)**

16.3.C.3.1 After removal of the flooring concrete, brush bare steel and then check 100 steel thickness measurement points on floor and around the floor drains in presence of ABS Surveyor. A record of the readings must be submitted to the IA, TA and ABS Surveyor, with a highlighting of the readings with more than 25% loss of thickness.

16.3.C.3.2 The Contractor must bid for the renewal of 10% (5 m<sup>2</sup>) of the steel flooring area. All welding work must be 100% MPI tested. It is the Contractor's responsibility to consult with ABS on the inspection requirements prior to steel renewal. New steel must be 44 W or equivalent. All repairs must be in accordance with IACS Quality Standard No. 47 for Shipbuilding and Repair. The Contractor must include in its bid an offer for the coverage of interference elements (ie, insulation below, wiring, piping work, etc.) or removal, storage and reinstallation later. The price must include the application of a coat of concrete primer on the bare steel in accordance with the manufacturer's requirements.

16.3.C.4 **Modification and installation of appliances, ceilings, walls and flooring**

16.3.C.4.1 The Contractor must take care to protect equipment and new facilities as work progresses according to planned expertise and coordination.

16.3.C.4.2 The Contractor must supply and install the new white honeycomb type C of 20 mm thick ceiling panels, fasteners, access hatches and gaskets. The ceiling area is of approximately 50 m<sup>2</sup>. The longest panels must be used wherever possible. When the ends of the panels are cut to the desired length, the edges must be folded to give a finished appearance. Panels must be cut to fit fixtures that have been removed during stripping, lights, vents, etc. The ten (10) 4

ft fluorescent light marine fixtures must be replaced by an equivalent marine LED 30W, 120-277 Vac, color temperature 3500K model supplied by the Contractor and presented to the TA for approval before procurement.

- 16.3.C.4.3 The Contractor must supply and install a new range hood and two new ceiling air suction hatches with louver controls over each oven (item 009 and 020). The two hatches and their ducting must be connected with its adapted supports to the hood ducting system. The ducting connections must allow the range hood fan to be sufficient for the 2 new hatches (ventury type) for a minimal suction air flow.
- 16.3.C.4.4 The Contractor must finish the perimeter of the exhaust hood to match the new ceiling by certified sheet metal workers. The material must be in accordance with the new one. The existing fire extinguishing and new lighting equipment must be installed to the same existing configuration.
- 16.3.C.4.5 The Contractor must supply and install new solid stainless steel wall panels, fasteners and moldings. Wall panels must be joiners of 20mm thick, interior face stainless steel, type C (minimum). Panels must be 20mm X 1200mm X 2400mm. The interior dimensions of the Galley must be the same once the new wall panels are installed. When the welds are checked (if any) and approved by IA to 100% NDT, the Contractor can then complete the paint and closure of the wall panels. The size of the countertops must be taken into account in relation to the width of the walls.
- 16.3.C.4.6 All seams must end vertically in the least visible areas and inside corners. There must be no seams on the outside corners; the liner must be folded to match the profile of the outside corners. The joints must be coated with a food grade sealant and a color matched to that of stainless steel. The sheet must be fixed with rivets made of stainless steel or glued. The top edge must have a finished appearance, without sharp edges, and must have a uniform height throughout the perimeter. The coating must be cut to match the penetrations, contours, etc., found in the kitchen as before. The new sheath must be provided in the largest possible sections to minimize seams.
- 16.3.C.4.7 The Contractor must supply and install new kitchen equipment at locations as per drawing *Amundsen Cuisine and Pantry – Plan et Elevation* and related equipment list *AMUNDSEN\_DEVIS\_GALLEY*.
- 16.3.C.4.8 The Contractor must validate the power and make the electrical and plumbing connections in accordance with the manufacturers instructions. Electrical cables that can be reused must be tested by insulation testing (Megger). Based on guidance drawings *Amundsen Cuisine & Pantry - Plan et Elevations*, some new devices will need new cables and circuit breakers (see items 007, 025, 026 and 027). the Contractor must provide a cable pulling list and equipment list for approval by the IA and the TA. New isolation valves must be provided and installed

by the Contractor with silver soldering on each equipment and faucets. All service lines must be hidden.

- 16.3.C.4.9 The Contractor must supply and install an "L" anti-drip seal installed between SS panels and countertops, if less than 1/4 "instead a seal must be caulked with quality sealant and a color matched to stainless steel by certified sheet metal professionals.
- 16.3.C.4.10 The Contractor must reinstall and fix the wall mounted equipment removed during disassembly to be reinstalled and connected as originally intended. The new refrigerator safety system must be installed using the existing cables already in place.
- 16.3.C.4.11 The Contractor must prepare the steel and cover the deck with marine concrete up to the same height as the existing with the Dex-O-Tex Insul-Dex lightweight product. The Contractor must provide a price per square foot for any surface exceeding the planned 50%. Depending on the sequence of work, a new 1/2" leveling sub-layer must be applied to the new and existing concrete subfloor. The new sub-layer must be compatible with the existing marine concrete. The replacement of insulating material around the plumbing drains must also be completed. A new IMO certified and marine approved kitchen flooring must be supplied and installed. The Contractor must present the proposed new products to the TA in order to get approval before procurement.
- 16.3.C.4.12 The Contractor must use the services of a professional cleaning company to clean the entire kitchen, from ceiling to floor once the work is completed.

16.3.C.5 **Refrigerator Safety System**

- 16.3.C.5.1 The Contractor must supply and replace the refrigerator Alarm System (see annex 2 below and refer to drawing *Refrigeration Alarms* provided).
- 16.3.C.5.2 The new system must be compact and using same concept of lights and buzzer as the existing one.
- 16.3.C.5.3 OPTIONAL: The Contractor must provide cost for a new system made with PLC or programmable relay and a small marine approved HMI/human machine interface of 12" with buzzer.
- 16.3.C.5.4 The system must use same voltage and existing cables from the actual system.
- 16.3.C.5.5 The system must be ABS approved.

16.3.C.6 **Modification of the Pantry**

- 16.3.C.6.1 The contractor must complete modification of the pantry following the Amundsen Galley and Pantry – Plan and Elevation and Spec Pantry documents. The Contractor must use same

wall panelling, ceiling and flooring as previously identified for the Galley. The Contractor must repair marine concrete subfloor in the same way as previously explained for the Galley. The Contractor must assume that 50% of the whole Pantry marine concrete subflooring (6m<sup>2</sup>) will have to be removed down to the deck steel to accommodate the installation of new cabinet bases. The Contractor must then rebuild the marine concrete subflooring following the same steps as previously explained for the Galley (see item 16.3.C.4.11). The Pantry must be cleaned in the same way that the Galley will be when the work is completed.

#### **16.3.D Proof of Performance**

##### **16.3.D.1 Inspection Points**

16.3.D.1.1 100% UT must be carried out on the welds and NDT report provided to IA and TA.

##### **16.3.D.2 Testing/Trials**

16.3.D.2.1 The Contractor must hire a galley equipment specialist to pre-check, start-up and do the commissioning all new equipment.

##### **16.3.D.3 Certification**

16.3.D.3.1 The Contractor must provide Class Certification for the material provided, insulation, panels, flooring, etc.

16.3.D.3.2 A certificate of return into service of the fire protection and fire extinguishing equipment must be provided. Must be coordinated with item 10.3 of the actual SOW.

16.3.D.3.3 The Contractor must provide the certificate of approval from ABS for the refrigeration safety system.

##### **16.3.D.4 Documentation**

16.3.D.4.1 The Contractor must supply 3 copies of the galley equipment commissioning FSR service report.

##### **16.3.D.5 Training – [Not Used]**



**Annex 1 (Door 632):**

**Annex 2 (Refrigerator Safety System):**

## 17.0 **DECK EQUIPMENT**

### 17.1 **ANCHOR WINDLASS MAJOR OVERHAUL**

#### 17.1.A **Identification**

- 17.1.A.1 The objective of this item is to complete a major overhaul of the windlass system. The work will relate to structural, mechanical, hydraulic and electrical components.

#### 17.1.B **References**

##### 17.1.B.1 **Equipment Data**

**Windlass:**

Manufacturer: John T. Hepburn Ltd

Model: 75-M-0527

Serial no: C-10084

Weight: 22 000 lbs

**Main hydraulic pump:**

Type: Pressure compensated piston pump

Manufacturer : Parker Denison

Model: P09H 2R1C C10 00

Code no: 022-09190-0

Serial no: 3712

**Auxiliary hydraulic pump:**

Type: Gear pump

Manufacturer: Dowty

Model: 2P3105-A-P-S-S-B

**Electric Motor for Hydraulic Unit:**

Manufacturer : Robbins Myers

Type : NX-BEW4

Frame : 445TSZ

Serial # : DM6707-1

Voltage : 440V, 3 ph, 60 Hz

Amperage : 122A

Power : 100 Hp

Speed : 1770 RPM

Bearings : 6316 Z, Qty: 2

### 17.1.B.2 Drawings and Documents

17.1.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Drawing Number	DRAWING TITLE	Number of Sheets
45225-0-A1 (rev 2)	Hand brake Assembly	
45229-0-A1 (rev 3)	Clutch assembly	
45234-0-A1 (rev 2)	Gear box assembly	
45241-0-A1 (rev 5)	Anchor windlass for 2 in stud link cable	
45992-0-A1 (rev 4)	Windlass control console	
45981-0-A6 (rev 3)	Hydraulic power unit	
45998-0-A2 (rev 1)	Windlass hydraulic schematic	
46174-0-A2	Hydraulic piping layout	
60021-A2 (rev 1)	Schematic diagram for anchor windlass	
MM-7222-2-E (rev 2)	Arrangement of automatic brake	
45247-0-A1 (rev 7)	Roller type bow stopper assembly & details	
	Brake Pad OEM (Morgan) Specification	
221-H-56	Anchor Handling Arrangement	
221-H-56a	Red lined for bidding purpose	
221-H-139	Profile and Decks	
221-900-6, sheet 14	Electrical Connections MCC #12	
221-900-8, sheet 56	Electrical Connections (shipyard)	
60021-A2, sheet 1	Electrical Connections (Hepburn)	
2016-07-29	Windlass new heater connections	
	Windlass Pictures Folder	

### 17.1.B.3 Regulations and Standards

17.1.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

FSSM Procedures	Title	Included Yes/No
<b>Publications</b>		
<b>Standards</b>		
ISO 23309	Hydraulic fluid power systems - Methods of cleaning lines by flushing	No

ISO 16431	Hydraulic fluid power - System clean-up procedures and verification of cleanliness of assembled systems	No
ABS	American Bureau of Shipping (ABS)	No
IEEE 45	Recommended Practice for Electrical Installations Shipboard	No
<b>Regulations</b>		
SOR/90-264	Marine Machinery Regulations	No

### **17.1.C Statement of Work**

#### **17.1.C.1 General**

- 17.1.C.1.1 Unless otherwise specified, the Contractor must provide all materials, steel, paint, hardware, tools, lifting equipment including crane services, oil and grease products, seals, sealants and all other parts/equipment necessary for to complete the work as described below.
- 17.1.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.
- 17.1.C.1.3 Before working on the windlass, the Contractor must coordinate with IA to take a series of photos of the windlass and its components, including the hydraulic power pack and its components. The Contractor must pay particular attention to the controls, its piping and accessories to ensure everything is put back as it was before the work.
- 17.1.C.1.4 Prior to working on the windlass, the Contractor must conduct the tests outlined in Section 17.1.D.2.1 of this specification.

#### **17.1.C.2 Windlass Overhaul**

- 17.1.C.2.1 The Contractor must remove the steps aft of the windlass, as well as the steel guard protecting the piping between the windlass and the control console. These items must be reinstalled upon completion of work.
- 17.1.C.2.2 The Contractor must protect the valve for the Fore Peak tank from being damaged during the work. Remove the protection once work is completed.
- 17.1.C.2.3 The Contractor must identify and remove hoses, accessories and hydraulic piping from the windlass, the control console, and the hydraulic unit. Plug all piping and hoses with threaded plugs and caps. The Contractor must recover all oil from the hoses and piping and dispose of it in accordance with environmental regulations. These items must be stored in a protected space where they will not get damaged.

- 17.1.C.2.4 The Contractor must remove the control console to gain access to the deck. The electrical box for starting the pump, the phone, the buzzer and the junction box fixed to the console must be disconnected. The electrical wires must be identified and pulled inside the compartment under the windlass. The cable penetrations must be temporarily plugged. Upon completion of the work, all items and wiring must be reinstalled installed in their respective locations.
- 17.1.C.2.5 The chains and anchors must be securely attached to allow removal of the chain from the wildcat (drive sprocket). The chain will be removed by the Contractor. The Contractor must disembark the windlass and bring it to its facilities to allow an inspection of the steel under the windlass, as well as to facilitate and permit the overhaul to be carried out in a sheltered location. According to the plan 45241-0-A1 rev. 5, the estimated weight of the windlass is 22 000 lbs.
- 17.1.C.2.6 The Contractor must remove the bowstopper assemblies in order to gain access to the deck and to be overhauled.
- 17.1.C.2.7 The Contractor must unbolt the base of the windlass. The shims for the windlass must be measured and clearly identified. The shims must be given to the IA for storage until the windlass is ready to be reinstalled on its base.
- 17.1.C.2.8 The Contractor must take 30 ultrasonic thickness measurements (UTM) on the seats and deck steel plate under the windlass.
- 17.1.C.2.9 OPTIONAL - The Contractor must provide a price for the replacement of a section of deck plating (insert) under the anchor windlass. The Contractor must quote for the area defined by the red rectangle on drawing 221-H-56a. The steel used must be 1/2" thick and Lloyd's grade "A" or an equivalent steel approved by a classification society. The Contractor must submit a welding procedure for all welds. This item is optional and execution of the work will depend on the results of the steel thickness measurements.
- 17.1.C.2.10 With the windlass removed, the steel under the windlass and its seating must be cleaned and sanded to obtain as surface preparation standard of SA 2 (SSPC-SP6) is achieved. The surface area to be clean is 23 feet long by 15 feet wide. In anticipation of sandblasting and painting of the specified area, the Contractor must install a temporary sealed shelter to confine the sand dust. The Contractor must protect the cranes and mooring winches located on the foredeck with polythene and close all vents and air intakes located on the deck in the vicinity. The Contractor must remove this protection only upon completion and approval of work by the IA. Dispose of the sand, paint and rust mixture according to environmental regulations and provide a certificate of disposal.

- 17.1.C.2.11 The Contractor must conduct a magnetic particle inspection on the seating arrangements of the windlass and the bowstopper assemblies and provide a report to the IA and TA.
- 17.1.C.2.12 The Contractor must manually apply (brush or roller) two coats of paint compatible with existing Interbond 201 KDL247, red (6.0 mils per dry coat) on the deck, the seating arrangements of the windlass, the base of the console (int./ext.) and the base of the bowstopper assemblies (int./ext.) in accordance with the paint manufacturer's recommendations. Anti-slip particles must be added in the second coat of paint for areas of the deck where personnel are expected to pass.
- 17.1.C.2.13 The Contractor must empty the oil from the gear box (380 litres Mobil SHC 629) and the hydraulic unit (325 litres Petro-Canada Hydrex 22). Dispose of it immediately in accordance with the environmental rules and submit a certificate of waste oil disposal. Do not leave barrels of used oil on the deck of the ship.
- 17.1.C.2.14 In a workshop, the Contractor must completely disassemble the windlass, its components and the bowstopper assemblies.
- 17.1.C.2.15 The Contractor must clean all parts to allow accurate measurement, inspection and crack detection.
- 17.1.C.2.16 The Contractor must verify the condition of all shaft sleeves and bearings, take measurements and record them in the report.
- 17.1.C.2.17 The Contractor must verify all lubrication points, clean out all lines and remove old grease. Replace all grease nipples with 316 high-pressure stainless steel nipples. All components must be lubricated with grease (Petro-Canada PXL2C30, Precision XL EP2) supplied by the Contractor.
- 17.1.C.2.18 The Contractor must conduct a dye penetrant inspection of all shafts and gears to detect any cracks, and provide an inspection report to the IA and TA.
- 17.1.C.2.19 The Contractor must check the straightness of the shafts. Provide a report of this inspection to the IA and TA.
- 17.1.C.2.20 The Contractor must remove the 2 hand brakes; check the wear of the brake band.
- 17.1.C.2.21 The Contractor must overhaul the cylinder of the hydraulic brake. Replace all seals. Check the wear of the brake pads.
- 17.1.C.2.22 The Contractor must show the dismantled parts and their measurements to ABS surveyor and to the IA. All parts found to be defective or excessively worn must be replaced with equivalent parts supplied by the Contractor, with approval by the IA. The use of original

parts is mandatory where possible. The costs will be negotiated separately using a PWGSC 1379 form.

- 17.1.C.2.23 The Contractor must reassemble all the parts as per the manufacturer's instructions with new seals.
- 17.1.C.2.24 All fasteners, bolts, nuts and washers (flat and lock) for seating of the various pieces of equipment must be replaced with new, Grade 5 parts of the same dimensions. All other disassembled fasteners, bolts, nuts and washers (flat and lock) must be replaced by new parts of the same grade and dimensions. All fasteners must be reassembled with copper and aluminum powder based anti-seize compound.
- 17.1.C.2.25 The Contractor must supply and replace the filter element in the hydraulic system. (2 cartridges, J-10 P-167516).
- 17.1.C.2.26 The Contractor must clean the hydraulic oil tank and the windlass gearbox. Complete an inspection with the IA before closing them. Close the inspection covers with new packing gaskets.
- 17.1.C.2.27 The Contractor must replace all of the hydraulic components inside the windlass control panel. When removing hydraulic components, the inside of the control panel is to be cleaned, primed and painted.
- 17.1.C.2.28 The Contractor must replace all pressure gauges, isolation valves, needle valves and other valves on the equipment throughout the hydraulic system. Add ball valves to isolate the tank to allow maintenance of components without having to empty the oil out of the tank. All new components must have the same specification and must be of similar or superior quality.
- 17.1.C.2.29 All parts with NPT threads must be reassembled with Master Metallic Compound (grey).
- 17.1.C.2.30 The main hydraulic pump, the auxiliary hydraulic pump, the operation control unit and the winch hydraulic motor must be replaced with new units supplied by the Contractor. The new units must meet the same operating specifications as the former units. The hydraulic motor must be of robust and waterproof design for installation on a ship deck. The new units must be certified by a recognized marine classification society and by TA and ABS Surveyor. Instruction manuals with drawings/plans and parts lists must be provided for each new piece of equipment.
- 17.1.C.2.31 The Contractor must conduct performance tests on the hydraulic brake and on control operation. During performance tests, the flow rates and pressures must be measured and recorded for the report. If it is necessary to open a component, it is important to demonstrate to the TA that delivery of the parts can be done within the contract's time limit. The



Contractor must also verify the performance of the new hydraulic pumps and motors. Provide a report of tests and work performed on each component.

- 17.1.C.2.32 The Contractor must send the Robbins & Myers electric motor for the hydraulic unit to a specialized firm for complete overhaul, insulation test before and after overhaul, cleaning, balancing, replacement the 2 bearings (part number: 6316 Z) with new SKF sealed bearings and paint frame with a grey epoxy paint. Provide a report of the tests and work performed on the motor to the IA and TA.
- 17.1.C.2.33 The Contractor must replace the coupling on the two pumps with new couplings having the same specifications (Make: Falk, type G20).
- 17.1.C.2.34 The Contractor must replace the 2 existing heating elements (240/1/60, 2KW) connected in series with two new heating elements (460/1/60, 2KW) connected in parallel. Replace the control panel of the heating elements by a new panel. Once all electrical connections are completed, measure and record the insulation resistance to ground, the resistance and the current flowing in each element. The Contractor must check the operation of the 2 elements and adjust their thermostats to 20°C. Refer to the following diagrams for details on electrical connections: (# 60021-A2 Sht 1) & (# 2016-07-29 Windlass new heater connections).
- 17.1.C.2.35 The Contractor must check the operation of the thermostat that prevents the pump from starting up if oil temperature is below 10°C.
- 17.1.C.2.36 The Contractor must replace all piping and hydraulic hoses on the windlass and hydraulic unit. All exterior piping and within the control panel must be 316 stainless steel. The Contractor must replace the piping passing through the deck penetrations and the piping between the windlass and the hydraulic power pack must be replaced. If insulation under the deck must be removed, every precaution must be taken to avoid damaging it. The Contractor must replace the insulation upon completion of work.
- 17.1.C.2.37 The Contractor must perform a hose test on the welded deck penetrations to verify their water tightness. The water pressure of the hose must be at least 200 KPa applied at a maximum distance of 1.5 m. The minimum allowable inside diameter of the spray nozzle must be 12 mm.
- 17.1.C.2.38 The hydraulic system and piping must be cleaned after the work. Cleaning must be performed in accordance with standard ISO 23309 – Methods of cleaning lines by flushing. Verification of the cleanliness of the assembled systems must be conducted in accordance with standard ISO 16431. The level of cleanliness required is 16/14/11 according to standard ISO 4406. The Contractor must submit the laboratory analysis reports.

- 17.1.C.2.39 The Contractor must fill the hydraulic oil tank (325 litres Petro-Canada Hydrex 22) and the gearbox (380 litres Mobil SHC 629) with new oil supplied by the Contractor. Empty drums and containers must be recovered by the Contractor.
- 17.1.C.2.40 The Contractor must repair any oil leaks observed during the work.
- 17.1.C.2.41 The windlass, the control console and the bowstopper assemblies must be cleaned with a degreaser. All rust on the windlass and its components must be mechanically removed to bare metal.
- 17.1.C.2.42 The windlass, control console and the bowstopper assemblies must be painted according to the following paint code. All surface preparation and paint application must be compatible and completed in accordance with the existing paint manufacturer's recommendations:
- a) Two coats: INTERPRIME 198, white, 3 mils dry film thickness per coat on bare metal;
  - b) Two coats: INTERLAC 665 buff colour (RAL 070-7040) on all surfaces, 2 mils dry film thickness per coat.
- 17.1.C.2.43 During the painting process the Contractor must protect all hoses, sliding surfaces, brake surfaces, and any other moving parts from being painted. Care must also be taken to avoid painting the surfaces of the gypsy heads (warping heads) where mooring lines are wrapped. Upon completion of painting the Contractor must remove this protection. The Contractor must provide all the paint.
- 17.1.C.2.44 The Contractor must apply two coats of paint compatible with existing Interbond 201 (red) deck paint on the piping and bare metal components near the deck (no primer is required for this paint).
- 17.1.C.2.45 Once the paint has dried in accordance with the manufacturer's recommendations, all components must be lubricated with grease (Petro-Canada PXL2C30, Precision XL EP2) supplied by the Contractor.
- 17.1.C.2.46 The Contractor must touch up the paint on installed bolts and other scratches according to the instructions given in this specification.
- 17.1.C.2.47 The Contractor must apply a silicone based sealant of good marine quality on the contours of the seats where the equipment is bolted. The purpose of the seal is to prevent infiltration of moisture causing corrosion.
- 17.1.C.2.48 The Contractor must supply and apply Petro-Tape to all exterior hose connectors.
- 17.1.C.2.49 The Contractor must perform the windlass commissioning and adjustments, and repair all deficiencies. The chain is to be reinstalled by the Contractor.

- 17.1.C.2.50 The Contractor must perform a complete operational test of the windlass in the presence of IA, TA and ABS surveyor.
- 17.1.C.2.51 The Contractor must provide an updated hydraulic plan including all system modifications and technical specifications of each new piece of equipment installed.
- 17.1.C.2.52 At the end of each day, the Contractor must ensure that the area around the windlass is clean and safe.
- 17.1.C.3 **Locations**
- 17.1.C.3.1 Windlass: Upper Foredeck, at the Centre, Frames 184 to 190
- 17.1.C.3.2 Hydraulic power unit: Main Deck, Boatswain Store, Frames 190 to 205
- 17.1.C.3.3 Electrical supply panel: Main Deck, Boatswain Store, Frames 190 to 205

**17.1.D Proof of Performance**

17.1.D.1 **Inspection Points**

- 17.1.D.1.1 The Contractor is responsible for coordinating all required inspections with the IA and with ABS Surveyor.
- 17.1.D.1.2 All step of the paint works must be inspected and approved by the IA and NACE inspector.

17.1.D.2 **Testing/Trials**

- 17.1.D.2.1 Before beginning the work, the ship's crew will demonstrate the proper operation of the equipment for the Contractor and its subcontractors. If operating abnormalities are found during this test, the Contractor must immediately notify the IA.
- 17.1.D.2.2 The same tests must be conducted at the end of the work to demonstrate proper operation of the equipment. The Contractor must demonstrate the windlass meets the following original requirement:
- a) Rated pull at each wildcat: 50 000 lb
  - b) Rated pull at warping drum: 13 000 lb
  - c) Stall pull at warping drum: 67 000 lb
  - d) Stall pull 2 wild cat combined: 68 000 lb
  - e) Rated speed at wildcat: 45 F.P.M
  - f) Rated speed at warping drum: 48 F.P.M
  - g) Manual brake holding capacity at each wildcat: 45 322 lb

h) Automatic brake holding capacity, two wildcat combined: 58 600 lbs

17.1.D.3 **Certification**

17.1.D.3.1 The Contractor must provide a certificate issued by ABS or a recognized marine organization certifying that the windlass and its components meet all applicable regulatory requirements.

17.1.D.4 **Documentation**

17.1.D.4.1 The Contractor must provide a complete report detailing all work carried out, all precise measurements taken for the windlass and its components, any corrective measures taken, any parts replaced, and any recommendations. This report must also include all certificates, all reports from the non-destructive testing (ultra sound, magnetic particle, dye penetrant), all subcontractor reports (hydraulic, electric, electric motor, and mechanical) and the results of all required electrical and mechanical testing. The Contractor must provide 3 hard copies and 1 electronic version (PDF format) to both the IA and TA.

17.1.D.4.2 The Contractor must supply to the TA 2 copies of the maintenance manuals, drawings and parts lists for the new equipment installed on the windlass (hydraulic pumps, hydraulic motor, control valve).

17.1.D.4.3 The Contractor must supply an "As Fitted" hydraulic plan in paper format, DWG format and PDF format to both the IA and the TA.

17.1.D.5 **Training – [Not Used]**

## **17.2 ANCHORS AND CHAINS**

### **17.2.A Identification**

- 17.2.A.1 The objective of this item is to carry out the 5 year inspection, maintenance and certification of the vessel's anchors and chains.

### **17.2.B References**

#### **17.2.B.1 Equipment Data**

- 17.2.B.1.1 The vessel has 2 anchors. The anchor chains are of the forged stud link type (2") with the starboard chain length measuring 9 shots and the port chain measuring at nine 9 shots in length.

- 17.2.B.1.2 Anchors weight approximatively 3500 kg each. Chains weight approximatively 13500 kg each.

#### **17.2.B.2 Drawings and Documents - [Not Used]**

#### **17.2.B.3 Regulations and Standards**

- 17.2.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
<b>FSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>		
SA 2 / SSPC SP6	Commercial blast	non
<b>Regulations</b>		

### **17.2.C Statement of Work**

#### **17.2.C.1 General**

- 17.2.C.1.1 The Contractor must supply all materials and equipment to conduct the work.
- 17.2.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.

- 17.2.C.1.3 The Contractor must remove both port and starboard anchors and their associated chains from the vessel and lower them to the dock floor where they are to be fully layed out for inspection and survey by the AI and the ABS Inspector.
- 17.2.C.1.4 The Contractor must clean the anchors and anchor chains with a high pressure water jet for inspection by the IA and the ABS Inspector.
- 17.2.C.1.5 The Contractor must dismantle all the shackle joints, including the ones in the chain lockers for inspection, heat them up to facilitate their dismantling and reassemble them correctly. The Contractor must seal the joints with melted lead.
- 17.2.C.1.6 The Contractor must inspect each link and shackle as well as measuring and recording the dimensions of 10 links, taken at random, per each shot of cable for a total of 100 links for the starboard chain and a total of eighty 90 links for the port chain. The Contractor must contact the AI to establish which links are to be measured. Any defects found are to be brought to the attention of the AI and the TA for remedial action. For bidding, the Contractor must quote a unit price for the renewal welding of 100 chain links.
- 17.2.C.1.7 Before reassembly of the shackle joints of each chain, the Contractor must, switch two shackles from the anchor side and connect them to the bitter ends/chain locker.
- 17.2.C.1.8 The Contractor must reconnect the remaining shackles in order to rebuild the anchor chains. All changes of chain links or shackle joints required are to be included in carrying out this work.
- 17.2.C.1.9 The Contractor must clean all surfaces of both anchors and their chains using sand blasting to SA 2.0 standard, making sure the turn them for a complete cleaning.
- 17.2.C.1.10 On completion of survey and/or repairs, the Contractor must supply and apply, on each chain surface, 2 separate coats of compatible paint with existing "INTERPRIME 234" red primer. Each coat is to be 0.0035" (0,08 mm) to achieve a DFT of 0.003" (0,07 mm).
- 17.2.C.1.11 The Contractor must supply and apply two coats of anti-corrosive compatible paint with existing black INTERGARD FP (or INTERGARD 264), paint on the chains. Each coat must be 0.0035" (0,08 mm) to achieve 0.003" (0,07 mm).
- 17.2.C.1.12 The Contractor must supply and apply red enamel paint on all joining shackles.
- 17.2.C.1.13 The appropriate number of links corresponding to the "shot number" (from the anchor) on either side of the joining shackle must be painted white enamel. The stay of the last painted white link on either side of the joining link must be wrapped with a galvanized steel wire with the number of winds equaling the number of shots.

- 17.2.C.1.14 The Contractor must sweep-blast, supply the paint and prime both anchors with two coats of compatible paint with existing "INTERPRIME 234" red primer. Each coat is to be 0.0035" (0,08 mm) to achieve a DFT of 0.003" (0,07 mm). Then each anchor is to receive two (2) coats of compatible paint with existing " Intergard 264 black". Each coat is to be 0.0035" (0,08 mm) to achieve a DFT of 0.003" (0,07 mm).
- 17.2.C.1.15 On completion of all work, the Contractor must reconnect both the port and starboard anchors and chains to their respective "Bitter-ends" and correctly re-stow and secure on board the vessel to the satisfaction of the AI, once work in section 17.1 is completed.

17.2.D **Proof of Performance**

17.2.D.1 **Inspection Points**

- 17.2.D.1.1 The Contractor must afford the attending ABS Surveyor and the IA the opportunity to visually inspect the following items;
- a) Spread out anchor and anchor chain.
  - b) Joining shackles and swivels,
  - c) Bitter end connection

17.2.D.2 **Testing/Trials**

- 17.2.D.2.1 The Contractor must afford the attending ABS Surveyor and the IA the opportunity to witness:
- a) Ringing out of all chain links and shackles.
  - b) The successful operation of anchor and anchor chain.

17.2.D.3 **Certification - [Not Used]**

17.2.D.4 **Documentation**

- 17.2.D.4.1 The Contractor must supply the IA and the AT with a typewritten copy of a report detailing the work undertaken, defects, repairs made and measurements and readings taken.
- 17.2.D.4.2 The Contractor must also provide a copy of the ABS survey credit to the IA.
- 17.2.D.4.3 The Contractor must provide a Quality Assurance (QA) report indicating that all parts of the anchors and chains have been inspected by the Contractor's QA Department for correct installation and fit.

17.2.D.5 **Training – [Not Used]**

## **17.3 INSPECTION AND CERTIFICATION ELEVATOR & DUMBWAITER**

### **17.3.A Identification**

- 17.3.A.1 The objective of this item is to perform annual maintenance and inspection of the vessel's elevator and dumbwaiter.

### **17.3.B References**

#### **17.3.B.1 Equipment Data**

- 17.3.B.1.1 Equipment characteristics:

- a) Elevator : Montgomery, model : VT-3431
- b) Dumbwaiter : Montgomery, model : VDS-3432

#### **17.3.B.2 Drawings and Documents**

- 17.3.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes:

<b>Drawing Number</b>	<b>Drawing / Document Title</b>	<b>Number of Sheets</b>
DWG CT-37457	Electric Elevator Layout	1

#### **17.3.B.3 Regulations and Standards**

- 17.3.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	<b>Title</b>	<b>Included Yes/No</b>
<b>FSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>		
CAN/CSA-B44-M90, sec. 12	Safety Code for Elevators	No
<b>Regulations</b>		



**17.3.C Statement of Work****17.3.C.1 Elevator**

- 17.3.C.1.1 The Contractor must provide labor to carry out the annual inspection and maintenance of the vessel's elevator as directed in section 12 of CAN / CSA-B44-M90.
- 17.3.C.1.2 The Contractor must calibrate and seal the cabin speed regulator.
- 17.3.C.1.3 The Contractor must calibrate and seal the counterweight speed regulator.
- 17.3.C.1.4 Following the work, the Contractor must update the maintenance register of each equipment.
- 17.3.C.1.5 The smoke detector in the elevator shaft Item 10.3.C.6 must be tested while the elevator inspection is being carried out. The elevator technician specialist must assist a fire safety specialist to reach the detector located on the ceiling of the elevator shaft as it involves riding on top of the elevator to the top of the tunnel.

**17.3.C.2 Dumbwaiter**

- 17.3.C.2.1 The Contractor must provide labor to carry out the annual inspection and maintenance of the vessel's dumbwaiter as specified in section 12 of CAN / CSA-B44-M90.
- 17.3.C.2.2 Following the work, the Contractor must update the maintenance register of each equipment.
- 17.3.C.2.3 The Contractor must adjust the brake according to the manufacturer's standards.

**17.3.D Proof of Performance****17.3.D.1 Inspection Points**

- 17.3.D.1.1 All work must be inspected by the IA or delegate.

**17.3.D.2 Testing/Trials**

- 17.3.D.2.1 The proper functioning of the equipment must be demonstrated by the Contractor to the IA.
- 17.3.D.2.2 The IA must be present for all trials.

**17.3.D.3 Certification**

- 17.3.D.3.1 The Contractor must provide the IA with the original copy of the inspection certificates upon completion of the work. The Contractor will also send an electronic copy of the certificates to the TA.

**17.3.D.4 Documentation**

- 17.3.D.4.1 At the end of the work, the Contractor must provide a complete report detailing the work performed, the cause of the failures (if any), the necessary modifications and the replaced parts. The Contractor must also provide the IA with an electronic PDF copy of the report.
- 17.3.D.4.2 The Contractor must provide within 3 days of the inspection a certificate for each piece of equipment attesting its compliance with the standard, and any inspections specified in standard CAN/CSA-B44-M90, sec. 12.
- 17.3.D.4.3 The Contractor must provide the IA and the TA with an electronic copy of the report in PDF format.
- 17.3.D.5 **Training - [Not Used]**

## **18.0 COMMUNICATIONS ET NAVIGATION**

### **18.1 SIMPLIFIED VOYAGE DATA RECORDER (SVDR) (OPTIONAL)**

#### **18.1.A Identification**

18.1.A.1 The objective of this item is to replace the existing SVDR with a Government supplied Danelec DM100 SVDR G1.

18.1.A.2 Contractor is responsible for subcontracting a Danelec and ABS certified FSR to proceed with commissioning and conduct the Installation Performance Test (IPT). An allowance of \$5000 will be allocated for travel expenses. This amount will be adjusted as required and upon presentation of invoices to the contracting authority. All labour costs for this item must be included in the contractor's financial proposal. This work must be carried out in conjunction with the other essential electronic equipment requirements detailed in this statement of work.

#### **18.1.B References**

##### **18.1.B.1 Equipment Data**

###### **18.1.B.1.1 Government Supplied Material (GSM)**

- a) Qty 1 of Danelec DM100 Bridge Alarm Unit P/N:1000720
- b) Qty 1 of Danelec DM100 Capsule MK4 P/N:1302373
- c) Qty 1 of Danelec DM100 Data Acquisition Unit P/N: 1302368
- d) Qty 5 of Danelec DM100 Indoor Bridge Microphone P/N: 1302646
- e) Qty 1 of Danelec DM100 DVI Remote Video Interface P/N: 1302365

###### **18.1.B.1.2 Contractor Supplied Material (CSM)**

- a) Qty 1 of Danelec DM100 Indoor Bridge Microphone P/N: 1302646

18.1.B.1.3 The Contractor must supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

##### **18.1.B.2 Drawings and Documents**

18.1.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes:

Drawing Number	DRAWING TITLE	Number of Sheets
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LM626-380-WI Rev. B	Amundsen – SVDR Drawing (Existing)	LM626-380-WI_Existing.pdf
LM626-380-WI Rev. C	Amundsen – SVDR Drawing (New)	LM626-380-WI_New.pdf
DBS10885-10 Rev. 1.0	Installation Manual for DM100 S-VDR	DBS10885-10 Installation Manual for DM100 S-VDR
N/A	VDR Capsule Pedestal Drawing	VDRCapsulePedestal.dwg

### 18.1.B.3 **Regulations and Standards**

- 18.1.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

FSSM Procedures	Title	Included Yes/No
	Fleet Safety and Security Manual (DFO/5737)	
<b>Publications</b>		
	N/A	
<b>Standards</b>		
ABS	American Bureau of Shipping (ABS)	
IEEE 45:2002	Recommended Practice for Electrical Installations on Ships	
70- 000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment	
<b>Regulations</b>		
	Canada Shipping Act, 2001	
	American Bureau of Shipping (ABS)	
	SOLAS	

### 18.1.C **Statement of Work**

#### 18.1.C.1 **General**

- 18.1.C.1.1 The Contractor must supply all equipment, enclosures, ventilation, staging, chain falls, craneage, slings and shackles necessary to perform the work. All lifting equipment must be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, of an adequate safe working load for the expected duties. Any brackets or other welded attachments required in the performance of this specification must be welded into place by CWB-certified welders certified to welding Std. W47.1, Div. 1 and 2.

- 18.1.C.1.2 Prior to any hot work taking place, the Contractor must ensure that the area of work and all equipment, wiring, transit, etc. have been sufficiently protected from any sparks or metal filings. The Contractor must also ensure that the area of work, the system, and the adjacent space are certified as gas free and suitable for hot work as per the Fleet Safety and Security Manual.
- 18.1.C.1.3 All cabling, once installed, must be marked with a stamped stainless steel metal tag for all outside cabling and an appropriate label type for all inside cabling. The labels must be securely affixed to the cable at each end and through any deck, deck heads, and/or gland penetrations with the designation for each cable as provided in this specification.
- 18.1.C.1.4 The Contractor must supply and install new shipboard and classification society approved cable glands to replace the existing where applicable.
- 18.1.C.1.5 The Contractor must re-seal all cable glands or penetrations that are not reused by a suitable means that is approved by the applicable classification society.
- 18.1.C.1.6 All cabling which has been deemed surplus as a result of this specification item must be disposed of at the Contractor's expense.
- 18.1.C.1.7 The Contractor must be responsible for ensuring that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this specification item.
- 18.1.C.1.8 Any disturbed or new metal surfaces must be primed with one coat of primer and painted with 2 coats paint similar to existing surfaces. The Contractor must provide the primer and paint.
- 18.1.C.1.9 Contractor must follow existing cable trays throughout the vessel where fitted. Once installed, all cabling must be secured as per ABS.
- 18.1.C.1.10 Prior to the commencement of any electrical work, the Contractor must ensure that all electrical supplies feeding the systems have been isolated at the source following an established lockout/tag out procedure, and as per ISM fleet safety manual.
- 18.1.C.1.11 Upon the final installation, testing must be carried out as per 18.1.D.2 of this document.
- 18.1.C.2 **Equipment**
- 18.1.C.2.1 The Contractor must dismantle the existing system including but not limited to the items in the **Table 1** below. All the items are manufactured by Rutter. The existing SVDR is a Rutter VDR-100G3S

**Table 1 – Equipment to be dismantled.**

<b>Description</b>	<b>Location</b>
Data Processing Unit(DPU)	Crawl Space
Fixed Capsule	Top of wheelhouse
Fixed Capsule Junction Box	Wheelhouse Ceiling
Audio Interface Box	Wheelhouse Ceiling
Microphone 1	Ceiling above PORT Wing
Microphone 2	Ceiling above STBD Wing
Microphone 3	Ceiling above Helmsman
Microphone 4	Ceiling above Chart Table
Microphone 5	Ceiling above Radar consoles
Microphone 6	Ceiling above GMDSS Console
NMEA Interface Box	Chart Table
Operator Unit	Safety Console
Video Interface	X-Band Radar Console

18.1.C.2.2 The Contractor must install the following SVDR equipment:

**a) SVDR Data Acquisition Unit (DAU)**

- i) Contractor must install the DAU in the crawl space in same location as the previous unit
- ii) Contractor must to modify the foundation to accommodate the new unit, if required.
- iii) Contractor must apply primer and paint compatible with the ship's paint system on any bare surfaces.

**b) DVI Remote Video Interface (RVI)**

- i) Contractor must install the RVI in the X-Band radar console.

**c) Fixed Capsule MK4**

- i) Contractor must install in the same location as the previous capsule

- ii) Contractor must make a pedestal as per drawing *VDRCapsulePedestal.dwg*
- iii) Contractor must apply primer and paint compatible with the ship's paint system on any bare surfaces.
- iv) Contractor must seal the unused cable glands adjacent to the Fixed capsule. (Old capsule required two (2) cables, the new unit only requires one (1)).

**d) Bridge Alarm Unit (BAU)**

- i) The Contractor must install the BCP in the same location as the previous operator unit
- ii) Refer to the pictures below.

**e) Bridge Indoor Microphones (6)**

- i) The Contractor must install one (1) microphone at each of the location below. The microphones must be mounted on the wheelhouse ceiling.
  - Above Port Wing Console
  - Above Starboard Wing Console
  - Above Chart table
  - Above Helmsman Console
  - Above Radar Station
  - Above GMDSS Station/Safety Console

18.1.C.2.3 All equipment listed above must be installed in accordance with OEM manuals and guidance drawings.

18.1.C.2.4 Contractor must ground all equipment as per OEM manuals.



**Figure 1: Existing Operator Unit to be replaced with new Bridge Alarm Unit**





**Figure 2 Existing NMEA Interface box to be removed**



Figure 3 Existing fixed capsule to be replaced. Pedestal to be replaced too.



**Figure 4 Existing SVDR Data Processing Unit to be removed and replaced with the new Data Acquisition Unit**



Figure 5 Other view of the existing fixed capsule

### 18.1.C.3 **CABLES**

18.1.C.3.1 Contractor must remove and dispose of the cables listed in the **Table 2** below:

**Table 2 – Existing cables to be removed**

Cable ID	Source	Destination
GMDSS-72	Audio Interface	VHF #1
GMDSS-73	Audio Interface	VHF #2
GMDSS-74 or RF-74	Audio Interface	VHF #3

Cable ID	Source	Destination
VDR-1	Audio Interface	Port Wing Microphone
VDR-2	Audio Interface	Forward Centre Microphone
VDR-3	Audio Interface	Starboard Wing Microphone
VDR-4	Audio Interface	Chart Table Microphone
VDR-5	Audio Interface	Radar Station Microphone
VDR-6	Audio Interface	GMDSS Console Microphone
VDR-7	SVDR DPU	Audio Interface
VDR-8	SVDR DPU	Audio Interface
VDR-9	Capsule Junction Box	Capsule
VDR-11	SVDR DPU	Capsule Junction Box
VDR-12	SVDR DPU	Capsule Junction Box
VDR-13	SVDR DPU	NMEA Interface
VDR-14	SVDR DPU	NMEA Interface
VDR-16	SVDR DPU	Video Interface (Radar)
VDR-18	SVDR DPU	Operator Unit
LC-69	SVDR DPU	Gyrocompass
AIS-10	SVDR DPU	AIS
R-SN-45	SVDR DPU	DGPS
DL-15	SVDR DPU	Speed Log
ES-29	SVDR DPU	Echo Sounder
HD-17	SVDR DPU	Wind Sensor

18.1.C.3.2 Contractor must install the cables listed in **Table 3** below and as per guidance drawing.

**Table 3 – New cable list.**

<b>Cable Label/Type</b>	<b>Source</b>	<b>Destination</b>	<b>Note</b>
VDR-01 Factory CAT5e	VDR Data Acquisition Unit	Fixed Capsule	
VDR-02 IEC ANGLED POWER CORD	VDR Data Acquisition Unit	AC Outlet	
VDR-03 2 Pairs 18 AWG Shielded	VDR Data Acquisition Unit	Microphone Helmsman	
VDR-04 2 Pairs 18 AWG Shielded	VDR Data Acquisition Unit	Microphone Chart Table	
VDR-05 2 Pairs 18 AWG Shielded	VDR Data Acquisition Unit	Microphone Port Wing	
VDR-06 2 Pairs 18 AWG Shielded	VDR Data Acquisition Unit	Microphone Stbd Wing	
VDR-07 2 Pairs 18 AWG Shielded	VDR Data Acquisition Unit	Microphone Radar Station	
VDR-08 2 Pairs 18 AWG Shielded	VDR Data Acquisition Unit	VHF FM#2 Chart Table	
VDR-09 2 Pairs 18 AWG Shielded	VDR Data Acquisition Unit	VHF FM#1 Chart Table	
*VDR-10 Existing CAT5e	VDR Data Acquisition Unit	Bridge Control Panel Safety Console	*Existing
ES-29 Belden 8723SB	VDR Data Acquisition Unit	Echosounder NMEA Splitter	
HD-17 Belden 8723SB	VDR Data Acquisition Unit	Wind Sensor NMEA Splitter	
GC-028/S Belden 8723SB	VDR Data Acquisition Unit	Gyrocompass New Data Distribution Unit	Same as required in Spec item 18.3.
*VDR-15 Existing CAT5	VDR Data Acquisition Unit	Remote Video Interface (RVI)	*Existing

Cable Label/Type	Source	Destination	Note
VDR-15A DVI-D 3 Feet	Remote Video Interface (RVI)	X-Band Radar Processor	
DL-15 Belden 8723SB	VDR Data Acquisition Unit	Speed Log NMEA Splitter	
*VDR-17 Existing CAT5	Machinery Space Data Computer	LAN to RS422 Converter	*Existing
VDR-17A Belden 8723SB	VDR Data Acquisition Unit	LAN to RS422 Converter	
R-SN-45 Belden 8723SB	VDR Data Acquisition Unit	DGPS NMEA SPLITTER	
AIS-10 Belden 8723SB	VDR Data Acquisition Unit	AIS NMEA Splitter	
VDR-20 Belden 8723SB	VDR Data Acquisition Unit	VHF FM#3 GMDSS Console	
VDR-21 Belden 8723SB	VDR Data Acquisition Unit	Microphone GMDSS Console	

18.1.C.3.3 Contractor must be responsible for unpacking/repacking all cable transits/glands.

18.1.C.3.4 Contractor must be responsible for completing the wiring terminations for the entire system.

#### 18.1.C.4 **Location**

18.1.C.4.1 Top of wheelhouse

18.1.C.4.2 Crawl Space

18.1.C.4.3 Wheelhouse

#### 18.1.C.5 **Interferences**

18.1.C.5.1 The Contractor is responsible for the identification of interference items, their temporary removal, storage, and refitting at the end of the works.

#### 18.1.D **Proof of Performance**

##### 18.1.D.1 **Inspection Points**

- 18.1.D.1.1 ABS class surveyor and the TA must be present at the inspection of the work
- 18.1.D.1.2 Any cable which has been installed by the Contractor that is found defective (fails a continuity test) or damaged must be replaced at the Contractor's expense (material and labour).
- 18.1.D.2 **Testing/Trials**
  - 18.1.D.2.1 Electronic equipment which has been removed for the performance of this specification must be discarded by the Contractor.
  - 18.1.D.2.2 Commissioning must be carried out by an FSR whom is authorized by ABS and Danelec to conduct commissioning of Danelec DM100 SVDR G1.
  - 18.1.D.2.3 Installation Performance Test (IPT) must be carried by an FSR whom is authorized by ABS and Danelec. The FSR must provide the Certificate of Compliance (COC) to the TA.
- 18.1.D.3 **Certification**
  - 18.1.D.3.1 The TA will complete the certification on this system after system has been installed and commissioned.
  - 18.1.D.3.2 The FSR must provide the Certificate of Compliance (COC) to the TA.
- 18.1.D.4 **Documentation – [Not Used]**
- 18.1.D.5 **Training - [Not Used]**



## **18.2 DISTANCE MEASURING EQUIPMENT (DME)**

### **18.2.A Identification**

- 18.2.A.1 The objective of this item is to install a Government supplied Distance Measuring Equipment (DME).
- 18.2.A.2 This work must be carried out in conjunction with the other essential electronic equipment requirements detailed in this statement of work.
- 18.2.A.3 CCG Electronics Technologist must have access to the yard to proceed with wiring terminations and commissioning.
- 18.2.A.4 CCG Electronics Technologist must be allowed to run short cables, install equipment inside consoles or racks if required during commissioning and troubleshooting.

### **18.2.B References**

#### **18.2.B.1 Equipment Data**

- 18.2.B.1.1 Government Supplied Material (GSM)
- a) DME Antenna
  - b) DME Cabinet
  - c) DME Operator Panel
- 18.2.B.1.2 Contractor Supplied Material (CSM)
- a) The Contractor must supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

#### **18.2.B.2 Drawings and Documents**

- 18.2.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

<b>Document Number</b>	<b>Document Name</b>	<b>File Name</b>
LM626-010-AL-01	Amundsen – Antenna Arrangement Drawing With DME Notes	LM626-010-AL-01_DME.pdf
LM626-320-WI Rev. A	Amundsen – DME Drawing (Existing)	LM626-320-WI_Existing.pdf
LM626-320-WI Rev. B	Amundsen – DME Drawing (New)	LM626-320-WI_New.pdf

572119-0001 Rev. E	DME Instruction Book	572119-0001E - Instruction Book.pdf
572238-0001 Rev. N	DME Operations and Maintenance Manual	572238-0001N - Operations and Maintenance Manual.pdf
N/A	New DME Rack Floor Brackets Drawing	DME Rack Floor Brackets.dwg
N/A	New DME Antenna Mount Drawing	New DME Antenna Mount.dwg
950962 Rev. B	DME Antenna Drawing	Selex Antenna Drawings 950962.pdf
N/A	3D Render of the DME Cabinet	48inch-cabinet.pdf
	DME Cabinet Dimensional Drawing	DME CABINET 9510XX-0001.pdf

### 18.2.B.3 **Regulations and Standards**

- 18.2.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

<b>FSSM Procedures</b>	<b>Title</b>	<b>Included Yes/No</b>
	Fleet Safety and Security Manual (DFO/5737)	
<b>Publications</b>		
	N/A	
<b>Standards</b>		
ABS	American Bureau of Shipping (ABS)	
IEEE 45:2002	Recommended Practice for Electrical Installations on Ships	
70- 000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment	
<b>Regulations</b>		
	Canada Shipping Act, 2001	
	American Bureau of Shipping (ABS)	
	SOLAS	

## 18.2.C **Statement of Work**

### 18.2.C.1 **General**

- 18.2.C.1.1 The Contractor must supply all equipment, enclosures, ventilation, staging, chain falls, craneage, slings and shackles necessary to perform the work. All lifting equipment must be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, of an adequate safe working load for the expected duties. Any brackets or other welded attachments required in the performance of this specification must be welded into place by CWB-certified welders certified to welding Std. W47.1, Div. 1 and 2.
- 18.2.C.1.2 Prior to any hot work taking place, the Contractor must ensure that the area of work and all equipment, wiring, transit, etc. have been sufficiently protected from any sparks or metal filings. The Contractor must also ensure that the area of work, the system, and the adjacent space are certified as gas free and suitable for hot work as per the Fleet Safety and Security Manual.
- 18.2.C.1.3 All cabling, once installed, must be marked with a stamped stainless steel metal tag for all outside cabling and an appropriate label type for all inside cabling. The labels must be securely affixed to the cable at each end and through any deck, deck heads, and/or gland penetrations with the designation for each cable as provided in this specification.
- 18.2.C.1.4 The Contractor must supply and install new shipboard and classification society approved cable glands to replace the existing where applicable.
- 18.2.C.1.5 The Contractor must re-seal all cable glands or penetrations that are not reused by a suitable means that is approved by the applicable classification society.
- 18.2.C.1.6 All cabling which has been deemed surplus as a result of this specification item must be disposed of at the Contractor's expense.
- 18.2.C.1.7 The Contractor must be responsible for ensuring that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this specification item.
- 18.2.C.1.8 Any disturbed or new metal surfaces must be primed with one coat of primer and painted with 2 coats paint similar to existing surfaces. The Contractor must provide the primer and paint.
- 18.2.C.1.9 The Contractor must follow existing cable trays throughout the vessel where fitted. Once installed, all cabling must be secured as per ABS.

- 18.2.C.1.10 Prior to the commencement of any electrical work, the Contractor must ensure that all electrical supplies feeding the systems have been isolated at the source following an established lockout/tag out procedure, and as per ISM fleet safety manual.
- 18.2.C.1.11 The Contractor must use all stainless steel mounting hardware that is recommended by the manufacturer for the mounting of all equipment within this specification unless provided with the equipment.
- 18.2.C.1.12 The Contractor must work in conjunction with a CCG Electronics technologist to oversee the installation of the new Distance Measurement Equipment system to ensure compliance with applicable CCG standards. Wiring terminations in all equipment must be completed by CCG Technologists with the exception of those for electrical supply which must be the Contractor's responsibility as well as any grounding requirements.
- 18.2.C.1.13 Upon the final installation, testing must be carried out as per Section 18.2.D.2 of this document.
- 18.2.C.2 **Equipment**
- 18.2.C.2.1 The Contractor must install the DME Cabinet.
- a) Exact location to be determined with the TA at the time of the work
  - b) Contractor must supply and install a cabinet foundation as per guidance drawing *DME Rack Floor Brackets.dwg*.
  - c) The height of the foundation must be tailored as per space limitations.
- 18.2.C.2.2 The Contractor must supply and install a new antenna pedestal.
- a) The pedestal must be six (6) feet high.
  - b) It must be made of Stainless Steel
  - c) Thickness to be approved by TA
  - d) Diameter to be approved by TA
  - e) It must be welded to the deck.
  - f) It must have strengthening webs.
  - g) It must have a hole at the bottom to allow water to drain.
  - h) It must have a hole for cable penetration.
  - i) The pedestal must have a mounting flange on top as per guidance drawing *New\_DME\_Antenna\_Mount.dwg*
  - j) It must be finished with a white powder coat.

k) Refer to LM626-010-AL-01\_DME.pdf for antenna location.

l) Refer to example of pedestal below as guidance.

18.2.C.2.3 The Contractor must supply and install a cable penetration close to the new pedestal. Cable penetration must be of one (1) inch NPT kick pipe type with suitable cable gland.

18.2.C.2.4 The Contractor must install the DME Antenna on the new pedestal.

a) Refer to LM626-010-AL-01\_DME.pdf for antenna location.



**Figure 6: Existing DME Antenna.**

**New antenna to be installed in same approximate location on a new pedestal.**



Figure 7: Example of antenna pedestal (NGCC Desgroseilliers)

- 18.2.C.2.5 The Contractor must install the DME Operator Panel in the wheelhouse at the chart table.
- a) Location will be determined with the TA at the time of the work
  - b) DME Operator Panel form and fit has not been confirmed at the time of writing this statement of work. It will either be a computer or a small display.
- 18.2.C.2.6 Contractor must ground all equipment as per OEM Manuals.
- 18.2.C.3 **Cables**
- 18.2.C.3.1 Contractor must install the cables listed in **Table 4** below and as per guidance drawing.

**Table 4 – New cable list**

<b>Cable Label/Type</b>	<b>Source</b>	<b>Destination</b>
DME-1 LMR-600	DME Cabinet	DME Antenna
DME-2 CAT6A	DME Cabinet	DME Operator Panel
DME-3 Power cord	DME Operator Panel	Local AC Outlet
P120A-6 3x14AWG	Panel P120A Breaker #6	DME Cabinet
L3-11 3x14AWG	Panel L3 Breaker #11	DME Cabinet

18.2.C.3.2 Contractor must be responsible for unpacking/repacking all cable transits/glands.

#### 18.2.C.4 **Locations**

18.2.C.4.1 Top of wheelhouse

18.2.C.4.2 Crawl Space

18.2.C.4.3 Wheelhouse

18.2.C.4.4 Electronics Equipment Room

#### 18.2.C.5 **Interferences**

18.2.C.5.1 The Contractor is responsible for the identification of interference items, their temporary removal, storage, and refitting to the vessel.

#### 18.2.D **Proof of Performance**

##### 18.2.D.1 **Inspection Points**

18.2.D.1.1 ABS class surveyor and the TA must be present at the inspection of the work

18.2.D.1.2 A cable which has been installed by the Contractor that is found defective (fails a continuity test) or damaged must be replaced at the Contractor's expense (material and labour).

**18.2.D.2     Testing/Trials**

18.2.D.2.1     Electronic equipment which has been removed for the performance of this specification must be returned in operational condition. They must be packaged properly and stored in a location determined with the Chief engineer at the time of the installation.

**18.2.D.2.2     Terminations**

- a) CCG Electronics Technologist will complete the wiring terminations (with the exception of the power cables which is the Contractor's responsibility) on the system. They must be granted access to the Contractor's site in all time.

**18.2.D.2.3     Commissioning**

- a) CCG Electronics Technologist will complete the commissioning of the system. They must be granted access to the Contractor's site in all time.

**18.2.D.3     Certification**

18.2.D.3.1     CCG TA will complete the certification on this system after system has been installed and commissioned.

**18.2.D.4     Documentation - [Not Used]****18.2.D.5     Training - [Not Used]**



### **18.3 COMPASS EQUIPMENT (OPTIONAL)**

#### **18.3.A Identification**

- 18.3.A.1 The objective of this item is to remove the existing gyrocompass system and replace it with new Government Supplied Material.
- 18.3.A.2 Both Gyrocompass will be replaced. A Satellite compass will be added.
- 18.3.A.3 This work must be carried out in conjunction with the other essential electronic equipment requirements detailed in this statement of work.
- 18.3.A.4 The work must be carried out in conjunction with item 11.04 Wheelhouse wall panels, insulation and windows replacement.
- 18.3.A.5 CCG Electronics Technologist must have access to the yard to proceed with wiring terminations and commissioning.
- 18.3.A.6 CCG Electronics Technologist must be allowed to run short cables, install equipment inside consoles or racks if required during commissioning and troubleshooting.

#### **18.3.B References**

##### **18.3.B.1 Equipment Data**

##### **18.3.B.1.1 Government Supplied Material (GSM)**

Note: These models are provided as indication only. Equivalent equipment may be provided, pending Canada procurement process.

<b>Description</b>	<b>Make</b>	<b>Model</b>	<b>Qty</b>
Gyrocompass Sensor	Sperry Marine	Navigat 3500 (73525)	2
Mounting Tray	Sperry Marine	44863	2
24VDC, 3 meters, cable	Sperry Marine	44861	2
RS422, 3 meters cable	Sperry Marine	44862	2
Data Distribution Unit (DDU)	Sperry Marine	74907	1

Description	Make	Model	Qty
Converter and Amplifier Board (CAU) for install inside DDU	Sperry Marine	25826	2
Converter and Amplifier Unit	Sperry Marine	74904	1
Control and Display Unit	Sperry Marine	Navitwin V (74902)	
Bearing Repeater	Sperry Marine	74880	3
Terminal Box	Sperry Marine	74859	4
Bearing Repeater on stand 1300mm	Sperry Marine	74911	1
Steering Repeater	Sperry Marine	74881	1
Bulkhead Steering Repeater	Sperry Marine	74883	1
Azimuth Device	Sperry Marine	75135	4
Satellite Compass Antenna	Simrad	MX575D	1
Satellite Compass Antenna cable 30meters	Simrad	000-10940-001	1

#### 18.3.B.1.2 Contractor Supplied Material (CSM)

- a) The Contractor must supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.
- b) Two (2) Switched-mode power supply; Classic; 3-phase; 24 VDC output voltage; 20 A output current; TopBoost; DC OK contact
- c) Two (2) Marine connection box with a hinged cover and required fused terminal blocks, ground terminal blocks and hardware. All terminal blocks must handle a wire conductor size of 2.5mm<sup>2</sup>.

- d) Three (3) Marine Terminal box (For connection of existing Digital Repeaters). Each completed with four (4) terminal blocks and one (1) ground terminal block that can handle a wire conductor size of 2.5mm<sup>2</sup>.

### 18.3.B.2 **Drawings and Documents**

- 18.3.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Document Number	Document Title	File name
LM626-230-IN	Amundsen – Gyrocompass Drawing (Existing)	LM626-230-IN_Existing.pdf
LM626-401-WI	Amundsen – NMEA Splitter Drawing (Existing)	LM626-401-WI_Existing.pdf
Preliminary	Amundsen – Navigat 3500 Compass Net Wiring Diagrams	LM626_Preliminary_Gyro_Upgrade_Drawing.pdf
056372/H1	Sperry Marine Navigat 3500 Compass Net Installation Manual	056372.pdf
N/A	Simrad MX575D User Manual	MX575D_UM_EN_988-10221-006_w.pdf

### 18.3.B.3 **Regulations and Standards**

- 18.3.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

FSSM Procedures	Title	Included Yes/No
	Fleet Safety and Security Manual (DFO/5737)	
<b>Publications</b>		
	N/A	
<b>Standards</b>		
ABS	American Bureau of Shipping (ABS)	
IEEE 45:2002	Recommended Practice for Electrical Installations on Ships	
70- 000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment	
<b>Regulations</b>		
	Canada Shipping Act, 2001	
	American Bureau of Shipping (ABS)	

	SOLAS	
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### 18.3.C **Statement of Work**

#### 18.3.C.1 **General**

- 18.3.C.1.1 The Contractor must supply all equipment, enclosures, ventilation, staging, chain falls, crange, slings and shackles necessary to perform the work. All lifting equipment must be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, of an adequate safe working load for the expected duties. Any brackets or other welded attachments required in the performance of this specification must be welded into place by CWB-certified welders certified to welding Std. W47.1, Div. 1 and 2.
- 18.3.C.1.2 Prior to any hot work taking place, the Contractor must ensure that the area of work and all equipment, wiring, transit, etc. have been sufficiently protected from any sparks or metal filings. The Contractor must also ensure that the area of work, the system, and the adjacent space are certified as gas free and suitable for hot work as per the Fleet Safety and Security Manual.
- 18.3.C.1.3 All cabling, once installed, must be marked with a stamped stainless steel metal tag for all outside cabling and an appropriate label type for all inside cabling. The labels must be securely affixed to the cable at each end and through any deck, deck heads, and/or gland penetrations with the designation for each cable as provided in this specification.
- 18.3.C.1.4 The Contractor must supply and install new shipboard and classification society approved cable glands to replace the existing where applicable.
- 18.3.C.1.5 The Contractor must re-seal all cable glands or penetrations that are not reused by a suitable means that is approved by the applicable classification society.
- 18.3.C.1.6 All cabling which has been deemed surplus as a result of this specification item must be disposed of at the Contractor's expense.
- 18.3.C.1.7 The Contractor must be responsible for ensuring that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this specification item.
- 18.3.C.1.8 Any disturbed or new metal surfaces must be primed with one coat of primer and painted with 2 coats paint similar to existing surfaces. The Contractor must provide the primer and paint.
- 18.3.C.1.9 Contractor must follow existing cable trays throughout the vessel where fitted. Once installed, all cabling must be secured as per ABS requirements.

- 18.3.C.1.10 Prior to the commencement of any electrical work, the Contractor must ensure that all electrical supplies feeding the systems have been isolated at the source following an established lockout/tag out procedure, and as per ISM fleet safety manual.
- 18.3.C.1.11 The Contractor must use all stainless steel mounting hardware that is recommended by the manufacturer for the mounting of all equipment within this specification unless provided with the equipment.
- 18.3.C.1.12 The Contractor must work in conjunction with a CCG Electronics technologist to oversee the installation of the new Compass Equipment system to ensure compliance with applicable CCG standards. Wiring terminations in all equipment must be completed by CCG Technologists with the exception of those for electrical supply which must be the Contractor's responsibility as well as any grounding requirements.
- 18.3.C.1.13 Upon the final installation, testing must be carried out as per section 18.3.D.2 of this document.
- 18.3.C.2 **Equipment**
- 18.3.C.2.1 The Contractor must remove the equipment listed in the table below and reference drawing number LM626-230-IN\_Existing. Refer to pictures below. All removed equipment must be returned to Canada.

Equipment	Location
Gyrocompass Sensor (qty 2) Raytheon Anschutz STD20	Navigation Deck Electronics Equipment Room
Distribution Unit ID : AS346015	Navigation Deck Electronics Equipment Room on Gyro Wall
Control Unit ID : 346013	Navigation Deck Electronics Equipment Room on Gyro Wall
Sperry Booster (Step) ID : AS346011	Navigation Deck Electronics Equipment Room on Gyro Wall
Power Supply (Qty of 2) Newmar 115-24-18CD	Navigation Deck Electronics Equipment Room on Gyro Wall
Terminal Block	Navigation Deck Electronics Equipment Room on Gyro Wall

Equipment	Location
Automatic Power Selector Newmar APS-70	Navigation Deck Electronics Equipment Room on Gyro Wall
Operator Unit Anschutz	Wheelhouse Chart Table
Gyro Repeater	Steering Gear Compartment
Bearing Repeater Note: Leave gimbal and rail in place.	Wheelhouse Port side on rail
Bearing Repeater Note: Leave gimbal and rail in place.	Wheelhouse Starboard side on rail
Bearing Repeater Note: Leave gimbal and rail in place.	Wheelhouse Port Side of the center console
Steering Repeater Only remove the repeater. Leave back box and swivel arm in place.	Wheelhouse Center Console by the Helmsman
Bearing Repeater with Stand	Top of wheelhouse Under FWD mast Searchlight platform
AC Outlet 1	Navigation Deck Electronics Equipment Room on Gyro Wall
AC Outlet 2	Navigation Deck Electronics Equipment Room on Gyro Wall



Figure 8: Gyrocompass Operator Unit to be removed

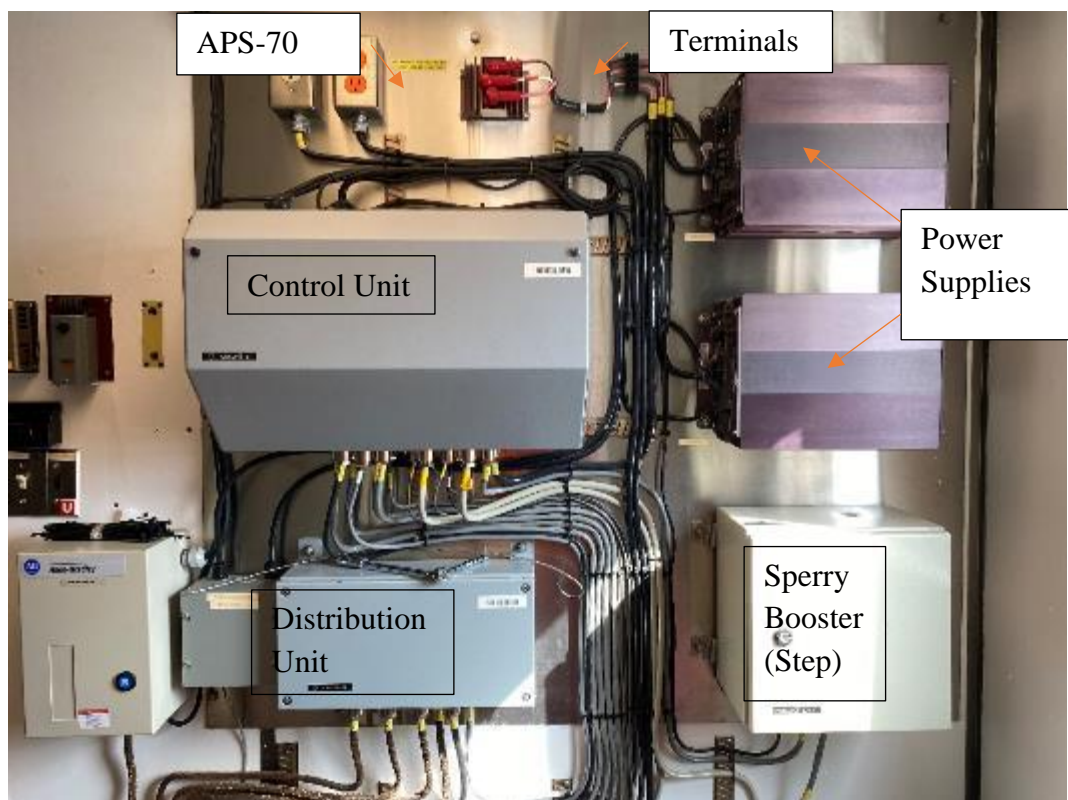
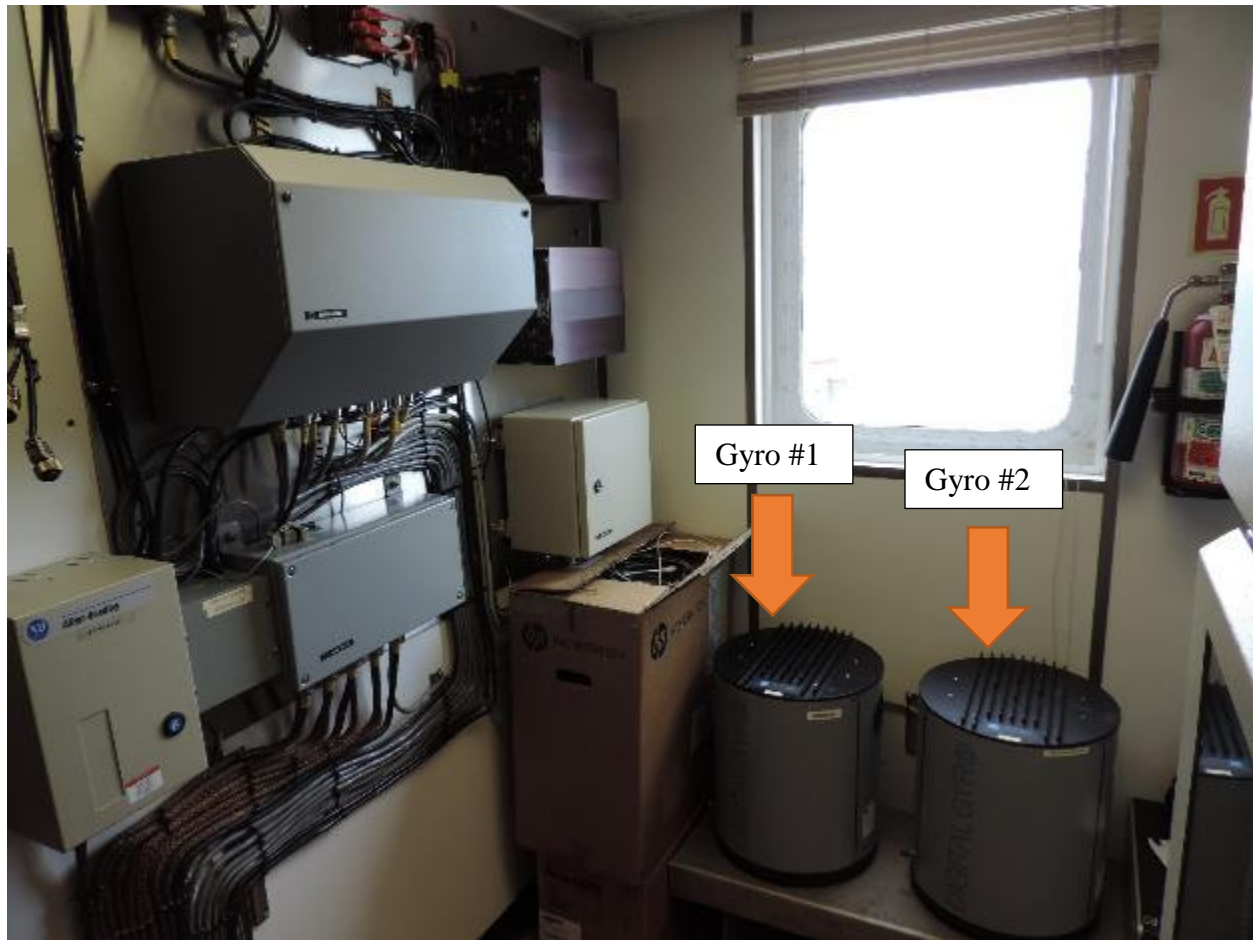


Figure 9: Gyrocompass Mounting Plate in Electronics Equipment Room



**Figure 10: Center Console Steering Repeater to be replaced  
(Contractor must retain the swivel arm and mounting box in place)**





**Figure 11: Gyrocompass sensors to be replaced**

- 18.3.C.2.2 The Contractor must remove the existing bearing repeater bracket units, gimbals, and sliding rail from the Center, Port Wing and Starboard wing repeaters and have them sand blasted and refinished with a powder coating (Color must be RAL1013 Matte Smooth Pearl White). Refer to pictures below.
- 18.3.C.2.3 The Contractor must reinstall these refinished bracket units, gimbals and sliding rail using new stainless steel mounting hardware that is of the same size as the existing. Refer to pictures below.



**Figure 12: Port Wing Bearing Repeater on rail**



**Figure 13: Center Bearing Repeater on Rail**

- 18.3.C.2.4 The Contractor must supply and install three (3) new cover plates on the existing bearing repeater terminal boxes on the bracket units. (The old terminal boxes had a switch and a control knob on the plate). They must be finished with a powder coating (Color must be RAL1013 Matte Smooth Pearl White). Refer to picture below.



**Figure 14: Bearing Repeater Terminal Box**

- 18.3.C.2.5 The Contractor must supply and install a new mounting plate for the steering gear compartment repeater.
- 18.3.C.2.6 The Contractor must retain the digital repeaters in place. They are located in the following locations:
- a) Port Wing
  - b) Starboard Wing
  - c) Helm Position



**Figure 15: Digital Repeater in Port Side Wing (to be retained in place)**

- 18.3.C.2.7 The Contractor must supply and install three (3) marine terminal box for connection of the existing digital repeater (Port Wing, Starboard Wing and Helm Position). In each box, Contractor must supply and install four (4) terminal blocks and one (1) ground terminal block that can handle a wire conductor size of 2.5mm<sup>2</sup> and provide the necessary materials required to mount them.
- 18.3.C.2.8 The Contractor must supply and install two (2) marine connection box with a hinged cover. In each box, Contractor must supply and install twelve (12) fused terminal blocks and six (6) ground terminal block that can handle a wire conductor size of 2.5mm<sup>2</sup> and provide the necessary materials required to mount the terminal blocks within the connection box. The Contractor supplied power supplies will also be housed in these connection boxes.
- 18.3.C.2.9 The Contractor must install the following equipment listed in Equipment List below and with reference to the preliminary LM626-230-IN\_New Wiring Diagram. Final location will be determined and finalized by CCG TA or CCG Representative.

<b>Equipment</b>	<b>Location</b>
Navigat 3500 Gyrocompass Sensor P/N: 73525 Completed with mounting tray 44863	Navigation Deck Electronics Equipment Room
Data Distribution Unit (DDU) Sperry Marine 74907 Completed with two (2) Converter and Amplifier Unit (CAU) board for installation inside DDU. P/N:25826	Navigation Deck Electronics Equipment Room
Converter and Amplifier Unit in Housing Sperry Marine 74904	Navigation Deck Electronics Equipment Room
Main Power Connection Box (Yard supply) Completed with: 1x Power Supply Fused terminal blocks Ground terminal blocks	Navigation Deck Electronics Equipment Room
Backup Power Connection Box(Yard Supply) Completed with: 1x Power Supply Fused terminal blocks Ground terminal blocks	Navigation Deck Electronics Equipment Room
Navitwin V Control and Display Unit Sperry Marine 74902	Wheelhouse Chart table
Bearing Repeater Sperry Marine 74880	Wheelhouse Port side New bearing repeater mounted within the existing gimbal unit on the sliding rail.
Terminal Box Sperry Marine 74859	Wheelhouse Port side On wall below the Repeater Rail.
Bearing Repeater Sperry Marine 74880	Wheelhouse Starboard side New bearing repeater mounted within the existing gimbal unit on the sliding rail.

<b>Equipment</b>	<b>Location</b>
Terminal Box Sperry Marine 74859	Wheelhouse Starboard side On wall below the Repeater Rail.
Bearing Repeater Sperry Marine 74880	Wheelhouse Port side of Center Console New bearing repeater mounted within the existing gimbal unit on the sliding rail.
Terminal Box Sperry Marine 74859	Wheelhouse Port side of Center Console On wall below the Repeater Rail.
Bearing Repeater on stand Sperry Marine 74911	Top of wheelhouse Under FWD Mast Searchlight Platform
Steering Repeater Sperry Marine 74881	Wheelhouse Center console by the helmsman Install in existing back box on swivel arm.
Bulkhead Steering Repeater Sperry Marine 74883	Steering Gear Compartment Same location as previous.
Terminal Box Sperry Marine 74859	Steering Gear Compartment Under new Repeater on plate
Satellite Compass Antenna Simrad MX575D	Top bridge or FWD mast Location TBD by CCG Technical Authority
Terminal Box (Yard supply) Complete with 4 Terminal blocks 1 Ground terminal block	Wheelhouse Center Console (For connection of existing digital repeater)
Terminal Box (Yard supply) Complete with 4 Terminal blocks 1 Ground terminal block	Crawl space Under Port Side Wing (For connection of existing digital repeater)
Terminal Box (Yard supply) Complete with 4 Terminal blocks 1 Ground terminal block	Crawl space Under Starboard Side Wing (For connection of existing digital repeater)

18.3.C.2.10 Contractor must ground all equipment as per OEM manuals.

### 18.3.C.3 **CABLES**

18.3.C.3.1 Contractor must remove the following existing cables from the existing system:

**Table 5 – Old cables to be removed**

<b>Cable ID</b>	<b>Source</b>	<b>Destination</b>
LC-1	Gyrocompass #1	Control Unit
LC-2	Power Supply Newmar #1	Terminal block/Isolator
LC-3	Control Unit	Digital Repeater Port Wing
LC-4	Control Unit	Steering Repeater Center Console
LC-5	Control Unit	Digital Repeater Starboard Wing
LC-6	Control Unit	Sperry Booster
LC-7	Control Unit	Operator Unit
LC-8	Sperry Booster	Step Distribution Unit
LC-9	Terminal block/Isolator	Control Unit
LC-11	Gyrocompass #2	Control Unit
LC-12	Power Supply Newmar #2	Terminal block/Isolator
LC-28	Control Unit	Digital Repeater Helm Position
LC-30	Step Distribution Unit	Steering Gear Repeater
LC-31	Step Distribution Unit	Bearing repeater Port side wheelhouse
LC-32	Step Distribution Unit	Bearing repeater Stbd side wheelhouse
LC-33	Step Distribution Unit	Top of wheelhouse Repeater
LC-43	Step Distribution Unit	Bearing repeater wheelhouse center
LC-50	Control Unit	Disconnected SATBOM B
LC-51	Control Unit	Disconnected Radar X
LC-52	Control Unit	Disconnected Radar S
LC-53	Control Unit	Disconnected ECPINS
LC-54	Control Unit	Gyro NMEA Splitter
R-SN-17	Control Unit	GNSS NMEA Splitter
P109A-3	Panel P109A Circuit 3	AC Outlet
UPS1-11	Panel UPS1 Circuit 11	AC Outlet



18.3.C.3.2 Contractor must supply and install all cable requirements as detailed in preliminary drawing *LM626\_Preliminary\_Gyro\_Upgrade\_Drawing.pdf*.

18.3.C.3.3 Contractor must be responsible for unpacking/repacking all cable transits/glands.

18.3.C.4 **Locations**

18.3.C.4.1 Wheelhouse

18.3.C.4.2 Top of wheelhouse

18.3.C.4.3 Electronics Equipment Room

18.3.C.4.4 Crawl Space

18.3.C.4.5 Steering Gear Compartment

18.3.C.5 **Interferences**

18.3.C.5.1 The Contractor is responsible for the identification of interference items, their temporary removal, storage, and refitting to the vessel.

18.3.D **Proof of Performance**

18.3.D.1 **Inspection Points**

18.3.D.1.1 ABS class surveyor and the TA must be present at the inspection of the work

18.3.D.1.2 All cables must be checked for continuity after installation to ensure operational capability.

18.3.D.1.3 A cable which has been installed by the Contractor that is found defective (fails a continuity test) or damaged must be replaced at the Contractor's expense (material and labour).

18.3.D.2 **Testing/Trials**

18.3.D.2.1 Electronic equipment which has been removed for the performance of this specification must be returned to Canada as it will be used as spares for similar equipment used in other Canada assets.

18.3.D.2.2 Terminations

- a) CCG Electronics Technologist will complete the wiring terminations (with the exception of power cables which is the Contractor's responsibility) on the system. They must be granted access to the Contractor's site in all time.

18.3.D.2.3 Commissioning

- a) CCG Electronics Technologist will complete the commissioning of the system. They must be granted access to the Contractor's site in all time.

18.3.D.3 **Certification**

- 18.3.D.3.1 The Contractor must supply certificates in accordance with the Documentation section of the General Notes.
- 18.3.D.3.2 TA will complete the certification on this system after system has been installed and commissioned.

18.3.D.4 **Documentation**

- 18.3.D.4.1 Contractor must provide OEM documentation such as manuals, drawings or datasheet to Canada in electronic and paper format.
- 18.3.D.4.2 Contractor must provide to the TA a typewritten report of the Contractors work in both electronic and hardcopy formats outlining the details of the inspections and any alterations / repairs to the acceptance of this item.

18.3.D.5 **Training - [Not Used]**

## **18.4 WIND SENSORS INTEGRATION**

### **18.4.A Identification**

- 18.4.A.1 The objective of this item is to provide and replace the wind sensor displays and NMEA splitters.
- 18.4.A.2 The Wind sensors (the sensors themselves) are supplied by Wartsila as part of the Dynamic Positioning replacement contract.
- 18.4.A.3 This work must be carried out in conjunction with the other essential electronic equipment requirements detailed in this statement of work.
- 18.4.A.4 This work must be carried out in conjunction with specification item 12.09 Replacement of retractable azimuth thrusters and DP.

### **18.4.B References**

#### **18.4.B.1 Equipment Data**

- 18.4.B.1.1 Government Supplied Material (GSM)
  - a) Two (2) Wind Sensor Gill Observer 65, P/N: 1390-65-B-222
  - b) Two (2) Wartsila Junction Box for Wind Sensor connection
- 18.4.B.1.2 Contractor Supplied Material (CSM)
  - a) The Contractor must supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.
  - b) Six (6) Wind Display Observator OMC-139 with the 24Vdc option
  - c) One (1) Actisense Pro-Buf-1 with screw terminals option
  - d) Two (2) Actisense NBF-3 with Din rail option
  - e) Two (2) Switched-mode power supply; Classic; 1-phase; 24 VDC output voltage; 10 A output current; TopBoost; DC OK contact;
  - f) One (1) Selector switch; contact switch type. Two (2) normally open and two (2) normally closed contacts.



Figure 16 - Observator OMC-139 Wind Marine Display

#### 18.4.B.2 Drawings and Documents

18.4.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Document Number	Document Title	File name
LM626-010-AL-01	Amundsen – Antenna Arrangement Drawing With Wind Sensor notes	LM626-010-AL-01_WindSensor.pdf
LM626-391-IN Page 1 and 2	Amundsen – Wind Sensor Drawing (Existing)	LM626-391-IN_Existing.pdf
LM626-401-WI	Amundsen – NMEA Splitter Drawing (Existing)	LM626-401-WI_Existing.pdf
LM626-391-IN Page 1 to 3	Amundsen – Wind Sensor Drawing (New)	LM626-391-IN_New.pdf
Datasheet-OMC-139- Ver20200603.	Observator OMC-139 Datasheet	Datasheet-OMC-139-V20200603.pdf
Manual V1.10	Observator OMC-139 Manual	OMC-138-139_manual_en_v1.10_1.pdf
1390-0036 Iss 9	Gill WindObserver 65 Brochure	1390-0036 Iss 9 WindObserver65.pdf
1390-PS-0039 Iss 6	Gill WindObserver 65 User Manual	1390-PS-0039 WindObserver 65 Manual Issue 6.pdf
	Actisense NBF-3 Datasheet	NBF3_Datasheet.pdf

Document Number	Document Title	File name
	Actiesense PRO-BUF-1 Datasheet	PROBUF1_Datasheet.pdf

### 18.4.B.3 **Regulations and Standards**

- 18.4.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard:

FSSM Procedures	Title	Included Yes/No
	Fleet Safety and Security Manual (DFO/5737)	
<b>Publications</b>		
	N/A	
<b>Standards</b>		
ABS	American Bureau of Shipping (ABS)	
IEEE 45:2002	Recommended Practice for Electrical Installations on Ships	
70- 000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment	
<b>Regulations</b>		
	Canada Shipping Act, 2001	
	American Bureau of Shipping (ABS)	
	SOLAS	

### 18.4.C **Statement of Work**

#### 18.4.C.1 **General**

- 18.4.C.1.1 The Contractor must supply all equipment, enclosures, ventilation, staging, chain falls, craneage, slings and shackles necessary to perform the work. All lifting equipment must be appropriate for the expected duties, and be accompanied by current certification indicating, or be permanently marked as to being, of an adequate safe working load for the expected duties. Any brackets or other welded attachments required in the performance of this specification must be welded into place by CWB-certified welders certified to welding Std. W47.1, Div. 1 and 2.
- 18.4.C.1.2 Prior to any hot work taking place, the Contractor must ensure that the area of work and all equipment, wiring, transit, etc. have been sufficiently protected from any sparks or metal filings. The Contractor must also ensure that the area of work, the system, and the adjacent

space are certified as gas free and suitable for hot work as per the Fleet Safety and Security Manual.

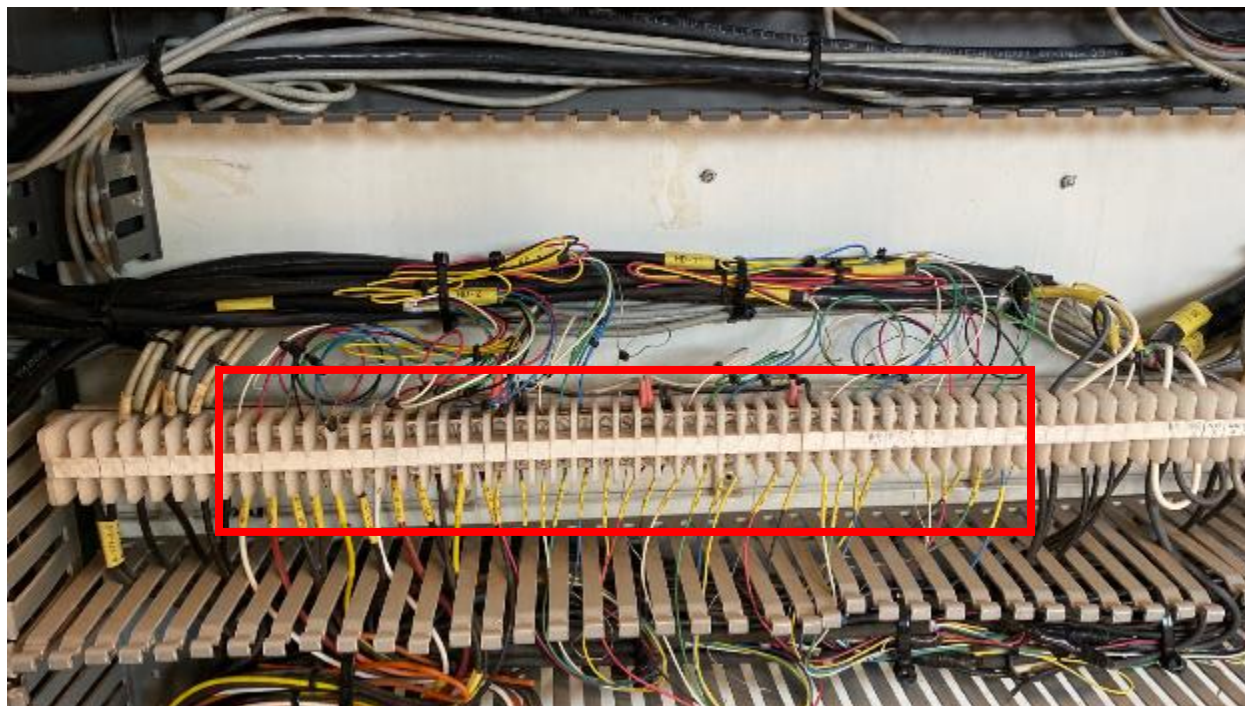
- 18.4.C.1.3 All cabling, once installed, must be marked with a stamped stainless steel metal tag for all outside cabling and an appropriate label type for all inside cabling. The labels must be securely affixed to the cable at each end and through any deck, deck heads, and/or gland penetrations with the designation for each cable as provided in this specification.
- 18.4.C.1.4 The Contractor must supply and install new shipboard and classification society approved cable glands to replace the existing where applicable.
- 18.4.C.1.5 The Contractor must re-seal all cable glands or penetrations that are not reused by a suitable means that is approved by the applicable classification society.
- 18.4.C.1.6 All cabling which has been deemed surplus as a result of this specification item must be disposed of at the Contractor's expense.
- 18.4.C.1.7 The Contractor must be responsible for ensuring that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this specification item.
- 18.4.C.1.8 Any disturbed or new metal surfaces must be primed with one coat of primer and painted with 2 coats paint similar to existing surfaces. The Contractor must provide the primer and paint.
- 18.4.C.1.9 Contractor must follow existing cable trays throughout the vessel where fitted. Once installed, all cabling must be secured as per ABS requirements.
- 18.4.C.1.10 Prior to the commencement of any electrical work, the Contractor must ensure that all electrical supplies feeding the systems have been isolated at the source following an established lockout/tag out procedure, and as per ISM fleet safety manual.
- 18.4.C.1.11 Upon the final installation, testing must be carried out as per section 18.4.D.2 of this document.
- 18.4.C.1.12 Electronic equipment which has been carefully removed by the Contractor for the performance of this specification must be returned to CCG as it will be used as spares for similar equipment used in other Canada assets. Contractor must refer to TA for specific location for storage onboard.
- 18.4.C.2 **Equipment**
- 18.4.C.2.1 The Contractor must dismantle the following existing equipment (refer to pictures below):
  - a) Stbd Wing Wind Display

- b) Port Wing Wind Display
- c) Helmsman Wind Display
- d) Wind Translator #1 in Chart Table. A colour match powder coated cover plate must be supplied and installed by the Contractor.
- e) Wind Translator #2 in Chart Table. A colour match powder coated cover plate must be supplied and installed by the Contractor.
- f) Humidity Sensor – top of the wheelhouse – cable gland must be filled with a blank plug by the Contractor.
- g) Wind Sensor Port – Top of Mast
- h) Wind Sensor Stbd – Top of Mast
- i) NMEA Splitter DD20 (Qty 2) – Refer to LM626-401-WI\_Existing.pdf
- j) Terminal blocks strip in the chart table



Figure 17: Existing Wind Translator to be removed in chart table





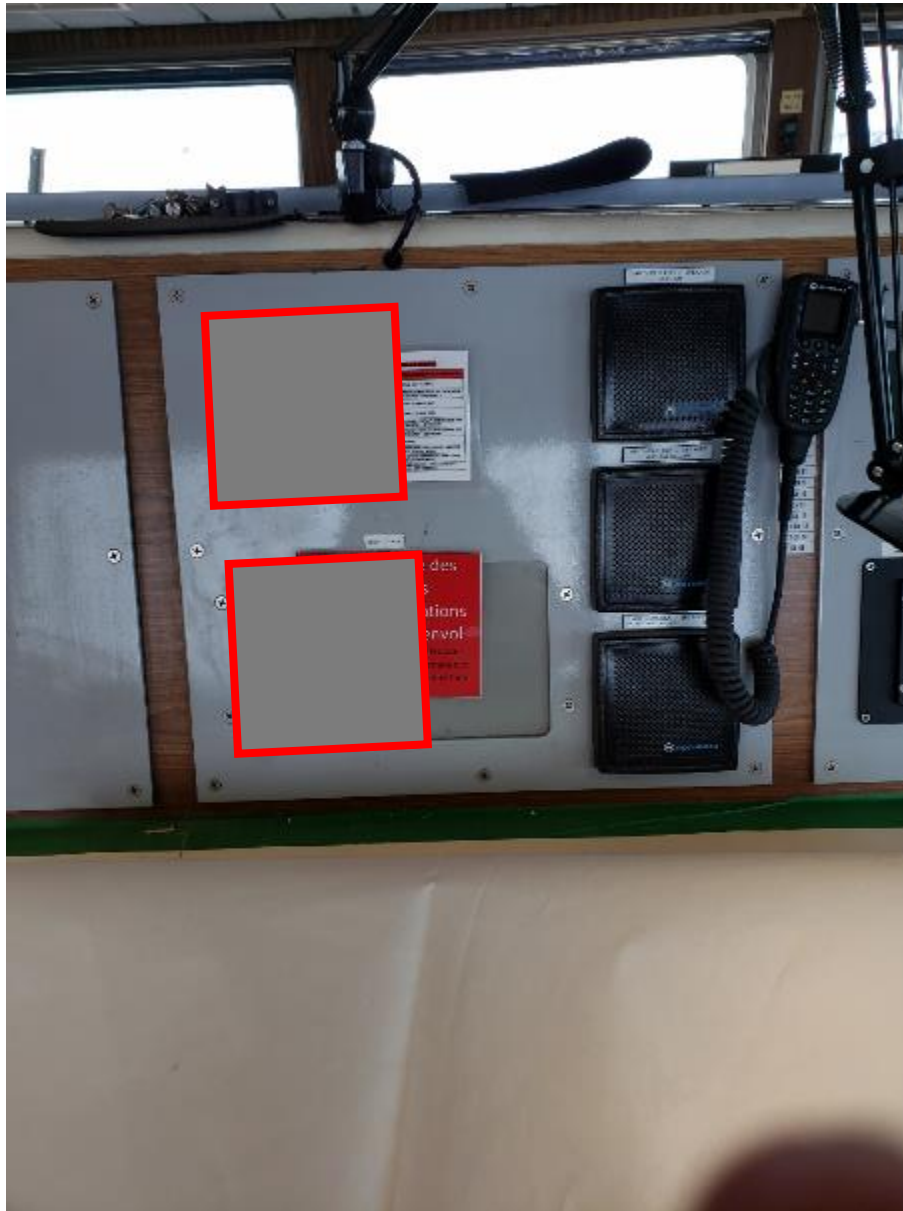
**Figure 18: Terminal strip to be partially removed inside chart table**



**Figure 19: Helmsman Wind Display to be replaced with a new unit**

18.4.C.2.2 The Contractor must install the new wind sensor display in the following location.

- a) Stbd wing – Same location as existing one.
- b) Port wing – Same location as existing one.
- c) Chart table (2x) – Refer to picture below for location
- d) Helmsman – Same location as existing one.
- e) Spare unit – To be handed over to the TA.



**Figure 20: Location for future Wind Displays on chart table**

- 18.4.C.2.3 The Contractor must install two (2) new GSM Wind Sensor Observer 65 (1390-65-B-222
- a) All bracket components must be stainless steel 316.
  - b) The Contractor must modify the supplied mounting bracket to add strengthening webs as per sketch below.
  - c) The Contractor must install the Wind Sensors in the same location as previous ones. Refer to picture below.

- d) The Contractor must align the Wind Sensors as per OEM manual. The North spar must point towards the ship's bow.
- e) The Contractor must connect the mounting brackets to the ship's structure using a 6mm<sup>2</sup> ground wire. Ref to sketch below.

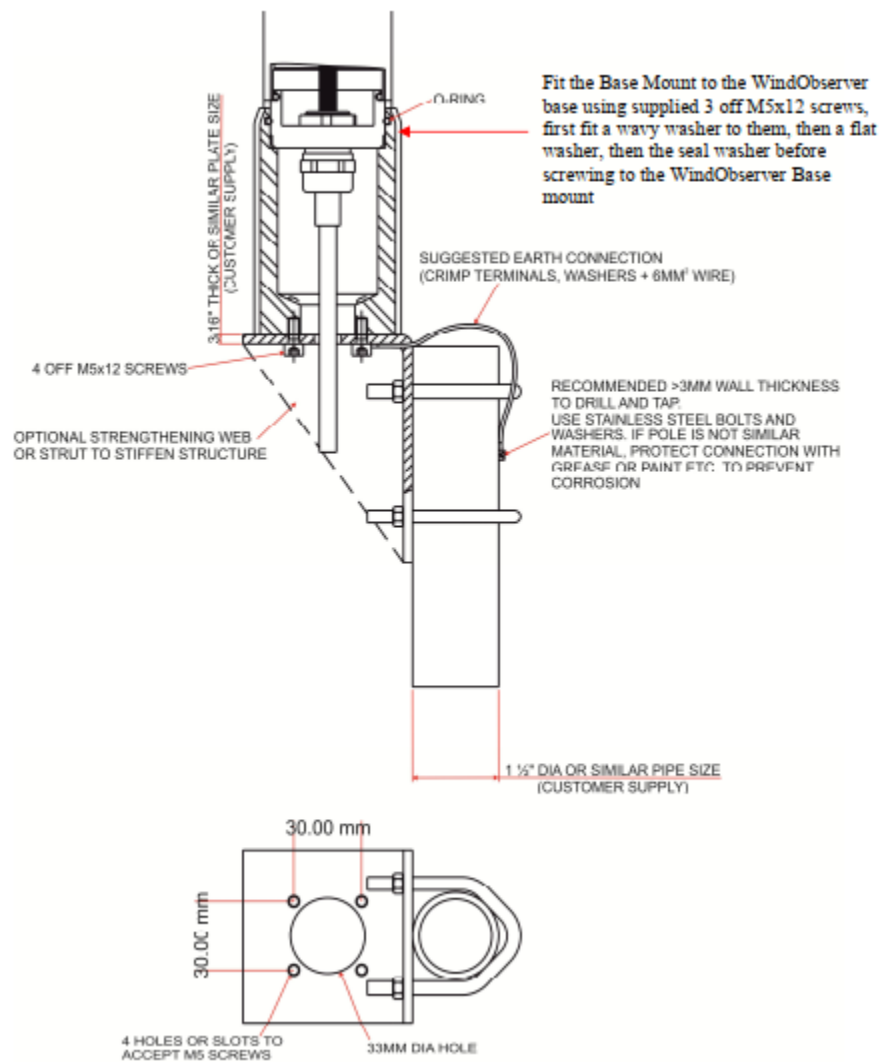


Figure 21: Extract from OEM manual showing the mounting bracket, strengthening web and earthing





**Figure 22: Existing Wind Sensor to be replaced**

- 18.4.C.2.4 The Contractor must install two (2) junction boxes. Contractor must mount them on a plate. The plate must be secured on the wind sensor mounting brackets using U shaped bolts. All components must be stainless steel 316. The junction boxes must be close enough to the sensors for the two (2) meters pigtails to reach them.
- 18.4.C.2.5 The Contractor must supply and install two (2) new Power Supply 24Vdc 10A inside the Chart table. They will be used to power both Wind Sensors system.
- 18.4.C.2.6 The Contractor must supply and install DIN Rail mounted fuse blocks on each 24vdc output from the Power supplies. Fuses must be of appropriate rating for the powered equipment.
- 18.4.C.2.7 The Contractor must supply and install new NMEA splitters as per guidance drawings. They must be installed in proximity of the displays, inside the chart table.
- a) Qty 2 of Actisense NBF-3 with DIN Rail installation kit.
  - b) Qty 1 of Actisense PRO-BUF-1 (Screw type)
- 18.4.C.2.8 The Contractor must supply and install a selector switch (contact switch, 2x Normally Close and 2x Normally Open). The switch must allow to select which wind sensor data is fed to the external equipment. Refer to guidance drawings.

18.4.C.2.9 Contractor must ground all equipment as per OEM manuals.

### 18.4.C.3 Cables

18.4.C.3.1 Contractor must remove **all** existing cables from the existing system. Refer to guidance drawing *LM626-391-IN\_Existing.pdf*.

18.4.C.3.2 Contractor must install the cables listed in **Table 6** below and as per guidance drawing *LM626-391-IN\_New.pdf*.

- Clarification on cable type:
  - 3PIS-18WG : 3 pairs, with individual shield, 18 AWG conductors

**Table 6 – New cables to be pulled**

Cable Label/Type	Source	Destination
HD-01A 2M Pigtail	Wind Sensor PS	Junction Box (PS Sensor)
HD-01B 3PIS-18AWG	Junction Box (PS Sensor)	Wind Display #1 (PS)
HD-01C 2x1.5mm <sup>2</sup> -Screened	Junction Box (PS Sensor)	24Vdc PSU PS Sensor
HD-02A 2M Pigtail	Wind Sensor SB	Junction Box (SB Sensor)
HD-02B 3PIS-18AWG	Junction Box (SB Sensor)	Wind Display #2 (SB)
HD-02C 2x1.5mm <sup>2</sup> -Screened	Junction Box (SB Sensor)	Wago Epistron 24Vdc PSU SB Sensor
HD-03 Belden 8723SB	NMEA Splitter Actisense Pro-Buf-1	Wind Display #5 PS Wing
HD-04 Belden 8723SB	NMEA Splitter Actisense Pro-Buf-1	Wind Display #3 SB Wing
HD-05 Belden 8723SB	NMEA Splitter Actisense Pro-Buf-1	Wind Display #4 Helmsman
HD-06 2x1.5mm <sup>2</sup> -Screened	Wago Epistron 24Vdc PSU PS Sensor	Wind Display #1 (PS)
HD-07 2x1.5mm <sup>2</sup> -Screened	Wago Epistron 24Vdc PSU PS Sensor	NMEA Splitter PS Sensor

<b>Cable Label/Type</b>	<b>Source</b>	<b>Destination</b>
HD-08 Belden 8723SB	NMEA Splitter Actisense Pro-Buf-1	Port Server
HD-09 Belden 8723SB	NMEA Splitter PS Sensor	Wind Display #1
HD-10 Belden 8723SB	NMEA Splitter Actisense Pro-Buf-1	Furuno Sensor Adapter S-Band Console
HD-11 2x1.5mm <sup>2</sup> -Screened	Wago Epistron 24Vdc PSU SB Sensor	Wind Display #2 (SB)
HD-12 2x1.5mm <sup>2</sup> -Screened	Wago Epistron 24Vdc PSU SB Sensor	NMEA Splitter SB Sensor
HD-13 2x1.5mm <sup>2</sup> -Screened	Wind Display #5 PS Wing	Wago Epistron 24Vdc PSU PS Sensor
HD-14 2x1.5mm <sup>2</sup> -Screened	Wind Display #3 SB Wing	Wago Epistron 24Vdc PSU PS Sensor
HD-15 2x1.5mm <sup>2</sup> -Screened	Wind Display #4 Helmsman	Wago Epistron 24Vdc PSU PS Sensor
HD-16 Belden 8723SB	NMEA Splitter SB Sensor	Wind Display #2 (SB)
HD-17 Belden 8723SB	NMEA Splitter Actisense Pro-Buf-1	S-VDR
HD-18 Belden 8723SB	Wind Selector Switch	NMEA Splitter Actisense Pro-Buf-1
HD-21 Belden 8723SB	NMEA Splitter PS Sensor	Wind Selector Switch
HD-22 Belden 8723SB	NMEA Splitter SB Sensor	Wind Selector Switch
HD-23 2x1.5mm <sup>2</sup> -Screened	NMEA Splitter Actisense Pro-Buf-1	Wago Epistron 24Vdc PSU PS Sensor
UPS1-7-Wind 3C-14AWG	AC Outlet (UPS1-7) Inside Chart table	Wago Epistron 24Vdc PSU PS Sensor
P119A-3 3C-14AWG	Panel P119A Breaker #3	Wago Epistron 24Vdc PSU SB Sensor

Cable Label/Type	Source	Destination
DP-221 Belden 8723SB	NMEA Splitter PS Sensor	Dynamic Positioning DP SPU
JS-221 Belden 8723SB	NMEA Splitter PS Sensor	Dynamic Positioning IBJS SPU
DP-222 Belden 8723SB	NMEA Splitter SB Sensor	Dynamic Positioning DP SPU
JS-222 Belden 8723SB	NMEA Splitter SB Sensor	Dynamic Positioning IBJS SPU

18.4.C.3.3 Contractor must be responsible for the wiring terminations in all of the equipment.

18.4.C.3.4 Contractor must be responsible for unpacking/repacking all cable transits/glands.

#### 18.4.C.4 **Locations**

18.4.C.4.1 Wheelhouse

18.4.C.4.2 Electronics Equipment Room

18.4.C.4.3 FWD Mast

#### 18.4.C.5 **Interferences**

18.4.C.5.1 The Contractor is responsible for the identification of interference items, their temporary removal, storage, and refitting to the vessel.

#### 18.4.D **Proof of Performance**

##### 18.4.D.1 **Inspection Points**

18.4.D.1.1 ABS class surveyor and the TA must be present at the inspection of the work

18.4.D.1.2 A cable which has been installed by the Contractor that is found defective (fails a continuity test) or damaged must be replaced at the Contractor's expense (material and labour).

##### 18.4.D.2 **Testing/Trials**

18.4.D.2.1 Contractor must hire a specialized FSR to proceed with commissioning of the system.

18.4.D.2.2 Contractor must provide proof of performance of the system as per, but not limited to, table below.



Test Description	Result
Visual inspection for any damage to the equipment	
Verify heater element in Port side sensor is functioning as expected	
Verify heater element in Starboard side sensor is functioning as expected	
Verify Wind data from Port sensor is displayed on Main display 1 as expected	
Verify Wind data from Starboard sensor is displayed on Main display 1 as expected	
Wind data in Port wing is as per main display	
Wind data in Starboard wing is as per main display	
Wind data Helm Position is as per main display	
Wind data in ECDIS is as per main display	
Wind data in S-VDR is as per main display	
Wind data in Dynamic Positioning is as per main display 1	
Redundant Wind data in Dynamic Positioning is as per main display 2	
Check operation of the selector switch	

### 18.4.D.3 **Certification**

18.4.D.3.1 The Contractor must supply certificates in accordance with the Documentation section of the General Notes.

18.4.D.3.2 TA will complete the certification on this system after system has been installed and commissioned.

### 18.4.D.4 **Documentation**

18.4.D.4.1 The Contractor must provide OEM documentation such as manuals, drawings or datasheet to Canada in electronic and paper format, where available.

18.4.D.5    **Training - [Not Used]**

## 19.0 **INTEGRATED CONTROL SYSTEMS - [NOT USED]**

## **20.0 SCIENCE, OCEANOGRAPHIC, AND HYDROGRAPHIC EQUIPMENT**

### **20.1 UPGRADE OF THE MULTIBEAM SONAR**

In the event of a discrepancy between the statement of work for the multibeam sonar and the requirements of the technical data, the requirements of the technical data takes precedence over the statement of work.

#### **20.1.A Identification**

- 20.1.A.1 The objective of this item is to carry out the necessary modifications to the vessel in anticipation of the replacement of an EM 302 Kongsberg multibeam sounder with an EM 304. The steel work involved in installing the multibeam sounder requires the vessel to be dry-docked. These specifications detail all the work required by the Contractor to install the EM 304 multibeam sounder on board the CCGS Amundsen. Note that the Kongsberg multibeam sounder components are provided by CCG.
- 20.1.A.2 The transmitter (TX) and receiver (RX) casings of the existing multibeam sounder must be removed. New casings for the TX and RX units are provided by CCG and must be installed as per the drawings provided see section 20.1.B.2.
- 20.1.A.3 The current 5" diameter communication conduit must be replaced with a new 8" diameter conduit. This new conduit must be connected to the existing free flooding pipe. The new conduit must be supplied by the Contractor.
- 20.1.A.4 The current processing units will be removed. This equipment's structural insulation and seats will also be removed. New seats are supplied with the new PU, TX and RX units but inking must be manufactured and installed by the Contractor. The structural insulation will be completely replaced.
- 20.1.A.5 Drawings C18-90-165-01, C18-90-165-02 and C18-90-165-03 illustrate all the steel work for the installation of the new casings, conduits and seats for the PU, TX and RX units. Kongsberg drawings 218461AA, 353859AA, 353860AA, 354393\_Pro01 and 354395\_Pro01 detail the protective plates that are provided by the Contractor.
- 20.1.A.6 The Contractor must arrange for the equipment manufacturer's representative (Kongsberg) to be present during the installation and to participate in the sea trials.

#### **20.1.B References**

##### **20.1.B.1 Equipment Data**

###### **20.1.B.1.1 Multibeam Sonar :**

a) Model : Kongsberg EM304

#### 20.1.B.1.2 Items supplied by CCG:

- a) Multibeam Sonar : Model : Kongsberg EM304
- b) RX Ice Window Section (x3) #353047
- c) RX Mounting frame #430244 (incluant Bolsters etc. #430195)
- d) TX Ice Window Section E2 (x5) #437505
- e) TX Mounting frame #391929
- f) Casing RX #430606
- g) Casing Assembly RX #430303 all shown items such as :
  - i) End Plate A (x1) #353859
  - ii) End Plate B (x1) #353860
  - iii) Side Cover A (x3) #354393
  - iv) Side Cover B (x3) #354395
  - v) Anode (x6)
  - vi) Installation Hardware as shown on the drawing#430303
- h) Casing TX # 392135
- i) End section TX Casing #599-218460
- j) TX sacrificial anodes see dwg #392136

#### 20.1.B.1.3 Items provided by the Contractor

- a) Hex. head Screws M16x90 A4-80 and flat washers for Ice Window installation #572-017719 (x72) see dwg #392136
- b) Installation hardware for TX sacrificial anodes see dwg #392136

#### 20.1.B.2 **Drawings and Documents**

20.1.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Drawing Number	Drawing / Document Title	Number of Sheets
427620aa	EM 304 Installation Manual	52
443741aa	EM 304 Product Description	64
C18-90-165-01_1	Structure for RX and TX casings	1
C18-90-165-02_0	Modification of Conduits	1
C18-90-165-03_0	Seats for transceivers and process unit	1

2000-02-A-001_B	Arrangement of rosette room, control room an	3
2000-02-A-002_C	Arrangement of forward thruster room	1
2000-02-A-003_A	Arrangement of propulsion motor room and eng	1
2000-02-A-004_A	Arrangement of lower science store	1
2000-02-H-001_B	Rosette room, heeling tank and moon pool str	7
2000-02-H-002_A	Structure in way of transducers	3
2000-02-H-003_F	Fwd thruster structure	3
2000-02-H-004_A	Acoustic well structure	1
2000-02-H-005_E	Aft thruster structure	3
2000-02-H-006_A	Welding schedule	7
371591AC	Rack Mount 3U MP8200H	1
378828AA	Outline Dimensions MP8200H HWS	1
05292-000	Mechanical outline DuraMON WS bracket standard	1
364666B	Display MD24 Desktop & ceiling bracket	1
422559A	Display MD24 16:9 MK3	1
385422B	Outline Dimensions Processing Unit	1
370275AA	Outline Dimensions Remote Box	1
426264_1A	Outline Dimensions RX Unit EM304	1
426226_1A	Outline Dimensions TX Unit EM304/124	1
353859AA	END PLATE A ICE WINDOW RX EM302	1
353860AA	END PLATE B ICE WINDOW RX EM302	1
354393_Pro01	SIDE COVER A ICE WINDOW RX EM302	1
354395_Pro01	SIDE COVER B ICE WINDOW RX EM2040	1
430303_1A	Casing Assembly Protected RX 2° EM30x	1
430606_1A	Casing Ice Window 2° EM302	1
434910_1A	Arrangement drawing EM30x RX 2° Ice Protected	1
353856AB	BOLSTER SHORT ICE WINDOW RX EM302	1
353857AB	BOLSTER ICE WINDOW RX EM302	1
353858AA	BOLSTER PLATE ICE WINDOW RX EM302	1
430195_1A	Ice Protection 2DEG RX EM302 CONTAINS KM ITEM NO 430244	1
430244_1A	MOUNTING FRAME ASSEMBLY PROTECTED SYSTEM RX 2 DEGREE EM302	1
353047_A	ICE WINDOW SECTION ICE WINDOW RX EM302	1
211475AA	OUTLINE DIMENSIONS RX MODULE EM 300A	1
218461AA	END SECTION TX CASING ICE WINDOW EM300	1
392135C	CASING ICE WINDOW 1DEG TX MOUNTING FRAME	1

392136C	ARRANGEMENT DRAWING CASING w. 1° TX MOUNTING FRAME AND ICE WINDOW	1
134005AA	MOUNTING FRAME ASSY TX MODULER EM 300	1
391928AA	MOUNTING FRAME ASSY MODIFIED 1° SYSTEM TX MODULE ICE WINDOW	1
437505_1Pro01	Ice Window Section E2 TX EM302 Mechanical Drawing	1
211473AA	OUTLINE DIMENSIONS TX MODULE 1 EM 300A	1
211474AA	OUTLINE DIMENSIONS TX MODULE 2 EM 300A	1

### 20.1.B.3 Regulations and Standards

20.1.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
<b>FSM Procedures</b>		
<b>Publications</b>		
<b>Standards</b>		
IACS, no 47	Shipbuilding and Repair Quality Standard (Norme de qualité dans la construction et la réparation navale)	No
CSA W59-08(R2008)	Welded Steel Construction	No
CSA W47.1-09	Fusion Welding of Steel Company Certification	No
<b>Regulations</b>		
	LLOYD'S REGISTER'S SHIP CLASSIFICATION RULES, PART 5	No
C.R.C., c. 1431	TRANSPORT CANADA HULL CONSTRUCTION REGULATIONS	No
SOR/90-264	TRANSPORTS CANADA MARINE MACHINERY REGULATIONS	No
C.R.C., ch. 353	TRANSPORT CANADA, Artic Shipping Pollution Prevention Regulations	No

	CANADA SHIPPING ACT – Marine Machinery Regulations	No
TP 11469	Guide to Structural Fire Protection	No

## **20.1.C Statement of Work**

### **20.1.C.1 General**

- 20.1.C.1.1 The Contractor must supply all materials and equipment to conduct the work.
- 20.1.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.
- 20.1.C.1.3 All work listed in these specifications, as well as all repairs, inspections and replacements, must be completed to the satisfaction of the I'AI. Upon completion of each item of these specifications, the Contractor must notify the IA, who will inspect the work prior to the complete closing up of the work. The Contractor's failure to notify the IA does not absolve it of its responsibility to provide the IA with the opportunity to inspect any item under these specifications. The IA's inspection cannot replace an inspection required by the classification society ABS.
- 20.1.C.1.4 See section G 5.10 for all items involving the use of heat to perform the work.
- 20.1.C.1.5 In its bid, the Contractor must include the costs of transportation, scaffolding, rigging, slings, craning, and the removal and installation of parts and equipment required to perform the work under these specifications.
- 20.1.C.1.6 All pipes, manholes, parts and/or equipment that the Contractor must disassemble to perform the work must be replaced upon completion of the work using new fittings, bolts, screws, washers, supports, and collars, as requested, assembled beforehand. All these items will be inspected by the IA and the Contractor.
- 20.1.C.1.7 The Contractor must provide the IA with all air quality certificates required to enter a confined space or tank, in accordance with the procedure defined or accepted by the Coast Guard, before any cleaning, painting or hot work begins in these tanks or engine rooms. The certificates must clearly specify the type of work to be performed and they must be renewed as required see section G 5.9. Certificates must be posted at the entry to the confined space and be verified daily.
- 20.1.C.1.8 When the Contractor performs work involving a fire suppression or warning system, it must ensure that the disarming of such a system leaves the vessel and/or personnel with adequate fire protection at all times. This can be accomplished by removing or disarming only a portion of the system, using replacement parts during the work, or using any other means accepted by the IA.



- 20.1.C.1.9 Unless otherwise specified, any steel that is replaced and/or repaired will be primed with a marine metal primer as soon as possible in accordance with a procedure defined or accepted by the Coast Guard.
- 20.1.C.1.10 All materials, unless otherwise specified, must be provided by the Contractor. The Contractor must provide all tools necessary to perform the work detailed in these specifications, with the exception of specialized tools, which will be provided by and must be returned to the TA. In addition, the vessel's tools and equipment will not be available to the Contractor. If a specified part or material cannot be provided, the replacement material must be approved by the IA.
- 20.1.C.1.11 The Contractor is responsible for contacting ABS surveyor, IA and TA when items are ready for inspection.
- 20.1.C.1.12 At the startup meeting, the successful Contractor must provide a production bar chart showing the start and end dates of the work for each item in this specification. This document must highlight important dates and show the impact of possible delays on the overall work. The Contractor must submit updated production schedules at each meeting scheduled during the refit, or more frequently if requested by the TA or CA.
- 20.1.C.1.13 Repairs and installation of all machinery and equipment stated in these specifications must be performed in accordance with the manufacturer's instructions, drawings and specifications.
- 20.1.C.1.14 Results of tests, calibrations, measurements and readings must be properly compiled and tabulated, and three (3) hard copies and one (1) electronic copy must be provided, specifically two (2) hard copies and one (1) electronic copy to the TA, and one (1) hard copy to the CA. All tests must be conducted to the satisfaction of the TA. In addition, they must meet the requirements of the ABS classification society inspector.
- 20.1.C.1.15 The Contractor must employ fully qualified, accredited and competent employees and supervisors and oversee the quality of the work to ensure that it is consistent and of the highest quality, in accordance with generally accepted shipbuilding standards and to the satisfaction of the TA.
- 20.1.C.1.16 All equipment that will have to be removed and reinstalled to perform the indicated work must first be inspected jointly by the Contractor and the IA to check for damage.
- 20.1.C.1.17 The Contractor must provide an adequate temporary shelter for all equipment and rooms affected by this work. The Contractor must take appropriate precautions to properly protect any machinery, equipment or devices, human or other property that may be damaged by exposure, movement of equipment, rain/snow, sand paint or sand dust, welding, as well as airborne particles from sanding, welding or painting.

- 20.1.C.1.18 The Contractor must ensure that any welding is performed by a welder certified by the Canadian Welding Bureau (CWB) in accordance with the standards of the Canadian Standards Association (CSA):
- a) SA W47.1 – Certification for Companies for Fusion Welding of Steel Structures (Minimum division level 2.0); and
  - b) CSA W47.2 – M1987 (R2003), Certification for Companies for Fusion Welding of Aluminium (Minimum division level 2.1).
- 20.1.C.1.19 All drawings and drawing revisions requested from the Contractor during the execution of this contract must be of a quality equal to that of the drawings being updated.
- 20.1.C.1.20 All equipment provided and work performed by the Contractor must resist to the following conditions of service:
- a) Outdoor temperatures from -40 to +35 degrees C;
  - b) Wind speed of 50 knots;
  - c) Water temperatures from -2 to +30 degrees C;
  - d) Shock when loading of 2.5 g horizontal and 1.5 g vertical.
- 20.1.C.1.21 The Contractor must refer to the Coast Guard painting procedure specific to the vessel (Amundsen) for all surface preparation, coating and painting work.
- 20.1.C.2 **Preparation**
- 20.1.C.2.1 The docking blocks must be high enough to allow for surveying and measurement of the two TX and RX units. Refer to section **S 4.17** and **S 4.18** for docking details.
- 20.1.C.3 **Cleaning of tanks and compartments before work begins**
- 20.1.C.3.1 This section must be coordinated with items 11.6, 11.7 and 11.8 of the SOW.
- 20.1.C.3.2 Some tanks and compartments will be subject to hot work and must be drained, cleaned, ventilated and tested to ensure air quality. The Contractor must provide the TA with the air quality certificates, in accordance with established procedures, before any hot work begins in tanks, confined spaces or engine rooms. The air quality certificate must be displayed at the entrance to each tank. These tanks must be ventilated and their certificate maintained for the duration of the work.
- 20.1.C.3.3 These tanks and compartments are:
- a) Upper port side heel tank, frames 138 to 165
  - b) Double Bottom no. 1, port, frames 122 to 165 (fuel);

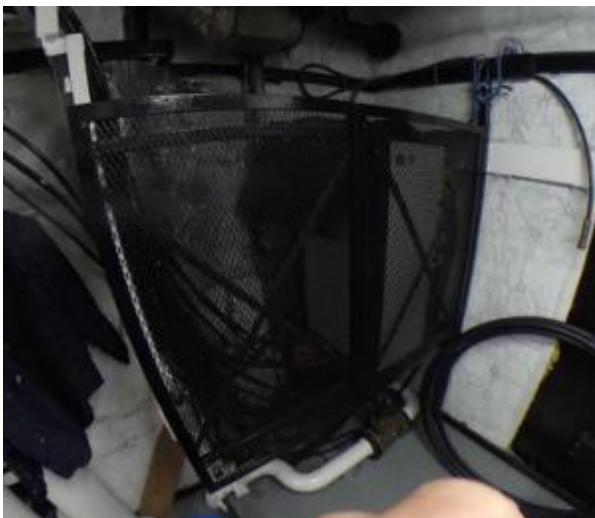
- c) Fore deep tank, port, frames 146 to 165 (fuel);
- d) Fore upper wing port-side tank, frames 138 to 165
- e) The duct keel

20.1.C.3.4 Hot work inside the lower science compartment (frames 138 to 150) is located within 300 mm of the cargo area (150 to 165). This space must be free of all devices, equipment, insulation or residue that could catch fire during nearby hot work.

20.1.C.4 **Dismantling**

20.1.C.4.1 All equipment in the lower science compartment that could be damaged during the work must be removed and stored properly. Permanently attached equipment that could be damaged must be protected.

20.1.C.4.2 The guards and other means of protecting the current processing units must be removed (see Photo 11).



**Photo 11 - Protective guard**

20.1.C.4.3 The transmission cables must be disconnected from the processing units and from the three conduits (see Photo 12).



**Photo 12 - Communication cables**

20.1.C.4.4 The existing processing unit (PU) will be removed and handed over to the CCG (see Photo 13).



**Photo 13 - Processing unit**

20.1.C.4.5 The insulation near the 5" conduit being replaced, on the bulkhead behind the processing unit, as well as on the 150 bulkhead, beginning 1.5 m from the corner behind the existing unit, must be removed and stored for reuse (see Photo 14 and Photo 15).



**Photo 14 - Isolation derrière conduit**



**Photo 15 - Isolation derrière unité**

20.1.C.4.6 The bolted section of the 5" conduit will be removed.



**Photo 16 - 5" conduit**

20.1.C.4.7 Devices and equipment that could be damaged during the work must be protected or removed, stored properly and reinstalled.

- 20.1.C.4.8 The raised floor of the forward thruster room located near and around the 5" conduit will be partially removed. This includes the floor plate and all stiffeners that are part of the raised floor in this area.



**Photo 17 - Raised floor**

- 20.1.C.4.9 The bolted sections of the 5" conduit will be completely removed and disposed of. The air outlet valve must be removed from the 5" pipe and stored before it's reinstallation on the new 8" pipe.



**Photo 20 - Bolting to the deck**



**Photo 18 - Bolting to the ceiling**



**Photo 19 - Bolted section**



- 20.1.C.4.10 The transducers and their cables will be removed from the TX and RX casings from underneath the hull. The "Ice windows", transducer (RX and TX), cables and hardware must be disposed of by the Contractor while complying with provincial and municipal regulations, or by a sub-Contractor licensed by provincial authorities for elimination of such products. Copies of the permits must be submitted upon request.
- 20.1.C.4.11 The old Processing Unit (PU) in the lower scientific compartment must be removed and retained. It must be given to the CCG representative to be stored on board.



Photo 21 - Transducers

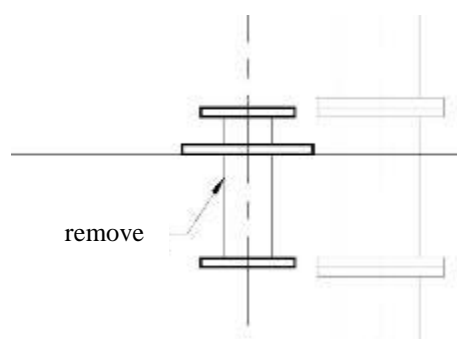
#### 20.1.C.5 **Steel Work – Dismantling**

- 20.1.C.5.1 Important: All measurements in this section 20.1.C.5 must be consulted for information purposes only. These measurements and distances are meant to facilitate understanding of these specifications and to approximately situate the work in question. For all actual measurements, refer to drawing C18-90-165-01.
- 20.1.C.5.2 All transducer cables, both TX and RX, must be removed beforehand by the Contractor. The three conduits (two of 8" and one of 6") will be empty.
- 20.1.C.5.3 The processing unit's upper and lower seats must be removed and disposed of. The upper and lower seats are similar.



**Photo 22 - Upper seat**

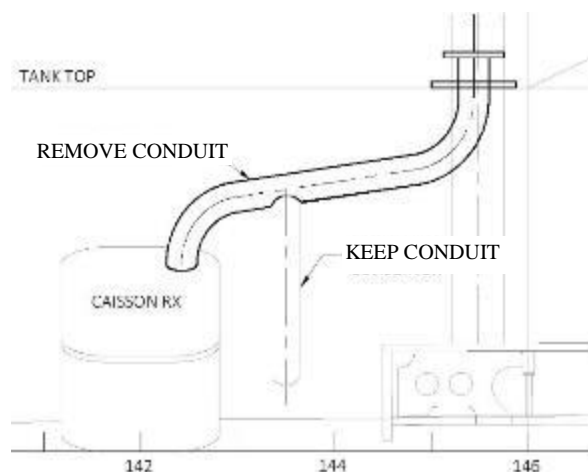
- 20.1.C.5.4 The opening for the 5" welded conduit through the deck must be cut, removed and disposed of. Ideally, remove the lap plate from the sleeve to facilitate installation of the new conduit.



**Figure 23 - Welded opening to the deck**

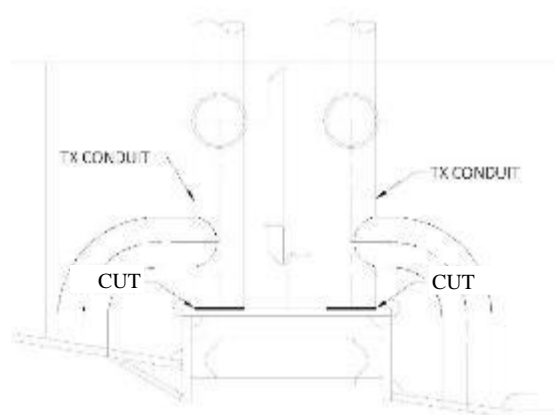
- 20.1.C.5.5 The opening through the tank top will be cut, removed and disposed of. Ideally, remove the solder from the lap plate to facilitate installation of the new conduit. The free immersion pipe must be kept. This operation must be coordinated with the removal of the existing RX casing (see item 20.1.C.5.8).





**Figure 24 - Welded opening to the Tanktop**

- 20.1.C.5.6 The two 8" conduits of the TX casing must be cut as close as possible to the casing. These pipes must be kept and must be re-welded to the new casing. The work must be executed with precision.



**Figure 25 - Cutting of the 8" conduits**

- 20.1.C.5.7 The TX casing and fairing will be removed. In order to facilitate installation of the new casing, the existing unit must be dismantled carefully to remove as little material as possible and avoid the use of inserts in the floors or bottom plate in order to fill gaps that are too large.

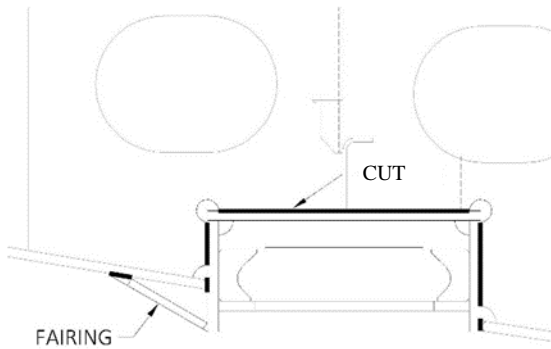


Figure 26 - Cutting of the TX casing

20.1.C.5.8 The RX casing will be removed with every attempt made to remove as little material as possible and avoid the use of inserts in the floors, girders or bottom plate. The work must be executed with precision. This step will be coordinated with the cutting of the 5" conduit (see item 20.1.C.5.4).

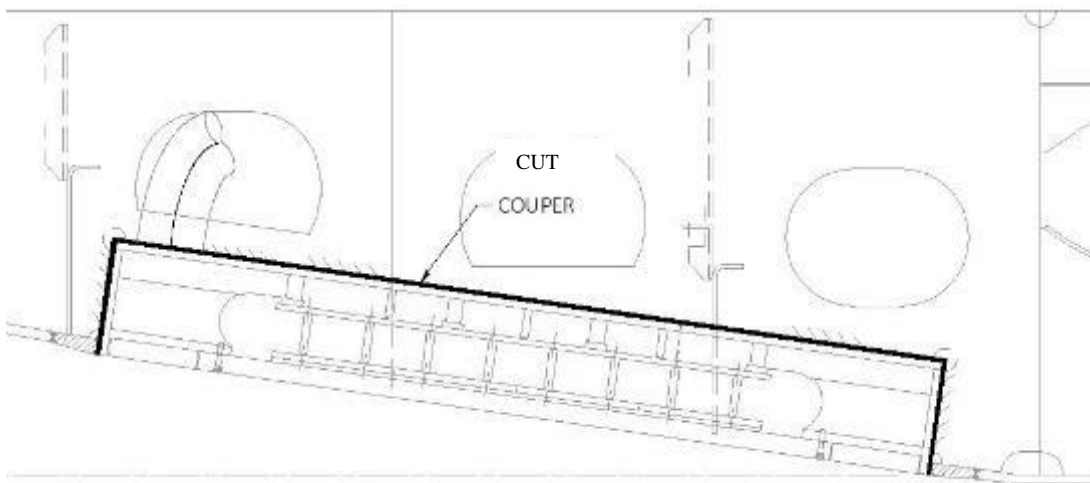


Figure 27 - Cutting of the RX casing

#### 20.1.C.6 **Steel Work – Reconstruction**

20.1.C.6.1 Two new casings provided by CCG have been manufactured as per drawing C18-90-165-01 and within the tolerances dictated by Kongsberg.

20.1.C.6.2 The protective plates, as described on the following Kongsberg drawings, must be supplied, manufactured and painted by the Contractor:

- |                               |            |                   |
|-------------------------------|------------|-------------------|
| a) Endplates of the TX casing | (2 plates) | Drawing: 218461AA |
| b) Endplate of the RX casing  | (1 plate)  | Drawing: 353859AA |

- c) Endplate of the RX casing (1 plate) Drawing: 353860AA
- d) Side plate of the RX casing (3 plates) Drawing: 354393\_Pro01
- e) Side plate of the RX casing (3 plates) Drawing: 354395\_Pro01

- 20.1.C.6.3 Cuts to the hull and structural elements must be adjusted to accommodate the new TX casing as shown on drawing C18-90-165-01. Maximum spacing before welding must comply with IACS No. 47.
- 20.1.C.6.4 The position of the openings in the casing ceiling for existing cable conduits must be confirmed on site and adjustments made if necessary. Care must be taken not to touch the casing welds when cutting the openings.
- 20.1.C.6.5 Since the new RX casing is slightly longer than the old one, the cut-out will have to be widened toward the port side after removal of the existing casing. Modifications and reinforcements to the structure will have to be made as per drawing C18-90-165-01. The final cuts to the hull and structural elements must be adjusted to accommodate the new RX casing as shown on the drawing.
- 20.1.C.6.6 The plate floor at frame 144 must be modified to enable routing of the RX casing cable conduits as per drawing C18-90-165-02. If the existing arrangement differs significantly from that on the drawing, the Contractor must be consulted TA to validate the final structural configuration.
- 20.1.C.7 **Casing installation**
- 20.1.C.7.1 The casing must be installed and welded as per drawing C18-90-165-01. Welding to fill gaps, if any, must comply with IACS No. 47.
- 20.1.C.7.2 A new fairing made of a 1" thick plate must be manufactured, installed and welded as per drawing C18-90-165-01.
- 20.1.C.7.3 Existing cable conduits must be welded to the ceiling of the TX casing as shown on the drawing.
- 20.1.C.7.4 The casing must be installed as per drawing C18-90-165-01. Welding to fill gaps, if any, must comply with IACS No. 47.
- 20.1.C.7.5 The casing will be connected to the bottom plate using a 2" thick insert that will be formed and/or moulded to ensure a smooth transition between the shape of the bottom and the edges of the casing.
- 20.1.C.7.6 A new conduit consisting of pipes with a Schedule 80 nominal diameter of 8" must be routed approximately along the path of the old 5" conduit as shown on drawing C18-90-165-02.

The air outlet valve previously removed see Section 20.1.C.4.9 must be reinstalled at the top of the conduit like the existing one.

- 20.1.C.7.7 The Contractor must adjust and assemble the free immersion conduit in place to connect it to the new RX cable conduit.
- 20.1.C.7.8 The openings for the new 8" conduit for the RX cables to the tank top and deck at 17" from the keel must be watertight welded. See drawing C18-90-165-02. Lap plates may be used to route sleeves.
- 20.1.C.7.9 The processing unit seats must be manufactured and installed as per drawing C18-90-165-03.
- 20.1.C.7.10 Before painting and installing Kongsberg equipment (transducers, cables, Roxtec cable joints), once the TX and RX casings have been welded in place in the ship, a watertightness test must be carried out to ensure the integrity of the tank formed by the double bottom and any other niches or sealed walls affected by the work. Welding of the new conduit and any welding repair work on the double bottom, conduits or casings must be completed before testing.
- 20.1.C.7.11 Watertightness tests must also be carried out along the entire length of each cable conduit and any leaks repaired before the cables are routed inside.

#### 20.1.C.8 **Painting and Finishing**

- 20.1.C.8.1 Refer to section G 5.4, G 5.5 and G 5.6 for more information about surface preparation, coating and painting. Below is a list of all items that require coating or painting after the modification. All structural steel, steel equipment, insulation surfaces and pipe items must be painted after installation.
- 20.1.C.8.2 The list below is not exhaustive, but provides a summary of the items covered by the engineering drawings and specifications requiring painting work:
  - a) Under the hull
    - i) Walls of the TX and RX casings facing the sea.
    - ii) Hull surfaces affected by hot work.
    - iii) Exterior of the fairing plate.
  - b) Double bottom
    - i) New structural items and surfaces affected by hot work.
    - ii) Free immersion pipes of the TX (2) and RX (1) casings
  - c) Forward thruster room
    - i) New RX conduit routed through the compartment.

- ii) Bulkhead and deck plates affected by hot work.
- d) Lower science compartment
  - i) RX conduit.
  - ii) Seats of the PU, RX and TX units.
  - iii) Bulkhead and deck plates affected by hot work.
- 20.1.C.8.3 The anodes, as detailed on drawing C18-90-165-01, are supplied by CCG and installed by the Contractor on site using mounting bolts. The anodes must not be welded.
- 20.1.C.8.4 The mounting screws for the other items installed in the TX and RX casings are supplied by Kongsberg, including the screws for mounting the protective plates. Une (1) couche d'apprêt doit être appliquée, suivie de deux (2) couches de finition.
- 20.1.C.8.5 The "end covers plates" and "side covers plates" of the TX and RX must be supplied by the Contractor and manufactured according to Kongsberg specifications.
- 20.1.C.8.6 The raised floor of the forward thruster room will be reassembled, with paint touch-ups.
- 20.1.C.8.7 Any items, components, equipment or other devices that were removed from the forward thruster room and lower science store during the work will be reinstalled.
- 20.1.C.8.8 The protective guard around the processing units in the lower science store will be replaced and modified as necessary.
- 20.1.C.8.9 The insulation in the lower science compartment walls will be properly reinstalled as original drawing and ABS standards.
- 20.1.C.8.10 All vents, valves, power cables, manholes, access points and hoses must be clearly labeled see Section G 11.
- 20.1.C.9 **Installation of electrical and electronic equipment**
- 20.1.C.9.1 The TX and RX transducer wires must be inserted into their respective conduits to the lower scientific compartment. Handling must be done with great care and the wires must be kept in the conduits.
- 20.1.C.9.2 The upper part of the communication cable ducts coming from the transducers (RX and TX) must be leakproof. The cable gaskets must be supplied by the Contractor and compatible with the existing "Roxtec".
- 20.1.C.9.3 The air outlet valve previously removed and stored must be installed by the Contractor at the top of the new 8 "conduit.

- 20.1.C.9.4 The TX Unit, RX Unit and the PU must be installed on their respective brackets with the new hardware supplied by the shipyard in the lower scientific compartment.
- 20.1.C.9.5 The connection of all equipment must be made by the Contractor under the supervision of Kongsberg FSR.
- 20.1.C.9.6 The Contractor must be responsible for arranging the arrival of the RSF according to its schedule of work. An allowance of \$5000 will be allocated for travel expenses. This amount will be adjusted as required and upon presentation of invoices to the contracting authority. All labour costs for this item must be included in the contractor's financial proposal.

#### **20.1.D Proof of Performance**

##### **20.1.D.1 Inspection Points**

- 20.1.D.1.1 All welding work must be inspected by the IA and the ABS Inspector.
- 20.1.D.1.2 Kongsberg FSR must inspect installation once completed and before start-up of the new Multibeam.

##### **20.1.D.2 Testing/Trials**

- 20.1.D.2.1 A leak test must be carried out to ensure the integrity of the tank formed by the double bottom and any other niches or watertight walls affected by the work. The welding of the new conduit and any welding repair work affecting the double bottom, ducts or caissons must be completed before testing.
- 20.1.D.2.2 Sealing tests must also be performed for the full extent of each cable conduit and any leaks repaired prior to the passage of the cables.
- 20.1.D.2.3 Perform the operational tests as required by the Kongsberg and ABS representative.
- 20.1.D.2.4 The Contractor must allocate a period to record the position of the transducers under the hull and the MRU located in the emergency generator room. This survey will be done by a subcontractor hired by CCG. To make room for the survey, the Contractor must remove any potentially harmful equipment or scaffolding.
- 20.1.D.2.5 Functional testing of the equipment must be conducted at sea in a minimum water depth of 300m.
- 20.1.D.2.6 The Contractor must arrange for the arrival of the Equipment Representative (Kongsberg) to supervise the installation and commissioning of the equipment.

##### **20.1.D.3 Certification**

20.1.D.3.1 Provide an ABS approved inspection and operating certificate.

20.1.D.3.2 A calibration certificate must be issued by Kongsberg following the tests.

20.1.D.4 **Documentation**

20.1.D.4.1 The results of the sea trials must be reported to us, as must the results of the geometric surveys (CIDCO).

20.1.D.5 **Training - [Not Used]**

## **20.2 ACOUSTIC WELL PAINT**

### **20.2.A Identification**

20.2.A.1 The objective of this item is to repaint the interior of the acoustic well.

### **20.2.B References**

#### **20.2.B.1 Equipment Data**

20.2.B.1.1 The acoustic well is at the main deck level (Local #683) (Frame 128).

#### **20.2.B.2 Drawings and Documents**

20.2.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Numéro de dessin	TITRE DU DESSIN	Nombre de feuilles
2000-02-H-004_rev A	Acoustic Well Structure	1
	1200 Icebreaker Coating scheme V5	1

#### **20.2.B.3 Regulations and standards**

20.2.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard

FSSM Procedures	Title	Included Yes/No
Publications		
	[Not Used]	
Standards		
Regulations		



**20.2.C Statement of work****20.2.C.1 Working environment**

- 20.2.C.1.1 The Contractor must take all necessary measures to maintain an appropriate temperature and environmental conditions within the welding and painting zones. A temporary shelter must be installed to meet the required conditions.

**20.2.C.2 Responsibilities**

- 20.2.C.2.1 The Contractor must retain custody and protect all equipment disassembled to allow access to the work from the beginning of the work until possession is given back to CCG.
- 20.2.C.2.2 The Contractor must maintain custody of all equipment to be installed on the ship including the ones provided by CCG from the moment they are delivered on site until the end of the contract.
- 20.2.C.2.3 All damages done on the surfaces of the ship, on equipment, supplies and accessories caused by the Contractor or subcontractors must be repaired or replaced at the cost of the Contractor.

**20.2.C.3 Cleaning**

- 20.2.C.3.1 The Contractor must clean, degrease and drain all surfaces, structures, compartments or equipment from the working areas.
- 20.2.C.3.2 The cleaning must be thorough to ensure no debris, waste or harmful substance accumulation will be tolerated onboard.

**20.2.C.4 Housing Painting**

- 20.2.C.4.1 The interior of the acoustic well must be sandblasted or cleaned with a brush of the same interior diameter as the well (11.374") in order to prepare the surface appropriately for painting.
- 20.2.C.4.2 All paint layers must be applied in accordance with the technical specification of the selected paint manufacturer.
- 20.2.C.4.3 All paint used must be approved by CCG and ABS.

**20.2.D Proof of Performance****20.2.D.1 Inspection Points**

- 20.2.D.1.1 The IA and/or TA and NACE Inspector must complete the following inspections :
- a) Visual Inspection of the acoustic wells

b) Inspection of the surface preparation and after every paint layers;

20.2.D.2 **Testing/Trials - [Not Used]**

20.2.D.3 **Certification - [Not Used]**

20.2.D.4 **Documentation – [Not Used]**

20.2.D.5 **Training - [Not Used]**

## **20.3 ARCTIC BOXES AND TRANSDUCERS FOR ECHOSOUNDERS**

### **20.3.A Identification**

- 20.3.A.1 The Contractor must remove the existing 120kHz transducer and arctic box from the EK60 echosounder.
- 20.3.A.2 The Contractor must install a new arctic box and a new 200kHz transducer for the EK80 echosounder.
- 20.3.A.3 The Contractor must install a new arctic box for the EK80 and install the 120kHz-7C transducer removed from the arctic box of the SADCP.
- 20.3.A.4 The Contractor must paint the arctic boxes prior to installing the transducers. He must also install protective windows (ice windows) and fill the two boxes with hydraulic oil (Type 32).

### **20.3.B References**

#### **20.3.B.1 Equipment Data**

##### 20.3.B.1.1 Equipment to be removed :

- a) 120kHz transducer from EK60 echosounder (Kongsberg)
- b) Arctic box for 120kHz transducer of the EK60

##### 20.3.B.1.2 Equipment to be installed :

- a) New Arctic box for new 120 kHz-7C transducer for the EK60.
- b) New 120 kHz-7C transducer for the EK80 (Kongsberg)
- c) New Arctic box for new 200 kHz transducer for the EK80
- d) New 200 kHz transducer for the EK80 (Kongsberg)

##### 20.3.B.1.3 Material provided by CCG :

- a) Arctic Box 120kHz-7C
- b) 120kHz-7C transducer for EK80 echosounder (removed from SADCP arctic box)
- c) Protection window ("ice window") for 120kHz transducer
- d) Arctic Box 200kHz
- e) New 200kHz transducer for EK80 echosounder
- f) Protection window ("ice window") for 200kHz transducer

**20.3.B.2 Drawings and Documents**

- 20.3.B.2.1 The following Drawings and Manuals are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Numéro de dessin	TITRE DU DESSIN	Nombre de feuilles
C20-59-160-01	Ajout et modification de transducteurs	1
2000-02-H-002	Structure in way of transducers	3
310687	EK80 120-7C Transducer - Arctic Tank Assy	1
871-204675 rev B	Mounting Ring 120kHz Transducer	1
871-204677 rev B	Clamping Ring 120kHz Transducer	1
310640	EK80 200-7C Transducer - Arctic Tank Assy	1
871-204449 rev C	Mounting Ring 200kHz Transducer	1
871-204451 rev A	Clamping Ring 200kHz Transducer	1
	1200 Icebreaker Coating scheme V5	1

**20.3.B.3 Regulations and standards**

- 20.3.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial Regulation or Standard.

FSSM Procedures	Title	Included Yes/No
<b>Publications</b>	Not Used	
<b>Standards</b>		
<b>Regulations</b>		

**20.3.C Statement of work****20.3.C.1 General**

- 20.3.C.1.1 The Contractor must supply all materials and equipment to conduct the work.
- 20.3.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.

- 20.3.C.1.3 The Contractor must take all necessary measures to maintain an appropriate temperature and environmental conditions within the welding and painting zones. A temporary shelter must be installed to meet the required conditions.
- 20.3.C.1.4 The Contractor is responsible of all equipment disassembled from the beginning of the work until possession is given back to CCG.
- 20.3.C.1.5 The Contractor is responsible of all equipment to be installed on the ship including the ones provided by CCG from the moment they are delivered on site until the end of the contract.
- 20.3.C.1.6 All damages done on the surfaces of the ship, on equipment, supplies and accessories caused by the Contractor or subcontractors will have to be repaired or replaced at the cost of the Contractor.
- 20.3.C.2 **Cleaning**
- 20.3.C.2.1 The Contractor must clean, degrease and drain all surfaces, structures, compartments or equipment from the working areas.
- 20.3.C.2.2 The cleaning must be constant et no debris, waste or harmful substance accumulation will be tolerated onboard.
- 20.3.C.3 **Disassembly of the 120 kHz transducer of the EK60 echosounder**
- 20.3.C.3.1 The 120 kHz must be disconnected from its unit (GPT) located in science room (cabin #682), the cable section located inside the room must be removed through a Roxtec transit giving on the adjoining room. (FWD Bilge).
- 20.3.C.3.2 The arctic Box must be drained from its Hydraulic oil (type 32) by loosening up some of the bolts of the Ice Window.
- 20.3.C.3.3 Then remove the protective window (Ice Window) located on Port side at frames 149 and 150.
- 20.3.C.3.4 Free the transducer by removing the bolts retaining it to the arctic box. A technician installed in the dry dock must pull on the cable attached to the transducer as another technician located in cabin #682 is guiding the cable in the wire pass pipe and ensure nothing is preventing it from being extracted.
- 20.3.C.3.5 Retain and return the transducer to the CGC.
- 20.3.C.3.6 The Contractor must replace all the bolts and the transducer Ice Window.
- 20.3.C.4 **Disassembly of the arctic box of the 120 kHz transducer of the EK60 echosounder**

- 20.3.C.4.1 Refer to drawing C20-59-160-01 "Ajout et modification de transducteurs" (section identified "Démantèlement / Stripout) in order to remove the arctic box of the 120kHz transducer.
- 20.3.C.4.2 The pipe used to guide the transducer cable must be cut right above the arctic box and the remaining section of the pipe must stay in place.
- 20.3.C.5 **Installation of the arctic boxes of the 120 kHz and 200 kHz transducers of the EK80 echosounder**
- 20.3.C.5.1 Refer to drawing C20-59-160-01 "Ajout et modification de transducteurs" for installation of the two new arctic boxes and the new pipe to guide the 200 kHz transducer cable.
- 20.3.C.6 **Housing Painting**
- 20.3.C.6.1 All paint layers must be applied in accordance with the technical specification of the selected paint manufacturer.
- 20.3.C.6.2 The Contractor must sandblast the interior of the Arctic Box and then apply 1 layer of primer and 2 layers of coating.
- 20.3.C.6.3 All paint used must be approved by CCG and ABS.
- 20.3.C.7 **Installation des transducteurs 120kHz-7C et 200kHz de l'échosondeur EK80**
- 20.3.C.7.1 The Contractor must use a fisher to guide the transducer cables in their respective cable pipe. A technician in the dry dock must guide the cables up their pipes as another technician located in ship's FWD hold is pulling them up using a fisher.
- 20.3.C.7.2 The Contractor must bolt the new transducers on the arctic boxes using a visible guide in order to get the beam #3 oriented at 0° to the BOW of the vessel.
- 20.3.C.7.3 Cables must be redirected inside the cabin #682 from ship's fore hold compartment (Frame 138 – 150) through the Roxtec transit up to the control units of the transducers (WBT) of the EK80.
- 20.3.C.7.4 Place back the Ice Windows, the tightening torque on the bolts must be of : 2Nm with locktite (1.475 lb-pd). Once installed, fill both arctic box with hydraulic Oil (type 32) using the load line located above the double bottom (identified by a blue circle in **Annex 1**)
- 20.3.C.7.5 Tightening torque of the protective window bolts covering the 120kHz and 200kHz transducers of the EK80: 20Nm (14 lb-ft) with locktite type 270.

## **20.3.D Proof of Performance**

### **20.3.D.1 Inspection Points**

20.3.D.1.1 The IA and/or TA and NACE Inspector must complete the following inspections :

- a) Visual Inspection of the arctic box
- b) Inspection of the surface preparation and every paint layers applied
- c) Assist to the installation and connections of the new transducers
- d) Final inspection once installation is completed
- e) Assist to the calibration of the system.

20.3.D.2 **Testing/Trials**

20.3.D.2.1 See trials must be completed at the same time as the Multibeam will be tested.

20.3.D.3 **Certification - [not used]**

20.3.D.4 **Documentation – [not used]**

20.3.D.5 **Training - [not used]**

**Annex 1 (Load line for hydraulic Oil):**



## **20.4 REPLACEMENT OF SADCP HULL CURRENT METER**

### **20.4.A Identification**

- 20.4.A.1 The Contractor must remove the EK80 120kHz transducer from the SADCPCurrentmeter Arctic Box.
- 20.4.A.2 The Contractor must install a new hull currentmeter (SADCP) in the free space.

### **20.4.B References**

#### **20.4.B.1 Equipment Data**

- 20.4.B.1.1 Transducer 120kHz of the EK80 echosounder manufactured by Kongsberg
- 20.4.B.1.2 SADCPC hull current meter manufactured by RD Instruments.
- 20.4.B.1.3 Material provided by CCG
- a) Hull Currentmeter
- 20.4.B.1.4 Protection Windows ("ice window") for the hull currentmeter

#### **20.4.B.2 Drawings and Documents**

- 20.4.B.2.1 All Drawings are listed in the General Notes. The following Drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes.

Drawing Number	Drawing / Document Title	Number of Sheets
834-204579	120kHz Outline Dimensions Transducer	1
SADCP 2017-1	SADCP Arctic Tank Assy	1
SADCP 2017-2	SADCP Ice Window Ring	1
SADCP 2017-3	SADCP Half Ring Adapter	1
SADCP 2017-4	SADCP Ice Window	1
	1200 Icebreaker Coating scheme V5	1

#### **20.4.B.3 Regulations and Standards**

- 20.4.B.3.1 The following Standards and Regulations apply to work carried out in this section; The Contractor must ensure all work completed in this section meets these Standards and Regulations as well as any other pertinent Federal/Territorial government Regulation or Standard:

	Title	Included Yes/No
<b>FSM Procedures</b>		



<b>Publications</b>	[Not Used]	
<b>Standards</b>		
<b>Regulations</b>		

#### **20.4.C Statement of Work**

##### **20.4.C.1 General**

- 20.4.C.1.1 The Contractor must supply all materials and equipment to conduct the work.
- 20.4.C.1.2 The CCG will provide the services of a NACE inspector to oversee the paint applications and to advise on the acceptability of the finished product.

##### **20.4.C.2 Work environment**

- 20.4.C.2.1 The Contractor must take all necessary measures to maintain an appropriate temperature and environmental conditions within the welding and painting zones. A temporary shelter must be installed to meet the required conditions.

##### **20.4.C.3 Responsibility**

- 20.4.C.3.1 The Contractor must be responsible for all equipment dismantled from the beginning of the work to the handover to the owner.
- 20.4.C.3.2 The Contractor must be responsible for the equipment supplied by the CCG as soon as it is delivered to the work site as well as all other equipment and materials to be incorporated into the vessel until the end of the work.
- 20.4.C.3.3 Any damage to the vessel's surfaces, equipment, supplies and accessories caused by the Contractor or one of its subcontractors during the work must be repaired at the expense of the Contractor.
- 20.4.C.3.4 The Contractor must also be liable for any damage or inconvenience detrimental to the operation of the vessel whose cause lies with him.

##### **20.4.C.4 Cleaning**

- 20.4.C.4.1 The Contractor must clean, degrease and drain all surfaces, structures, compartments or equipment on the work area.

- 20.4.C.4.2 The cleaning must be constant and no accumulation of waste or substance harmful or affecting the safety of the workplace will be tolerated on board.
- 20.4.C.5 **Disassembly of the 120 kHz transducer of the EK80 echosounder**
- 20.4.C.5.1 First of all, the 120 kHz must be disconnected from its unit (GPT) located in science room (cabin #682).
- 20.4.C.5.2 Then remove the protective window (Ice Window) located on Starboard side at frames 149 and 150.
- 20.4.C.5.3 Free the transducer by removing the bolts retaining it to the arctic box. A technician installed in the dry dock must pull on the cable attached to the transducer as another technician located in cabin #682 is guiding the cable in the wire pass pipe and ensure nothing is preventing it from being extracted. The Contractor must then give back to CCG the adaptor connecting the transducer to the arctic box.
- 20.4.C.5.4 The Contractor must pay attention to not put any damage on the transducer as this will be used for replacement later in the actual contract.
- 20.4.C.5.5 The Contractor must replace all the bolts by new ones. All treads must be cleaned or rebuilt if damaged.
- 20.4.C.6 **Housing Painting**
- 20.4.C.6.1 All paint layers must be applied in accordance with the technical specification of the manufacturer.
- 20.4.C.6.2 The Contractor must sandblast the interior of the Arctic Box and then apply 1 layer of primer and 2 layers of coating.
- 20.4.C.6.3 All paint used must be approved by CCG and ABS.
- 20.4.C.7 **Installation of the Hull Currentmeter (SADCP)**
- 20.4.C.7.1 The Contractor must use a fisher to guide the cable in the currentmeter cable pipe. A technician in the dry dock must guide the cable up the pipe as another technician located in Cabin #682 is pulling it up using a fisher.
- 20.4.C.7.2 Bolt back the new SADCP transducer on the arctic box using a visible guide in order to get the beam #3 oriented at 45° to the BOW of the vessel. (See **Annex 1**).
- 20.4.C.7.3 When placing back the Ice Window, the tightening torque on the bolts must be of : 2Nm with locktite (1.475 lb-pd).

**20.4.D Proof of Performance****20.4.D.1 Inspection Points**

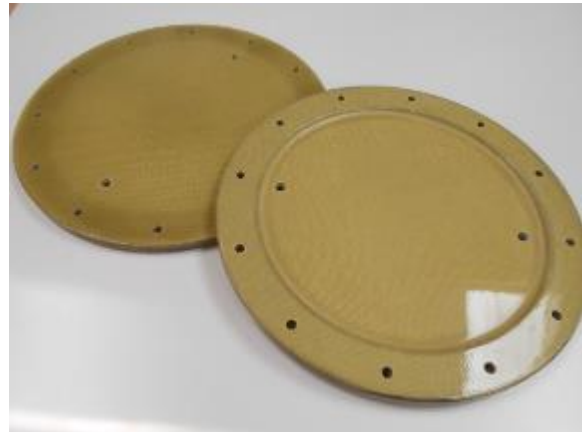
20.4.D.1.1 The TA and / or IA must perform the following inspections:

- a) Visual inspection of the housing following complete disassembly of the transducer;
- b) Inspection of preparation and painting by a NACE inspector;
- c) Attend the installation and connection of the new currentmeter SADCP;
- d) Visual inspection following the installation of the new transducer;
- e) Attend system calibration.

**20.4.D.2 Testing/Trials**

20.4.D.2.1 Calibration tests must be carried out during sea trials.

**20.4.D.3 Certification - [Not Used]****20.4.D.4 Documentation - [Not Used]****20.4.D.5 Formation - [Not Used]**

**Annexe 1:****Unité de contrôle****SADCP protection windows**