CCGS TRAVERSE
2022 REPOWER
F2599-200011

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G 1.0 GENERAL NOTES

G 1.1 Vessel Particulars

G 1.1.1 Details

Name:	CCGS Traverse
Type:	Specialty Vessel- Catamaran
Class:	Sheltered Waters Voyage
Year Built:	1998
Principle Dimensions:	
Length:	20.17 meters
Breadth, molded:	7.6 meters
Loaded Draft:	0.636 meters
Tonnage, displ:	34.27 tonnes
j	
Propulsion	2 X Volvo TAMD41H-A 146HP

G 1.2 References

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

Publications	Title
CCG 5737	Fleet Safety Manual
TP 127	Ships Electrical Standards, 05/2018
NFPA 306 2014	Standard for the Control of Gas Hazards on Vessels
TP 3669	Standards for Navigating Appliances and Equipment
TP 11469	Guide to Structural Fire Protection
TP 14231	Marine Occupational Health and Safety Program

TP 14612	Procedures for Approval of Life-saving Appliances and Fire Safety Systems, Equipment and Products
TP 7301	Stability Subdivision and Load Line Standards (1975)
IEEE 45-2002	Institute of Electrical and Electronics Engineers, Recommended Practice for Electrical Installations on Shipboard
70-000-000-EU-JA-001	Specification for the Installation of Shipboard Electronic Equipment
IEC 60533	Electrical and Electronic installations in ships – Electromagnetic Compatibility
EPS Report 1/RA/2	Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems - Environment Canada
NFPA 10	Standard for portable fire extinguishers
18-080-000-SG-003 (formerly DFO/5884 - TP 12445E)	Paints And Coatings Standard

Standards	Title
CCG	CCG CAD using AutoCAD http://intra.coast-guard.ca/folios/00922/docs/ccgstden.zip
CCG	Canadian Coast Guard Specification for Electronic Technical Data Deliverables CA-014-000-NU-TD-001
CCG	Colour Coding Standard for Piping Systems 30-000-000-ES-TE-001
CCG	Trim and Stability Book Production for CCG Vessels
CSA W47.1	Certification of Companies for Fusion Welding of Steel Structures Division 2 Certification
CSA W47.2	Certification of Companies for Fusion Welding of Aluminum
CSA W59	Welded Steel Construction – Metal Arc Welding
CSA W59.2	Welded Aluminum Construction

CSA W178.2	Certification of Welding Inspectors
ISO 9712:2005	International Standards for NDT
CT-043-EQ-EG-001-E	Welding Specification, August 2017 http://intra.coast-guard.ca/folios/00922/docs/WeldingSpecification-eng.pdf
SSPC	The Society for Protective Coatings
ISO 8501-1:2007	Preparation of steel substrates before application of paints and related products
ISO 10816-1:1995	Mechanical vibration -- Evaluation of machine vibration by measurements on non-rotating parts -- Part 1: General guidelines
ASME Y14.100	American Society of Mechanical Engineers Y14.100 - 2017 Engineering Drawing Practices - Nov. 14, 2017

Regulations	Title
MOHS	Maritime Occupational Health and Safety
CSA	Canada Shipping Act, 2001
Machinery Regs.	Marine Machinery Regulations (SOR/90-264)
Vessel Fire Safety Regs.	Vessel Fire Safety Regulations (SOR/2017-14)
Hull Regs.	Hull Inspection Regulations (C.R.C., C. 1432)
Canada Labour Code	Canada Labour Code (R.S.C., 1985, c. L-2)
Federal Halocarbon Regulations	Federal Halocarbon Regulations, 2003 (SOR/2003-289).

G 1.3 Abbreviations

ABS	American Bureau of Shipping
CA	Contract Authority (PSPC)
CCG	Canadian Coast Guard
CLC	Canada Labour Code
CSM	Contractor Supplied Material
CSA	Canadian Standards Association

CWB	Canadian Welding Bureau
DFO	Department of Fisheries and Oceans
FSM	Fleet Safety Manual (CCG)
FSR	Field Service Representative
GSM	Government Supplied Materials
HC	Health Canada
IEEE	Institute of Electrical and Electronic Engineers
LOA	Length Over All
MOHS	Maritime Occupational Health and Safety
MMR	Marine Machinery Regulations
NDT	Non Destructive Testing
OEM	Original Equipment Manufacturer
OHS	Occupational Health and Safety
PSPC	Public Services and Procurement Canada
RO	Registered Organization as defined by Canada Shipping Act
SDS	Safety Data Sheet
SSMS	Safety & Security Management System
TBS	Treasury Board of Canada Secretariat
TCMS	Transport Canada Marine Safety
TA	Technical Authority – Owner's Representative (CCG)
WHMIS	Workplace Hazardous Material Information System

G 1.4 Conditions and Definitions

G 1.4.1 The following conditions and definitions are applicable to all work contained in the Specifications and are intended to outline the quality of workmanship and practice that is the minimum acceptable level:

a) The word "install" means that the Contractor must connect mechanically and electrically and provide the labour and material to complete the installation;

b) The word "reinstall" means a piece of equipment that the Contractor has affected repairs on and is to be returned/installed in its original location and be mechanically and electrically connected. The Contractor must provide the labour and material to complete the reinstallation;

c) The word "remove" means that the Contractor must provide all labour and material to remove the unit, equipment, material, or system in its entirety. Part of the removal process is to blank openings, restore insulation and paint;

d) the word "relocate" means that the Contractor must provide all labour and material to remove the unit, piece of equipment, or system and to install the same unit, piece of equipment, or system in the new location;

e) The term "or equivalent" means a substitute which has equal characteristics i.e. (size, material type, life, weight, input, and output) as approved by the TA. A comparison of the general specifications must be provided to the TA for the equipment specified and the "or equivalent" (i.e. old compared to the new);

f) the term "overhaul" as applied to any mechanical equipment, structure or system comprises: disassembly into component parts; cleaning examination of parts for defects; gauging of parts for wear; reporting of parts worn beyond specification limits or otherwise defective and reassembly followed by specification adjustments; tests; and functional trials;

g) the word "disconnect" means the Contractor must mechanically and electrically disconnect the piece of equipment of all piping, wiring, seatings and other attachments permitting the removal of the unit as a whole;

h) the word "disassemble" means that the Contractor must provide all labour to take apart, piece by piece, the equipment, machinery or system to be examined or repaired;

i) the word "reassemble" means that the Contractor must provide all labour and material to put together, piece by piece, the equipment, machinery or system on completion of examination or repair;

j) the words "Additional Work Procedures" means the procedures as defined in solicitation and contract and includes any additional work required on a system, sub-system or equipment which the original specification did not specify;

k) the word "calibrate" means the adjustment of readings and measurements to a known standard;

l) The word "check" means that the Contractor must provide labour to find faults by sighting, feeling or listening. The checking of any equipment does not involve the disturbance or removal of parts, components or sub-assemblies;

m) the word "examine" means that the Contractor must provide labour for the process of systematically examining, checking and testing equipment,

records or administrative procedures to detect actual or potential defects or errors;

n) the word "test" means that the Contractor must provide labour to conduct the operation of a unit in relation to a stated standard or procedure;

o) The words "set-to-work" means the tuning, alignment and adjustment of equipment/systems required subsequent to satisfactory installation. Inspection to make the equipment/systems ready for technical acceptance trials;

p) the word "trials" is an element of QA that means an action(s) by which the Contractor proves by a visual or instrumental presentation that the equipment or system satisfies the requirements of the specified trials agenda; and

q) the term "functional test" means operation of a piece of equipment in all its normal operating modes and throughout its operating range to establish that it will perform its designed function within normal operating parameters as indicated in the manufacturer's documentation.

G 1.5 Occupational Health and Safety

G 1.5.1 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 1.5.2 Where “Safety Management System” is referenced in this document, it is referring to the Contractor’s Safety Management System, which must be in effect while in the Contractor’s Care and Custody and must be in accordance with the applicable OHS regulations and procedures.

G 1.5.3 The Contractor must, for all work on Canadian Coast Guard Vessels, meet or exceed the Safety Management System defined in the FSSM unless a Contractor proposed comprehensive Safety Management System is presented and accepted by the TA.

G 1.5.4 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.

G 1.5.5 The 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 and Security Manual.

G 1.5.6 The Contractor must comply with the Fleet Safety and Security 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:

G 1.5.7 Work at heights;

G 1.5.8 Entry into enclosed spaces;

G 1.5.9 Degassing before entering into confined spaces and for hot work;

G 1.5.10 Lockout and Tagout;

G 1.5.11 Pre-work safety assessments.

G 1.5.12 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.

G 1.5.13 The Contractor must adhere to local facilities shore based safety instructions and safety procedures.

G 1.5.14 The Contractor must identify a specified person that is responsible for the safety management of the work site. The Safety Manager must ensure that daily safety rounds are carried out and that safety issues are identified and safety precautions are maintained.

G 1.5.15 Areas that pose a hazard as a result of the specification work are to be secured and clearly identified by the Contractor with signage to advise and protect all personnel from the hazard in accordance with applicable regulations.

G 1.6 Lead Paint and Paint Coatings

G 1.6.1 The Contractor must not use lead based paints.

G 1.6.2 CCG ships have been painted with lead based paints in the past and as a result some of the Contractor's processes such as grinding, welding and burning may release this lead from the coatings. The Contractor must ensure that coatings in the affected work areas are tested for lead content and that the work is performed in accordance with applicable Federal and Provincial regulations The Canadian Coast Guard will provide copies of all past lead testing results if testing was previously done.

G 1.7 Touch-up / Disturbed Paint

G 1.7.1 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 1.8 Asbestos Containing Materials (ACM)

G 1.8.1 The Contractor must use insulation that contains 0% ACM.

G 1.8.2 The Contractor must provide an "Observation Report (OR)" with reference to any concerns or intentions in regards to asbestos containing materials not already specified. The Contractor is to identify any materials that are suspected to contain asbestos prior to any work being completed. Any approved work resulting from the OR will follow the Additional Work Procedures.

G 1.9 Confined Spaces

G 1.9.1 Entry into any confined space onboard the vessel during the contract period must be conducted in accordance with the safety management system as determined in the Pre-Work Meeting. In addition to those requirements, the Contractor must also conduct the following:

a) Have a qualified person issue 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) Provide copies of all certificates generated to the TA in accordance with the Documentation section of the General Notes.

G 1.10 Hot Work

G 1.10.1 All hot work conducted during the contract 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 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) Provide a copy of the site generated hot work permits to the TA in accordance with the Documentation section of the General Notes; Named in accordance with the specification item generating the required work.

G 1.11 <u>Work Aloft</u>

G 1.11.1 Any work aloft onboard the vessel during the maintenance/refit 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 1.12 <u>Electrical Equipment</u>

G 1.12.1 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.

d) Ensure the lock-outs and electrical caution tags remain in place until completion of all work.

G 1.12.2 The TA must be notified of all such ongoing work.

G 1.12.3 All electrical installations and repairs must be done in accordance with the latest revisions of TP127 - Electrical Standards of Transport Canada Marine Safety and of standard 45- Recommended Practice for electrical installation on ships – of the IEEE. Standard TP127 takes precedence over the IEEE standard.

G 1.13 Workplace Hazardous Materials Information System (WHMIS)

G 1.13.1 The Contractor must provide the TA with Safety Data Sheets (SDS) for all Contractor and sub-contractor supplied WHMIS controlled products. SDS sheets are to be the formats requested in the Documentation section of the General Notes.

G 1.13.2 All SDS sheets must be maintained in accordance with OHS procedures.

G 1.13.3 The TA will provide the Contractor with access to SDS sheets for all controlled products on the ship for all specified work items on request.

G 1.14 Smoking in the Work Space

G 1.14.1 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 1.15 Contractor Supplied Materials (CSM) and Tools

G 1.15.1 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 1.15.2 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 1.15.3 The Contractor must provide all equipment, devices, tools and machinery such as cranage, staging, scaffolding, hoarding, and rigging necessary for the completion of the work in this specification unless otherwise stated.

G 1.15.4 The Contractor must deliver and store all new CSM equipment at their facility. The CSM must be stored in a secure, environmentally controlled space in accordance with the equipment storage section of this specification.

G 1.15.5 All tools must be Contractor supplied unless otherwise stated in the technical specifications.

G 1.16 Government Supplied Materials (GSM) & Tools

G 1.16.1 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 1.16.2 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 1.17 <u>Storage and Protection of Equipment</u>

G 1.17.1 Equipment (i.e. covers, cowling and other items that may need to be removed and stored) must be stored in accordance with the equipment manufacturer's or equipment vendor's specific storage instructions. The Contractor must make these instructions available to the TA.

G 1.17.2 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 1.17.3 The Contractor must take precautions to ensure that surfaces and components of equipment installed on the vessel are protected against damage, soiling, and contamination as a result of contracted work.

G 1.17.4 All electrical and electronic equipment and components must be protected during the contract against physical damage, internal damage, and by the effects of adverse temperatures or other environmental conditions.

G 1.17.5 The Contractor must protect equipment that could be damaged as a result of movement of materials and equipment nearby. The Contractor must also protect equipment from nearby sources of contamination including but not limited to burning, welding, media (sand) blasting, grinding and painting.

G 1.17.6 Any damage to surfaces, equipment, furnishings or decor incurred prior to acceptance must be returned to As-Delivered condition by the Contractor.

G 1.17.7 All openings in machinery and/or systems must be kept covered by fitted solid inserts or covers prior to connections being made.

G 1.17.8 The Contractor must obtain and follow instructions from its sub-Contractors for any special protection required for their equipment during the project work. Such instructions must be made available to the TA.

G 1.17.9 The Contractor must protect the vessel from the possibility of vermin infestation (insect/mammal/bird). If an infestation does occur during the contract period, the Contractor must bear all costs to ensure the vessel is made vermin free before the vessel's departure and contract completion.

G 1.17.10 Physical protection including but not limited to plastic sheets, fireproof covers, heavy weight material covers, wood plugs, wood encasements and heaters must be used as required.

G 1.18 Regulatory Inspections and/or Class Surveys

G 1.18.1 This vessel is maintained to the rules and regulations contained in the Canada Shipping Act 2001.

G 1.18.2 ABS is our inspection agency, and will be inspecting to regulations as per Canada Shipping Act 2001.

G 1.18.3 The Contractor must contact, coordinate and schedule all regulatory inspections and/or class surveys with ABS as required by the specification.

G 1.18.4 Any documentation generated by the above inspections and/or surveys to show that the inspections and/or surveys were conducted (i.e. original signed and dated certificates) must be provided to the TA.

G 1.18.5 The Contractor must not substitute inspection by the TA for the required regulatory inspections or class surveys.

G 1.18.6 The Contractor must provide timely advance notification (minimum of 24 hours) of scheduled regulatory inspections and/or class surveys to the TA so they may witness the inspection.

G 1.18.7 All ABS fees will be paid by CCG.

G 1.19 Contractor Inspections

G 1.19.1 The Contractor must afford the opportunity for the TA to conduct an inspection with the contractor on the condition and location of items to be removed prior to either carrying out the specified work or gaining access to a location to carry out the work.

G 1.20 Recording of Work in Progress

G 1.20.1 The TA may record any work in progress using various means including, but not limited to, photography and video, digital or film.

G 1.21 Access for Maintenance, Installation, and Removal (NOT USED)

G 1.22 Assembly of Components

G 1.22.1 The Contractor must ensure that during installation of specified equipment, that parts and assembled equipment are cleaned of smudges, spatter or excess solder, weld metal and metal chips or any other foreign material which might detract from the

intended operation, function, or appearance of the equipment. (This would include any particles that could loosen or become dislodged during the normal expected life of the equipment). All corrosive material must be removed. This cleaning must take place before the parts are assembled into the equipment.

G 1.22.2 Covers, cowlings and components damaged by the Contractor must be replaced with a new CFM cover, cowling, or component.

G 1.22.3 Where torque specifications are not provided by the manufacturer, the applicable SAE, ANSI, or BS1083 nut and bolt standard torque must be used.

G 1.23 Welding

G 1.23.1 All welding and weld inspections must be in accordance with the CCG Welding Specification CT-043-eq-eg-001. This document will be provided to the Contractor within 48 hours of written request to the TA.

G 1.23.2 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-eg-eq-001. 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-eg-eq-001.

b) For structural aluminum greater than 3 mm in thickness, welding must meet the requirements of CSA Standards W47.2 and W59.2, except as modified by the CCG Welding Specification CT-043-eg-eq-001.

c) For structural stainless steels greater than 3mm in thickness, welding must meet the requirements of CSA Standard W47.1 and AWS D1.6, and of the CCG Welding Specification CT-043-eg-eq-001

G 1.24 Documentation

G 1.24.1 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 1.24.2 All photographs obtained by the contractor as requested in the specification must be provided in .JPG formatted files at a resolution of at least 640 x 480 and named according to the “File Naming” section of this specification.

G 1.25 Measurements, Calibrations, and Readings.

G 1.25.1 All measurements, calibrations and readings recorded, must be signed by the person taking the measurements, dated and scanned into electronic format and be available in electronic PDF format.

G 1.25.2 Unless otherwise specified the Contractor must record dimensions to a precision of three significant digits in the metric system.

G 1.25.3 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 1.26 Test/Inspection Records and Certificates

G 1.26.1 Test and/or Inspection Records and Certificates are identified as a deliverable in the individual specification item requesting them.

G 1.26.2 Not Used

G 1.26.3 The Contractor is responsible for maintaining a complete and accurate record of all tests and trials conducted on the vessel and on each piece of equipment. Prior to the commencement of a trial, all relevant documentation and associated test sheets, including shop test data, must be complete and attached to the trials agenda.

G 1.26.4 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.

G 1.27 Drawings

G 1.27.1 The Contractor must have on staff or through a sub-contractor a person qualified and experienced in the use of AutoCAD who will create or modify drawings that result from the work. All the drawings must be provided in AutoCAD 2010 DWG format or newer.

G 1.27.2 The Contractor must comply with the Canadian Coast Guard National CAD Standards titled "Computer Aided Design (CAD) using AUTOCAD" provided.

G 1.27.3 Final As-Fitted prints/plots must not contain markings or corrections by hand (i.e. marker, pen, pencil, etc.). Drawings containing mark-ups must be revised and re-printed/plotted.

G 1.27.4 The Contractor must prepare all the working drawings necessary for the project requirements and modernization work.

G 1.27.5 The Contractor must furnish all drawings required by sub-Contractors, trades and other consultants.

G 1.27.6 Schematic drawings of systems must include all pertinent system information, including sizes, dimensions, labeling, equipment locations, and all information relating to system fittings.

G 1.27.7 The Contractor must have in place a complete system of documenting and controlling all drawing revisions affected by the work of this project. Drawing numbering system and titles must match the original drawings for clarity and include a revision number with date.

G 1.27.8 The Contractor must use ASME Y14.100 for guidance for drawing deliverables.

G 1.28 Guidance Drawings

G 1.28.1.1 All technical guidance drawings are issued to the Contractor for guidance purposes only. It is the responsibility of the Contractor to develop working drawings and to ensure that all such drawings receive American Bureau of Shipping approval. The Contractor is to note that not all technical guidance drawings supplied are As-Fitted drawings. It is the responsibility of the Contractor to physically verify all affected items.

G 1.28.1.2 All departures from the provided guidance drawings and project specifications must be clearly indicated by the Contractor and written approval obtained from the TA before carrying out such alterations or departures.

G 1.28.1.3 Specification deviations must be documented using an Observation Report.

10.0 SAFETY AND SECURITY (NOT USED)

11.0 HULL AND RELATED STRUCTURES (NOT USED)

12.0 PROPULSION / MANOEUVRING SYSTEMS

12.1 Purchase of New Engines And Gearboxes

12.1.A Identification

12.1.A.1 The CCGS Traverse requires the replacement of its two main engines, gearboxes and ancillary equipment as defined by this specification.

12.1.A.2 The vessel will be located at the CCGS Kenora Base located in Kenora, On. Work is to be completed on the vessel while dry docked on the marine railway at the CCGS Kenora Base.

12.1.B References

12.1.B.1 Existing Equipment:

Propulsion: 2 x Volvo Penta TAMD41H-A (rated:104kW/141hp @Top 2600RPM)
Port Serial# 2204156237 Starboard S# 2204156142

Gearboxes: 2 x Velvet Drive AS11-72C (Ratio 1:1)
Port Serial# 31572 Starboard Serial# 19068

Drive Shaft Torsional Coupling: 2 x Cardan Shaft.

Stern drives: 2 x Conrad 520 (Input 180- 440HP)
Port Serial# 3172 Starboard Serial# 10215

12.1.B.2 Guidance Drawings

The following drawings are to be considered as Guidance Drawings as defined in the Drawings section of the General Notes section G1.28. and must not be used for engineering development. The contractor is responsible for taking all required dimensions and measurement on-site.

Drawing Number	DRAWING TITLE	Number of Sheets
50214/9-01	TRAVERSE MANUAL OF TRIM & STABILITY	30
EL-1	ELECTIRCAL SCHEMATIC	1
GA-1	GENERAL ARRANGEMENT	1
CMT22-003-MI	SAFETY CONTROL PLAN	1
MECH-1	MECHANICAL ARRANGEMENT	1
STR-1	LONGITUDINAL STRUCTURAL ARRANGEMENT	1
STRUCTURE	STRUCTURAL ARRANGEMENT 1-1	1

STR-2	STRUCTURAL ARRANGEMENT 2-2	1
001X	TYPICAL SECTION AT EXTERIOR WALL	1
J18063-M01	ENGINE COMPARTMENTS MACHINERY ARRANGEMENT	1
J18063-A01	ENGINE COMPARTMENT, ACCESS HATCH AND VENTILATION	1
J18063-A02	ENGINE COMPARTMENTS HULL PENETRATIONS	1
J18063-A03	TRANSOM DIMENSIONS	1
J18063-S01	ENGINE GIRDER AND STERN DRIVE CONNECTION ARRANGEMENT	1

12.1.C Statement of Work

12.1.C.1 Engines

12.1.C.1.1 The Contractor must supply two new main engines that consists of the following;

- The engines must be a certified marine type, approved by TCMS.
- Engines must be diesel compression ignition powered, inboard, and have a propeller shaft power rating between 241hp to 291hp, at a maximum rated speed of 2600 RPM.
- Engine dry weight without reverse gear cannot exceed 1375lbs.
- Engines must meet the IMO Tier II Emission standard.
- Engines must be compatible with Type B CAN/CGSB-3.517 marine diesel fuel.
- Engines must have heavy duty rating.
- Engine room temperature, when engines are at full power, should not exceed 50 degree C when raw water supply is 25 degree C and outside temperature is 35 degree C. If increased air supply is required in order to meet these parameters, the contractor should provide in their drawings increased air supply.
- Engines must be equipped with all required pre-alarms, alarms and shutdowns, as per Marine Machinery Regulations.
- Engines must be capable of working with raw water supplied between 0 and 25 degree C and air temp between -5 and +35 degree C.

12.1.C.2 Engine Lubrication System

12.1.C.2.1 The Contractor must supply an engine lubrication system that includes the following;

- Engines must include a lube oil cooler assembly with thermostatically controlled bypass arrangement to maintain oil temperature within manufacturers specified range with engine operating at full power with raw water at 25 C and air temperature at 35 C. The lubricating oil system must be self-contained with filters, pump, cooler, piping, all included and be of wet sump type.
- Engines must include oil dip-stick.
- Engines must include oil fill arrangements, allowing oil to be added without removal of any equipment or structure.
- Engines must include a sampling port to collect a representative oil sample for wear particle analysis in a location upstream of the filter while the engine is running under normal operating conditions.
- Engines must be equipped with waste oil pump quick connect, permanently mounted on the oil pan for oil changes.

12.1.C.3 Engine Cooling System

12.1.C.3.1 The Contractor must supply an engine cooling system that includes the following;

- Engines are to be thermostatically regulated water cooled, connected to existing raw water supply, sent through the engines jacket water heat exchanger, then out through the wet exhaust.

12.1.C.4 Engine Fuel System

12.1.C.4.1 The Contractor must supply an engine fuel system that includes the following;

- Engines must connect to and be useable with existing fuel piping system.
- Engines must be direct fuel injection.
- Engines must have a control unit for processing injection of fuel.
- Engines must be equipped with duplex manifold primary filter minimum with water separator. If required, fuel oil heater to be provided for heating fuel for low temperatures to maintain proper injection viscosity, cost to be adjusted via 1379.

12.1.C.5 Engine Electrical System

12.1.C.5.1 The Contractor must supply an engine electrical system that includes the following;

- Engines must include OEM approved thermostatic controlled block heaters suitable for starting engine at -10 Deg. C.
- Engines must be electric start.
- Engines must be provided with OEM approved battery boxes and OEM approved starting batteries**.** The engine starting battery must be capable of starting the engine 14 times repeatedly.
- Engines must be fitted with a suitable alternator to charge manufacturer recommended start batteries.

12.1.C.6 Engine Wet Exhaust System

12.1.C.6.1 The Contractor must supply and fit the engines with a wet exhaust system. System must connect to existing water source. Sizing and backpressure to be confirmed by the engine manufacturer.

12.1.C.7 Engine Mounts

12.1.C.7.1 The Contractor must supply and fit the engines & gearboxes with flexible engine mounts. Engine mounts must be suitable for marine use and OEM approved**.**

12.1.C.8 Gearboxes

12.1.C.8.1 The Contractor must supply two new reversing gearboxes and two new shaft torsional couplings and consist of the following;

- Gearboxes must be marine type, approved for use by TCMS. Approval certificates to be provided to TA.
- Gearboxes must be rear mounted, drop center, close coupled and reversing with electronic (forward-neutral-reverse) shifting capability.
- Gearboxes must be fitted with the same rotation as existing gear boxes.
- Gearboxes must have heavy duty rating.
- The shaft torsional coupling must be connected to the existing Konrad stern drive and the gearbox. Coupling must be rated for gearbox output shaft torque.

12.1.C.9 Engine Foundation Modifications

12.1.C.9.1 Contractor must provide ABS approved installation drawings for the structural modifications to the engine foundations to facilitate the installation of the new main engines and gearboxes.

12.1.C.9.2 The Contractor must use the existing shaft line.

12.1.C.9.3 Contractor must provide a new ABS approved shafting arrangement drawing with existing stern shaft and propeller.

12.1.C.9.4 Any modifications to the engine (and gearbox) foundations must be reviewed and approved by ABS prior to the start of installation.

12.1.C.10 Instrumentation & Alarm System

12.1.C.10.1 Contractor must provide an alarm and monitoring system with indication lights, audible alarm on activation, and engine emergency shutdowns, suitable for a periodically unattended machinery space as per Marine Machinery Regulations, Schedule VIII.

12.1.C.10.2 Contractor must provide monitoring displays in wheel house, accommodation container, and in the port and starboard engine compartments using J1939 data link to engine, for:

- engine speed,
- temperature,
- oil pressure
- oil temperature
- fuel rate,
- gearboxes pressure
- gearbox temperature,
- engine hours and
- battery voltage of start batteries, primary and secondary DC display power sources.

12.1.C.10.3 Contractor must ensure all instrumentation and alarm connections are completed via CSM OEM electrical harnesses and connectors.

12.1.C.11 Propulsion Control System

12.1.C.11.1 Contractor must provide a Propulsion Control System (PCS) which includes:

- A dual lever control head to operate both engines (RPM) and gearbox (forward-neutral-reverse) for the wheelhouse;
- A dedicated start/stop pushbutton control and an emergency-stop pushbutton on the panel in each of the two engine compartments;
- a dedicated emergency-stop pushbutton (with enunciator) for the console in the Wheelhouse.

12.1.C.12 Connections to Existing Systems

12.1.C.12.1 The drawings listed in section 12.1.B.2 are for reference only and are not to be used to create the new set of ABS approved installation drawings for newly supplied machinery.

12.1.C.12.2 The Contractor must provide ABS approved installation drawings with proposed machinery, showing how the new engines and gearboxes connect to existing piping prior to any work on the vessel commencing.

12.1.C.12.3 The Contractor must provide new AS-FITTED drawings for the following systems.

- Electrical systems;
- Cooling systems;
- Fuel oil systems;
- Exhaust systems;
- Ventilation system;
- Engine Foundations.
- Shafting arrangement

12.1.C.13 Engine Room Indicators

12.1.C.13.1 The Contractor must provide all panels, gauges, and alarms for each engine to be installed mounted either to the engine or near the engine in the compartment in accordance to TP 127E.

12.1.C.13.2 The engine gauges must include:

- Engines Tachometers;
- Lube oil pressure;
- Jacket water temperature;
- Lube oil temperature.
- Hour meter

12.1.C.14 Wheelhouse Controls & Indicators

12.1.C.14.1 The Contractor must provide a digital dual engine display unit to be fitted in wheelhouse console. Display screen to be a minimum of 7", and must include the following display parameters;

- Engines Tachometers;
- Lube oil pressure;
- Jacket water temperature;
- Lube oil temperature;
- Exhaust temperature;
- Starting battery voltage;

12.1.C.14.2 The Contractor must provide, in each location listed, two digital shaft tachometers with ahead/astern indication.

- Wheelhouse console,
- Port engine compartment panel,
- Starboard engine compartment panel,

12.1.C.14.3 Contractor must provide one (1) dual stick control head as well as all alarms and enunciators required by the MMR and regulations contained in section G1.18 on the wheelhouse console.

12.1.C.14.4 Contractor must ensure all monitors and indicators in the wheelhouse are fitted with rheostat controlled lightning dimmable to OFF.

12.1.C.14.5 Contractor must provide new console top drop in panel for the wheelhouse controls and indicators. The panel must be in a similar material and color as the existing console top. The panel design is to be provided to the TA for review and

comments prior to fabrication and installation. TA to have 2 business days for review.

12.1.C.15 Serviceability

12.1.C.15.1 Contractor must ensure suppliers of all new equipment have North American service support with availability of 24/7 call in/email service, and in person technical support within 48 hours to locations in Canada including Kenora ON and Lake of the Woods area.

12.1.C.16 Warranty – (In Contract)

12.1.C.17 Consumables

12.1.C.17.1 Contractor must include the following consumables in accordance with manufacturer's specifications:

- Lube oil for flushing, initial run-up and first oil change;
- All coolant required;
- One operational season supply of Fuel filters, Lube filters and Air filters based on initial start-up, and two complete filter replacement engine services.

12.1.C.18 Plan Approval

12.1.C.18.1 Contractor must submit all required plans and drawings to ABS for plan approval. The TA must be copied on all communication with ABS including the submittal.

12.1.C.18.2 Contractor must submit original copies and one (1) PDF electronic copy of the approved drawings to the TA upon ABS approval.

12.1.C.19 Torsional and vibrations calculations

12.1.C.19.1 Contractor must supply torsional calculations for new driveline including main engines, gearboxes, couplings, drive shaft torsional couplings, and stern drives.

12.1.C.19.2 Torsional calculations must show areas of significant vibration and define any operational RPM ranges the vessel should not run in due to resonating frequencies.

12.1.C.19.3 All the torsional calculations and non-operational ranges must be included in the installation package.

12.1.C.20 Stability

12.1.C.20.1 The Contractor must complete a lightship survey and vessel inclining to determine the new vessel centre of gravity and vessel weight. The lightship survey and vessel inclining must be completed in accordance with TP 7301 standard. The vessel lightship survey and inclining must be witnessed by an ABS inspector.

12.1.C.20.2 The Contractor must determine the new lightship weight, changes in centre of gravity and change in GM with new equipment installed. Contractor must supply the finding in a report in accordance with Section G 1.26 of this specification.

12.1.C.20.3 The Contractor must complete a new stability booklet using the new Lightship, CoG and GM figures as determined in vessel inclining. The booklet must be completed in accordance with the Trim and Stability Book Production for CCG Vessels, and use the same operating conditions as noted in the original booklet. Once complete the booklet must be submitted to ABS for review and approval. Contractor is responsible for providing a ABS stamped approved Intact Stability Booklet.

12.1.C.20.4 The Contractor must complete a new vessel maneuvering card in accordance with TP 7301 standard. This card must be printed on an 8-1/2 x 11 sheet, laminated and posted in the wheelhouse in similar location to the existing card.

12.1.C.21 Certification

12.1.C.21.1 Contractor must supply TA with all engines and gearboxes certificates. This must include classification society and approval and IMO emissions certificates.

12.1.C.22 Factory acceptance tests (FAT)

12.1.C.22.1 Contractor must arrange factory acceptance tests in Contractor's (or sub Contractor's) facility.

12.1.C.22.2 FAT must be witnessed by the TA and the ABS surveyor.

12.1.C.22.3 Contractor must complete a Factory Testing plan and submit it to the TA and the ABS representative for approval. The plan must show intended dates for the tests as well as a list of the tests to occur.

12.1.C.22.4 The approved plan must include testing of the following:

- Output rotation direction of gearboxes;
- All alarms and shutdowns;
- Engines normal start and stop;

- Emergency stops;
- Engine Room controls and displays;
- Wheelhouse controls and displays;
- 0 - 15% power for 30 minutes. Monitoring and measuring pressures, temperatures rpm, to be recorded twice for duration;
- 15 - 30% power for 30 minutes. Monitoring and measuring pressures, temperatures, and rpm, to be recorded twice for duration;
- 30 - 50% power for 30 minutes. Monitoring and measuring pressures, temperatures, rpms, to be recorded every 15 minutes for duration;
- 50 - 75% power for 30 minutes. Monitoring and measuring pressures, temperatures, rpms, to be recorded every 15 minutes for duration;
- 75 - 100% power at rated speed for 1 hour. Monitoring and measuring pressure, temperatures, and rpms, to be recorded every 15 minutes for duration.

12.1.C.22.5 All test data must be provided to the TA as well as a complete report detailing all tests completed. The report must be submitted to the TA two (2) weeks after completion of the tests.

12.1.D Deliverables

12.1.D.1 Material

12.1.D.1.1 Contractor must provide the engine and gearbox assemblies which include:

- Cooling system;
- Electrical system;
- Lubrication system;
- Exhaust System;
- Flexible mounts;
- Drive Shaft Torsional Coupling;
- All required control panels and actuators;
- All required OEM cables and connectors.

12.1.D.1.2 Contractor must provide the propulsion controls, including:

- Control head and Indicators;
- All required panels and junction boxes;
- All required OEM cables and connectors;

12.1.D.1.3 Contractor must provide the engine and gearboxes alarm and monitoring system including:

- All required sensors pre-mounted on engines;
- All required sensors pre-mounted on gearboxes;
- Panels and junction boxes;
- All required OEM cables and connectors;
- Gauges and indicators;
- Annunciators;
- Alarm and monitoring Display.

12.1.D.1.4 Contractor must supply preassembled engine room controls and indicators.

12.1.D.1.5 Contractor must supply wheelhouse preassembled drop-in panels.

12.1.D.2 Spares

12.1.D.2.1 Contractor must provide a list of OEM spare parts for the engines and gearboxes. The list must include clearly identify parts that are critical spares and the unit price for each part.

12.1.D.3 Delivery

12.1.D.3.1 The CCG Kenora Base employees will handle the truck off loading and the required safe storage of the delivered equipment on site in one of the warehouses. Unloading must be under the direction of the Contractor.

12.1.D.4 Training

12.1.D.4.1 The Contractor must provide both operational and maintenance training on the engines, gearboxes, and propulsion control system for up to 6 people, to be adjusted up or down by 1379.

12.1.D.4.2 Training must be completed by factory trained representatives.

12.1.D.4.3 The Contractor must submit a training plan and the training documents thirty (30) days after the contract award.

12.1.D.4.4 The operator training objective must be to familiarize the operators with the normal and emergency operation of the new system such that the operators are able to correctly operate and accurately interpret the responses and indications of the new system.

12.1.D.4.5 The Maintenance Training must be focused on component and system trouble shooting, component replacement, component identification and on routine testing and verification of system condition and functions.

12.1.D.4.6 The training session and the training material must be provided in English.

12.1.D.5 Documentation

12.1.D.5.1 Contractor must provide technical information on the proposed engines, gearboxes, alarms and control systems. The documentation must demonstrate that the proposed equipment is compliant with all the requirements section 12 of this specification. The documentation must be submitted with the bidder's bid and must include the following:

- Make;
- Model;
- Technical specifications;
- Emission certification;
- Class approval;
- Duty cycle.

12.1.D.5.2 Contractor must provide a detailed installation package. The installation package must be delivered in two (2) hard copies and one (1) electronic copy to the TA. All the drawings must be provided in AutoCad 2010 DWG format or newer. The package must include the followings:

- Port and Starboard Engines and Gearboxes foundations modification drawings;
- Fuel system drawing (including connection to existing system);
- Cooling system drawing (including connection to existing system);

- Exhaust system drawing (including connection to existing system);
- Electrical drawing (including connections to existing system);
- Cabling drawings (cabling of the entire provided system)
- Cables connection drawings (for the entire provided system)
- Stability Calculations;
- Torsional Calculations;
- Vibration analysis and non-operational ranges;
- Installation instructions for every provided piece of equipment and panels;
- Service & Maintenance Manuals,
- Spare parts list.

12.2 INSTALLATION OF NEW ENGINES AND GEARBOXES

12.2.A Identification

12.2.A.1 The Contractor must install new CSM Main Engines, Gearboxes, Drive Shaft Torsional Coupling, and propulsion control system as defined in section 12.1.

12.2.A.2 The Contractor must remove existing equipment to allow for the installation of new equipment.

12.2.A.3 The Contractor must complete all modifications to the existing vessel structure and systems to accommodate the new equipment.

12.2.A.4 The Contractor must return the vessel to operational condition.

12.2.B References

12.2.B.1 Drawings/Manuals

See section 12.1.B.2

12.2.C Statement of Work

12.2.C.1 Equipment Removal

12.2.C.1.1 The Contractor must remove port and starboard main engines, gear boxes and monitoring and control systems from the engine room and wheelhouse.

12.2.C.1.2 The Contractor must remove all the control and power supply cables of the old system. None of the old cables are to be reused and no unused cable are to be left onboard.

12.2.C.1.3 The Contractor must utilize the port and starboard engine compartment hatch openings as the removal and install path for the engines and generator set. Refer to section 13.0 for the generator statement of work. The clear opening is 1145mm x 1645mm. The generator can only be removed and or installed with the starboard main engine removed from the engine compartment. Refer to drawing J18063-A01 for engine compartment, access hatch and ventilation details.

12.2.C.1.4 All supporting systems must be disconnected, capped and secured to be reused for the new engines to be installed. Existing systems must be disconnected to the closest available flange or connection point. These points must be determined during the site survey.

12.2.C.1.5 Temporary lifting lugs and beams used to facilitate the removal of equipment must be removed and structure returned to original condition upon contract completion.

12.2.C.1.6 All temporary lifting lugs and beams must be engineered and approved by a Contractor provided professional engineer or ABS and tested to 125% SWL prior to use.

12.2.C.2 Engine Foundation Modifications

12.2.C.2.1 Contractor must complete structural modifications to the engine foundations to facilitate the installation of the new main engines and gearboxes in accordance to the ABS approved installation drawing and section G.1.23.

12.2.C.3 Main Engines Installation

12.2.C.3.1 The Contractor must transport the Engine inside the engine compartment through the deck hatch opening. All cranes and operators to be supplied by Contractor.

12.2.C.3.2 The Contractor must install the engine on the modified foundations, using the new CSM vibration dampers/ flexible mounting.

12.2.C.3.3 All the engine installations must be in compliance to the OEM installation instructions and approved ABS installation drawings.

12.2.C.4 Gearboxes Installation

12.2.C.4.1 The Contractor must install gearbox as per approved ABS installation drawing and OEM instructions.

12.2.C.5 Engines and Gearboxes Alignment

12.2.C.5.1 Engine and gearbox must be aligned with drive shaft torsional coupling and existing shaft line.

12.2.C.5.2 Alignment must consist of minimum 3 rotations with offsets taken quarterly on each rotation and all measurements within manufacturers recommended limits.

12.2.C.5.3 Contractor must give ABS the opportunity to be present while all measurements are taken.

12.2.C.5.4 Final measurements must be submitted to ABS and TA upon completion.

12.2.C.6 Wet Exhaust System Modification

12.2.C.6.1 The Contractor must install the Wet exhaust system in accordance to the new ABS approved system drawing.

12.2.C.6.2 All required fittings to be new CSM.

12.2.C.7 Fuel System Modifications

12.2.C.7.1 The Contractor must install shipboard fuel lines in accordance with new ABS approved drawings.

12.2.C.7.2 All required fittings to be new CSM.

12.2.C.8 Cooling System Modification

12.2.C.8.1 The Contractor must install shipboard cooling system lines in accordance with new ABS approved drawings.

12.2.C.8.2 All required fittings to be new CSM.

12.2.C.9 Electrical Installations

12.2.C.9.1 The Contractor must install all electrical connections in accordance with new ABS approved drawings.

12.2.C.9.2 All required fittings to be new CSM.

12.2.C.10 Starting Batteries

12.2.C.10.1 The Contractor must install new starting batteries in accordance with new ABS approved drawings and as per TP 127E.

12.2.C.11 Wheelhouse Console

12.2.C.11.1 The Contractor must install the new engine controls, and display recessed in the wheelhouse console. All required new cables, supports, ties, brackets required to be supplied and installed by the contractor.

12.2.C.11.2 The Contractor is responsible for cutting out the console top where the existing engine controls were located.

12.2.C.11.3 The Contractor must install the top panel on the existing console and perform all required structural modifications to the console frame.

12.2.C.11.4 The Contractor must confirm any changes to the position of any existing devices and equipment with the TA prior to construction.

12.2.C.11.5 The Contractor must use 316 SS hardware with a 2mm x 10mm rubber gasket between console top and drop in panels.

12.2.C.11.6 The Contractor must modify existing consoles to accommodate new console tops. All bare metal must be painted black to match existing color. Paint specification will be provided by CCG.

12.2.D Proof of Performance

12.2.D.1 Plan Approval

12.2.D.1.1 Contractor must submit all required plans and drawings to TA for review and ABS for approval.

12.2.D.1.2 Contractor must have ABS plan approval prior to the commencing installation.

12.2.D.2 Inspections

12.2.D.2.1 Contractor must arrange all required ABS inspections and approvals.

12.2.D.2.2 Contractor must provide TA with inspection schedule and inform the TA 48 hour prior to any inspections by ABS.

12.2.D.3 Sea Trials / Commissioning

12.2.D.3.1 Contractor must provide a sea trial test plan and commissioning test & procedures as recommended by engine and gearbox manufacturer(s) to TA 1 week prior to commissioning of machinery.

12.2.D.3.2 The Contractor must ensure FSRs of newly supplied equipment are present during sea trials and commissioning.

12.2.D.3.3 The Contractor must provide opportunity to ABS to be present during sea trials and commissioning of new equipment.

12.2.D.3.4 The Contractor must perform dock and sea trials as per sea trials and commissioning plan. The Contractor must bid on conducting dock and sea trials over 3 days at eight hour working hours each day.

12.2.D.3.5 The Contractor must have sufficient personnel on-hand during the undocking of the vessel to ensure watertight integrity of vessel. Any deficiencies to be resolved at contractors expense.

12.2.D.3.6 The Contractor must, during the Sea Trials:

- Monitor and record the port and starboard shaft coupling temperatures every 30 minutes;
- Monitor and record the port and starboard engine compartment temperatures every 15 minutes;
- Record all the temperatures and pressures from the main engines every 15 minutes;
- Readings must be provided to the TA upon completion of the sea trial period;

12.2.E Deliverables

12.2.E.1 Documentation (Reports/Drawings/Manuals)

12.2.E.1.1 The Contractor must provide the TA with an installation report including the followings:

12.2.E.1.2 The Contractor must provide commissioning reports from FSR to TA.

12.2.E.1.3 The Contractor must provide databook which includes all measurement, work completed and FSR reports.

12.2.E.1.4 The Contractor must supply copies of ABS approved drawings along with the as-fitted drawings.

12.2.E.1.5 The Contractor must provide all As Fitted drawings as per section 12.1.C.12.3. Drawings must be provided in AutoCad 2010 DWG format or newer in accordance with CCG Drafting Standard references under G1.27.

13.0 Ship's Service Electrical Power Generation

13.1 NEW SHIP SERVICE GENERATOR

13.1.A Identification

13.1.A.1 The CCGS Traverse requires the replacement of its ship service generator set.

13.1.B References

13.1.B.1 Existing Equipment Data

Generator Set: Northern Lights M964 M30CS (rated: 30kW, 240V, 1 Phase, 60HZ, RPM 1800, 125Amps, PF 1.0, Continuous Rating, Stator WYE, AVR SX460 Diesel Engine Inline 4 cylinder, 3 ltr, Cycle 4)

Serial# 9642-21172

Attached existing engine driven hydraulic pump for deck crane operation. (Denison Hydraulics PV10-1R1C-C00). Serial # 00018967

13.1.B.2 Guidance Drawings

Refer to section 12.1.B.2

13.1.C Statement of Work

13.1.C.1 Generator Set

13.1.C.1.1 The Contractor must supply one new 30kw ship service generator set that consists of the following;

- The generator set must be a certified marine type, approved by TCMS.
- Generator set must be rated for 30kW, 240V, 1 Phase, 60HZ, RPM 1800, 125Amps, PF 1.0, Continuous Rating, Stator WYE, with an Automatic Voltage Regulator. The engine must be diesel powered, and have an Inline 4 cylinder marine diesel engine with a power take-off (PTO) with 12V electric clutch, and SAE B spline of up to 42hp.
- Generator set PTO must be compatible and be able to reconnect to the existing engine attached hydraulic pump that is required for the vessels deck crane operation. Refer to 13.1.B.1 for pump details.
- Generator set dry weight cannot exceed 1300lbs.

- Generator set must meet the IMO Tier II Emission standard.
- Generator set must be compatible with Type B CAN/CGSB-3.517 marine diesel fuel.
- Generator set must have heavy duty rating.
- The engine compartment temperature, when generator set and the starboard main engine are at full power, should not exceed 50 degree C when raw water supply is 25 degree C and outside temperature is 35 degree C. If increased air supply is required in order to meet these parameters, the contractor should provide in their drawings increased air supply.
- Generator set must be equipped with all required pre-alarms, alarms and shutdowns, as per Marine Machinery Regulations.
- Generator set must be capable of working with raw water supplied between 0 and 25 degree C and air temp between -5 and +35 degree C.

13.1.C.2 Generator Set Lubrication System

13.1.C.2.1 The Contractor must supply a generator set lubrication system that includes the following;

- Generator set must include a lube oil cooler assembly with thermostatically controlled bypass arrangement to maintain oil temperature within manufacturers specified range with generator set operating at full power with raw water at 25 C and air temperature at 35 C. The lubricating oil system must be self-contained with filters, pump, cooler, piping, all included and be of wet sump type.
- Generator set must include oil dip-stick.
- Generator set must include oil fill arrangements, allowing oil to be added without removal of any equipment or structure.
- Generator set must include a sampling port to collect a representative oil sample for wear particle analysis in a location upstream of the filter while the generator set is running under normal operating conditions.
- Generator set must be equipped with waste oil pump quick connect, permanently mounted on the oil pan for oil changes.

13.1.C.3 Generator Set Cooling System

- The Contractor must supply a generator set cooling system that is thermostatically regulated water cooled, connected to existing raw water supply, sent through the generator set jacket water heat exchanger, then out through the wet exhaust.

13.1.C.4 Generator Set Fuel System

13.1.C.4.1 The Contractor must supply a generator set fuel system that includes the following;

- Generator set must connect to and be useable with existing fuel piping system.
- Generator set must be direct fuel injection.
- Generator set must have a control unit for processing injection of fuel.
- Generator set must be equipped with duplex manifold primary filter minimum with water separator. If required, fuel oil heater to be provided for heating fuel for low temperatures to maintain proper injection viscosity.

13.1.C.5 Generator Set Electrical System

13.1.C.5.1 The Contractor must supply a generator set electrical system that includes the following;

- Generator set must connect to and be useable with existing cables in the vessels electrical system.
- Generator set must include a thermostatic controlled block heater suitable for starting generator set at -10 Deg. C and approved by generator set manufacturer
- Generator set must be electric start.
- Generator set must be provided with a battery box, and a starting battery approved by generator set manufacturer. The generator set starting battery must be capable of starting the generator set 14 times repeatedly.
- Generator set must be fitted with a suitable alternator to charge manufacturer recommended start battery.

13.1.C.6 Generator Set Wet Exhaust System

13.1.C.6.1 The Contractor must supply and fit the generator set with a wet exhaust system. System must connect to existing water source. Sizing and backpressure to be confirmed by the generator set manufacturer.

13.1.C.7 Generator Set Mounts

13.1.C.7.1 The Contractor must supply and fit the generator set with flexible mounts that must be suitable for marine use and approved by generator set manufacturer.

13.1.C.8 Generator Set Foundation Modifications

13.1.C.8.1 Contractor must provide ABS approved installation drawings for the structural modifications to the generator set foundations to facilitate the installation of the new main generator set. Any modifications to the generator set foundation must be reviewed and approved by ABS prior to the start of installation.

13.1.C.9 Generator Set Hydraulic Pump Connection Components

13.1.C.9.1 The Contractor must supply all required components including the flexible coupling, mounting plate, and PTO clutch to connect the existing hydraulic pump to the Generator Set for deck crane operations.

13.1.C.10 Instrumentation & Alarm System

13.1.C.10.1 Contractor must provide an alarm and monitoring system with indication lights, audible alarm on activation, and generator set emergency shutdowns, suitable for a periodically unattended machinery space as per Marine Machinery Regulations, Schedule VIII.

13.1.C.10.2 Contractor must provide displays in wheel house, accommodation container, and in the starboard generator set compartment using J1939 data link to generator set, for:

- generator set speed,
- temperature,
- oil pressure
- oil temperature
- generator set hours and
- battery voltage of start battery, primary and secondary DC display power sources,
- AVR output voltage

13.1.C.10.3 Contractor must ensure all instrumentation and alarm connections are completed via CSM OEM electrical harnesses and connectors.

13.1.C.11 Connections to Existing Systems

13.1.C.11.1 The drawings listed in section 12.1.B.2 are for reference only and are not to be used to create the new set of ABS approved installation drawings for newly supplied machinery.

13.1.C.11.2 The Contractor must provide ABS approved installation drawings with proposed machinery, showing how the new generator set connects to existing piping and cables prior to any work on the vessel commencing.

13.1.C.11.3 The Contractor must provide new AS-FITTED drawings for the following systems.

- Electrical systems;
- Cooling systems;
- Fuel oil systems;
- Exhaust systems;
- Ventilation system;
- Generator set Foundations.
- Shafting arrangement

13.1.C.12 Generator Set Room Controls & Indicators

13.1.C.12.1 The Contractor must provide all panels, gauges, and alarms for the generator set to be installed mounted either to the generator set or near the generator set in the compartment in accordance to TP 127E.

13.1.C.12.2 The Contractor must provide a local start/stop control panel including engine preheat switch, and an emergency-stop pushbutton with annunciator on the panel in the generator set compartment.

13.1.C.12.3 The generator set gauges must include:

- Generator set Tachometers;
- Lube oil pressure;
- Jacket water temperature;
- Lube oil temperature.

- Hour meter

13.1.C.13 Wheelhouse Controls & Indicators

13.1.C.13.1 The Contractor must provide a generator set display unit to be fitted in wheelhouse console. Display screen to be a minimum of 5", and must include the following display parameters;

- Lube oil pressure;
- Jacket water temperature;
- Lube oil temperature;
- Exhaust temperature;
- Starting battery voltage;

13.1.C.13.2 The Contractor must ensure all monitors and indicators in the wheelhouse are fitted with rheostat controlled lightning dimmable to OFF.

13.1.C.13.3 The Contractor must provide a remote start/stop control panel and an emergency-stop pushbutton on the panel in the wheelhouse.

13.1.C.13.4 Contractor must provide new console top drop in panel for the wheelhouse controls and indicators. The panel must be in a similar material and color as the existing console top. The panel design is to be provided to the TA for review and comments prior to fabrication and installation. TA to have 2 business days for review.

13.1.C.14 Serviceability

13.1.C.14.1 Contractor must ensure suppliers of all new equipment have North American service support with availability of 24/7 call in/email service, and in person technical support within 48 hours to locations in Canada including Kenora ON and Lake of the Woods area.

13.1.C.14.2 Contractor must provide written confirmation of serviceability with the Bidder's technical submission.

13.1.C.15 Warranty (Not used – In Contract)

13.1.C.16 Consumables

13.1.C.16.1 Contractor must include the following consumables in accordance with manufacturer's specifications:

- Lube oil for flushing, initial run-up and first oil change;
- All coolant required;
- One operational season supply of Fuel filters, Lube filters and Air filters based on initial start-up, and two complete filter replacement engine services.

13.1.C.17 Plan Approval

13.1.C.17.1 Contractor must submit all required plans and drawings to ABS for plan approval. The TA must be copied on all communication with ABS including the submittal.

13.1.C.17.2 Contractor must submit original copies and one (1) PDF electronic copy of the approved drawings to the TA upon ABS approval.

13.1.C.18 Stability

13.1.C.18.1 Refer to section 12.1.C.20.

13.1.C.19 Certification

13.1.C.19.1 Contractor must supply TA with all generator set certificates. This must include classification society and approval and IMO emissions certificates.

13.1.C.20 Factory acceptance tests (FAT)

13.1.C.20.1 Contractor must arrange factory acceptance tests in Contractor's (or sub Contractor's) facility.

13.1.C.20.2 FAT must be witnessed by the TA and the ABS surveyor.

13.1.C.20.3 Contractor must complete a Factory Testing plan and submit it to the TA and the ABS representative for approval. The plan must show intended dates for the tests as well as a list of the test to occur.

13.1.C.20.4 The approved plan must include testing of the following:

- All alarms and shutdowns;
- Generator Set normal start and stop;
- Generator preheat switch;
- Emergency stops;
- Generator Set Compartment controls and display;

- Wheelhouse controls and displays;
- 0 - 15% no load for 30 minutes. Monitoring and measuring pressures, temperatures rpm, to be recorded twice for duration;
- 15 - 30% load for 30 minutes. Monitoring and measuring pressures, temperatures, and rpm, to be recorded twice for duration;
- 30 - 50% load for 30 minutes. Monitoring and measuring pressures, temperatures, rpms, to be recorded every 15 minutes for duration;
- 50 - 75% load for 30 minutes. Monitoring and measuring pressures, temperatures, rpms, to be recorded every 15 minutes for duration;
- 75 - 100% load at rated speed for 1 hour. Monitoring and measuring pressure, temperatures, and rpms, to be recorded every 15 minutes for duration.

13.1.C.20.5 All test data must be provided to the TA as well as a complete report detailing all tests completed. The report must be submitted to the TA two (2) weeks after completion of the tests.

13.1.D Deliverables

13.1.D.1 Material

13.1.D.1.1 Contractor must provide the generator set assemblies which include:

- Cooling system;
- Electrical system;
- Lubrication system;
- Exhaust System;
- Flexible mounts;
- Coupling, mounting plate, and PTO clutch to connect the existing hydraulic pump;
- All required control panels and actuators;
- All required OEM cables and connectors.

13.1.D.1.2 Contractor must provide the generator set alarm and monitoring system including:

- All required sensors pre-mounted on generator set;

- All required sensors pre-mounted on gearboxes;
- Panels and junction boxes;
- All required OEM cables and connectors;
- Gauges and indicators;
- Annunciators;
- Alarm and monitoring Display.

13.1.D.1.3 Contractor must supply preassembled generator set compartment controls and indicators.

13.1.D.1.4 Contractor must supply wheelhouse preassembled drop-in panels.

13.1.D.2 Spares

13.1.D.2.1 Contractor must provide a list of OEM spare parts for the generator set and gearboxes. The list must include clearly identify parts that are critical spares and the unit price for each part.

13.1.D.3 Delivery

13.1.D.3.1 All freight and delivery fees are at Contractor's expenses including and up to placement of the generator set in their designated places on the ship.

13.1.D.3.2 The CCG Kenora Base employees will handle the truck off loading and the required safe storage of the delivered equipment on site in one of the warehouses. Unloading must be under the direction of the Contractor.

13.1.D.4 Training

13.1.D.4.1 Refer to section 12.1.D.4

13.1.D.5 Documentation

13.1.D.5.1 Contractor must provide technical information on the proposed generator set, alarms and controls. The documentation must demonstrate that the proposed equipment is compliant with all the requirements the current section of this specification. The documentation must be submitted with the bidder's bid and must include the following:

- Make;
- Model;

- Technical specifications;
- Emission certification;
- Class approval;
- Duty cycle.

13.1.D.5.2 Contractor must provide a detailed installation package. The installation package must be delivered in three (3) hard copies and one (1) electronic copy to the TA. All the drawings must be provided in AutoCad 2010 DWG format or newer. The package must include the followings:

- Generator set foundations modification drawings;
- Fuel system drawing (including connection to existing system);
- Cooling system drawing (including connection to existing system);
- Exhaust system drawing (including connection to existing system);
- Electrical drawing (including connections to existing system);
- Cabling drawings (cabling of the entire provided system)
- Cables connection drawings (for the entire provided system)
- Stability Calculations;
- Vibration analysis and non-operational ranges;
- Installation instructions for every provided piece of equipment and panels;
- Service & Maintenance Manuals,
- Spare parts list.

13.2 INSTALLATION OF NEW GENERATOR SET

13.2.A Identification

13.2.A.1 The Contractor must install CSM new generator set, and control and monitoring system as defined in section 13.1.

13.2.A.2 The Contractor must remove existing equipment to allow for the installation of new equipment.

13.2.A.3 The Contractor must complete all modifications to the existing vessel structure and systems to accommodate the new equipment.

13.2.A.4 The Contractor must return the vessel to operational condition.

13.2.B References

13.2.B.1 Drawings/Manuals

See section 12.1.B.2

13.2.C Statement of Work

13.2.C.1 Equipment Removal

13.2.C.1.1 The Contractor must remove the generator set, and monitoring and control systems from the engine room and accommodation space.

13.2.C.1.2 The Contractor must utilize the starboard engine compartment hatch opening as the removal and install path for the generator set and main engine. Refer to section 12.0 for the main engine statement of work. The clear opening is 1145mm x 1645mm. The generator set can only be removed and or installed with the starboard main engine removed from the engine compartment. Refer to drawing J18063-A01 for engine compartment, access hatch and ventilation details.

13.2.C.1.3 All supporting systems must be disconnected, capped and secured to be reused for the new generator set to be installed. Existing systems must be disconnected to the closest available flange or connection point. These points must be determined during the site survey.

13.2.C.1.4 Temporary lifting lugs and beams used to facilitate the removal of equipment must be removed and structure returned to original condition upon contract completion.

13.2.C.1.5 All temporary lifting lugs and beams must be engineered and approved by a Contractor provided professional engineer or ABS and tested to 125% SWL prior to use.

13.2.C.2 Generator set Foundation Modifications

13.2.C.2.1 Contractor must complete structural modifications to the generator set foundations to facilitate the installation of the new generator set in accordance to the ABS approved installation drawing and section G.1.23.

13.2.C.3 Main Generator set Installation

13.2.C.3.1 The Contractor must transport the generator set inside the generator set compartment through the deck hatch opening. All cranes and operators to be supplied by Contractor.

13.2.C.3.2 The Contractor must install the generator set on the modified foundations, using the Contractor supplied vibration dampers/ flexible mounting.

13.2.C.3.3 All the generator set installations must be in compliance to the OEM installation instructions and approved ABS installation drawings.

13.2.C.4 Wet Exhaust System Modification

13.2.C.4.1 The Contractor must install the wet exhaust system in accordance to the new ABS approved system drawing.

13.2.C.4.2 All required fittings to be new CSM.

13.2.C.5 Fuel System Modifications

13.2.C.5.1 The Contractor must install shipboard fuel lines in accordance with the new ABS approved drawing.

13.2.C.5.2 All required fittings to be new CSM.

13.2.C.6 Cooling System Modification

13.2.C.6.1 The Contractor must install shipboard cooling system lines in accordance with new ABS approved drawings.

13.2.C.6.2 All required fittings to be new CSM.

13.2.C.7 Electrical Installations

13.2.C.7.1 The Contractor must install all electrical connections in accordance with new ABS approved drawings.

13.2.C.7.2 All required fittings to be new CSM.

13.2.C.8 Starting Batteries

13.2.C.8.1 The Contractor must install new starting batteries in accordance with new ABS approved drawings and as per TP 127E.

13.2.C.9 Wheelhouse Console

13.2.C.9.1 The Contractor must Refer to section 12.2.C.11 and install the new Generator Set controls, and display.

13.2.D Proof of Performance

13.2.D.1 Plan Approval

13.2.D.1.1 Contractor must submit all required plans and drawings to ABS for approval and TA for comments.

13.2.D.1.2 Contractor must have ABS plan approval prior to the commencing installation.

13.2.D.2 Inspections

13.2.D.2.1 Contractor must arrange all required ABS inspections and approvals.

13.2.D.2.2 Contractor must provide TA with inspection schedule and inform the TA 48 hour prior to any inspections by ABS.

13.2.D.3 Sea Trials / Commissioning

13.2.D.3.1 Contractor must provide a sea trial test plan and commissioning test & procedures as recommended by engine and gearbox manufacturer(s) to TA 1 week prior to commissioning of machinery.

13.2.D.3.2 The Contractor must ensure FSRs of newly supplied equipment are present during sea trials and commissioning.

13.2.D.3.3 The Contractor must provide opportunity to ABS to be present during sea trials and commissioning of new equipment.

13.2.D.3.4 The Contractor must perform dock and sea trials as per sea trials and commissioning plan. The Contractor must bid on conducting dock and sea trials over 3 days at eight hour working hours each day.

13.2.D.3.5 The Contractor must have sufficient personnel on-hand during the undocking of the vessel to ensure watertight integrity of vessel. Any deficiencies to be resolved at contractors expense.

13.2.D.3.6 The Contractor must carry out a two hour dock side load bank test with the FSR and ABS inspector present, and complete the following testing;

- All alarms and shutdowns;
- Generator set normal start and stop;
- Emergency stops;
- Generator set compartment controls and displays;
- Wheelhouse controls and displays;
- 0 - 15% load for 30 minutes. Monitoring and measuring pressures, temperatures rpm, to be recorded every 15 minutes for duration;
- 15 - 30% load for 15 minutes. Monitoring and measuring pressures, temperatures, and rpm, every 15 minutes for duration;
- 30 - 50% load for 15 minutes. Monitoring and measuring pressures, temperatures, rpms, to be recorded every 15 minutes for duration;
- 50 - 75% load for 30 minutes. Monitoring and measuring pressures, temperatures, rpms, to be recorded every 15 minutes for duration;
- 75 - 100% load for 30 minutes. Monitoring and measuring pressure, temperatures, and rpms, to be recorded every 15 minutes for duration.
- Crew to engage the PTO clutch, run the attached hydraulic pump, and ensure the deck crane operates as existing. It is the Contractor responsibility to make sure the hydraulic lines are air free.

13.2.E Deliverables

13.2.E.1 Documentation (Reports/Drawings/Manuals)

13.2.E.1.1 The Contractor must provide the TA with an installation report including the following:

13.2.E.1.2 The Contractor must provide commissioning reports from FSR to TA.

13.2.E.1.3 The Contractor must provide data book which includes all measurement, work completed and FSR reports.

13.2.E.1.4 The Contractor must supply copies of ABS approved drawings along with the as-fitted drawings.

13.2.E.1.5 The Contractor must provide all As Fitted drawings as per section 13.1.C.11.3. Drawings must be provided in AutoCad 2010 DWG format or newer in accordance with CCG Drafting Standard references under G1.27.